HANDBOOK OF EXPERIMENTAL ECONOMICS RESULTS

Edited by

CHARLES R. PLOTT

California Institute of Technology

and

VERNON L. SMITH

Chapman University

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Chapter 94

THREE-WAY EXPERIMENTAL ELECTION RESULTS: STRATEGIC VOTING, COORDINATED OUTCOMES AND DUVERGER'S LAW

THOMAS RIETZ

Department of Finance, Henry B. Tippie College of Business, University of Iowa, Iowa City, IA 52242-1000, USA

1. Introduction

When a majority is split between two majority-preferred candidates in an election, a minority-preferred candidate can win a three-way race. The winner would lose the two-way race with each other candidate and, therefore, is known as a Condorcet Loser (see Condorcet, 1785, and discussions in Black, 1958). Here, I discuss recent experimental work that shows (1) when a split-majority results in a minority-preferred (Condorcet Loser) candidate winning an election, (2) when a split-majority can coordinate using a pre-election signal to defeat the Condorcet Loser and (3) what kind of signals work best in coordinating the majority.

To see what causes the Condorcet Loser problem and how strategic voting can overcome it, consider the electorate profile given in Figure 1. Type "O" and "G" voters form the split majority. When they can coordinate and concentrate their votes on one of their preferred candidates (essentially ignoring the other), they can defeat the Condorcet Loser (candidate "B"). Then, the election becomes a two-way race with one majority-preferred candidate and the minority-preferred candidate as the remaining viable candidates. This is the outcome predicted by Duverger (1967) for plurality voting elections.[1]

Felsenthal, Rapoport, and Maoz (1988), Felsenthal (1990) and Rapoport, Felsenthal, and Maoz (1991) present a series of bloc voting models that allow tacit cooperation between voting blocs in elections among three alternatives. They find that majority voters can often find means of tacit coordination to overcome the Condorcet Loser problem under a variety of payoffs. The papers discussed below build on this research by allowing individual voting models (which have more appealing continuity properties, see Rietz, 1993) and comparing several types of public coordinating signals that may allow immediate coordination. McKelvey and Ordeshook (1985a, 1985b, 1990) show that non-binding pre-election polls can transmit information between voters and between candidates and voters. Plott (1991) also studies polls and finds that they can both

[1] See any of the papers cited in Figure 1 for a discussion of the roots and importance of the split-majority/Condorcet Loser problem and Duverger's Law.

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Payoff Schedule Group:

Voter Type	Election Winner: Orange (O)	Election Winner: Green (G)	Election Winner: Blue (B)	Total Number of Each Type
1 (O)	\$1.20	\$0.90	\$0.20	4
2 (G)	\$0.90	\$1.20	\$0.20	4
3 (B)	\$0.40	\$0.40	\$1.40	6

Figure 1. Split-majority, "symmetric" payoff schedule used to induce voter preferences in: (1) Forsythe et al. (1993) in single-shot and initial elections without pre-election, coordinating signals. (2) Forsythe et al. (1993, 1996) in repeated elections with previous election results as coordinating signals. (3) Forsythe et al. (1993, 1996) in single-shot and repeated elections with pre-election polls as coordinating signals. (4) Rietz, Myerson, and Weber (1998) in single-shot elections with campaign finance levels as coordinating signals. (5) Gerber, Morton, and Rietz (1996) in single-shot elections with a majority requirement/runoff rule. Preferences were induced by paying voters of each type (row) the amount listed under the winning candidate in each election (regardless of who they voted for). Voter types are labeled by first preference here for convenience. (They were not in the experiments.) Type O and G voters constitute the split majority, while type B voters form the minority. Actual payoff tables were randomly scrambled and labeled for each voting group. They are unscrambled here for reporting purposes so that O always represents the first listed (on the ballot) of the majority-preferred candidates, G represents the second listed, majority preferred candidate and B represents the minority candidate.

transmit information and help voters coordinate in multi-candidate elections. The papers discussed below build on this research by focusing exclusively on the coordination effect of polls (isolated from the information transmission role) and by comparing polls with other coordination mechanisms.

Here, I discuss a series of papers with common electorate profiles (from Figure 1) and common experimental design elements. Forsythe et al. (1993, 1996) begin this research with baselines documenting that, without coordinating signals, the Condorcet Loser problem is very real in experimental elections. Then, they show that both polls and repeated elections can overcome the problem, leading to Duverger-type effects. Rietz, Myerson, and Weber (1998) discuss how campaign finance levels can coordinate voters and discuss the efficiency and rationality of campaigns. Gerber, Morton, and Rietz (1996) study the effects of runoff elections in these split-majority electorates. Each paper analyzes a series of elections with the same electorate profile. Here, I discuss the equilibria to the voting game (Figure 2) and summarize how subjects use strategic coordination based on pre-election signals to overcome the Condorcet Loser problem (Figure 3).

2. The Experiments

2.1. Common Procedures

Each experiment used subjects recruited from university populations as voters in a series of laboratory elections. For each session, subjects received instructional information and any questions were answered. (See Forsythe et al., 1993, for basic instructions.) Each subject participated as a member of several "voting groups" in 24 elections. With two voting groups each period, this gives 48 total elections in each session. Except for the study of repeated elections in Forsythe et al. (1996), each voting group participated in one election before random re-assignment to new groups.[2] In each election, the voting group was divided into voters of three "types," differing by their payoffs as given in Figure 1. Voters received complete information about their groups in the sense that they knew these induced preferences exactly. At the end of the sessions, subjects received cash payments based on the election winners for the voting groups in which they participated.

The results I discuss here all used plurality voting (with an additional majority requirement in Gerber, Morton, and Rietz, 1996). Thus, subjects could cast the vote vectors $(1, 0, 0)$, $(0, 1, 0)$, $(0, 0, 1)$ and $(0, 0, 0)$ for the candidates "O," "G" and "B," respectively. After each election, the candidate with the most votes was declared the winner and subjects were paid accordingly. If a tie occurred between two or more candidates, the winner was selected randomly with the tied candidates having equal probabilities of being selected. After each election, subjects were informed of the number of votes received by each candidate, the election winner and their payoffs.

2.2. Equilibria

Each paper focuses on the stage-game voting equilibria for each election using Myerson and Weber's (1993) definition. Figure 2 shows equilibria for plurality voting and the electorate profile of Figure 1. The equilibria are based on expectations about (1) which candidates will be in contention in a close race (conditional tie probabilities) and (2) the values voters place on breaking ties in their favor. For these payoffs, only the relative strengths of candidates O and G matter in selecting the equilibrium. When O is perceived strong while G is weak, all majority voters vote for O. This justifies the expectations. O wins with 8 votes to B's 6 and G's 0. Similarly, if G is perceived as strong, G wins. When neither O nor G is perceived as significantly stronger, no majority voters "cross over" and B wins with 6 votes to O's 4 and G's 4. Thus, there are two "coordinated" equilibria (right and left ends of the relative strength continuum).

[2] In Forsythe et al. (1996), each subject participated as a member of three voting groups and in eight elections in each group, for 24 elections total. Again, there were two voting groups at any given time resulting in 48 elections in 6 repeated election series.

In each, the majority voters cast all their votes on a single majority-preferred candidate, that candidate wins and the other majority-preferred candidate receives zero votes. These equilibria are Duverger-like in that one majority preferred candidate receives zero votes. However, they require both strategic voting and coordination on a specific equilibrium. In the other equilibrium, the majority voters are unable to coordinate and split their vote across the majority-preferred candidates. This results in the Condorcet Loser winning and the non-Duverger property that all three candidates remain in the race.

2.3. *Specific Treatments*

Forsythe et al. (1993) ran a series of single-shot elections under the electorate profile given in Figure 1. After each election, subjects were randomly re-assigned to two new voting groups with randomly rearranged and re-labeled payoff tables. (They have been unscrambled to correspond to Figure 1 for reporting purposes.) This allowed subjects to gain experience while preserving independence across elections. In effect, there were no coordinating signals in these elections. While Forsythe et al. (1996) run repeated elections, the first election in each series is similar in the sense that there are no coordinating signals. I group these elections as "elections without coordinating signals" for reporting.

Forsythe et al. (1993) run a series of single-shot elections each preceded by a non-binding pre-election poll. Poll results were reported to subjects before the election. Forsythe et al. (1996) run pre-election polls in repeated elections. They find a similar poll/outcome relationship. I report these outcomes with the "preceding poll" as the coordinating signal.

Forsythe et al. (1996) also run repeated elections without intervening polls. I report these outcomes with the "preceding election" as the coordinating signal.

Rietz, Myerson, and Weber (1998) have subjects contribute to candidates in a pre-election campaign and report the finance levels garnered by each candidate before each election.[3] I report these outcomes with the "preceding campaign" as the coordinating signal.

Gerber, Morton, and Rietz (1996) impose a majority requirement rule. Under this rule, if a candidate receives an absolute majority in the three-way race, that candidate is declared the winner. If not, the two leading candidates compete in a two-way runoff election to determine the winner. I report these outcomes with "runoff" as the coordinating signal.

Notice that each coordinating signal can result in three rankings between the majority-preferred candidates. The first-listed ("O" for reporting purposes) can lead, the second-listed ("G" for reporting purposes) can lead, or they can tie. One might expect that these differences lead to different behaviors among the majority voters. Thus, I report the results split across these three cases.

[3] The campaign contributions were subtracted from each subject's election payoffs. The funds were used to buy "commercials" which consisted of randomly tiled "Vote for *X*" statements that appeared on each subject's terminal over a 10-second period.

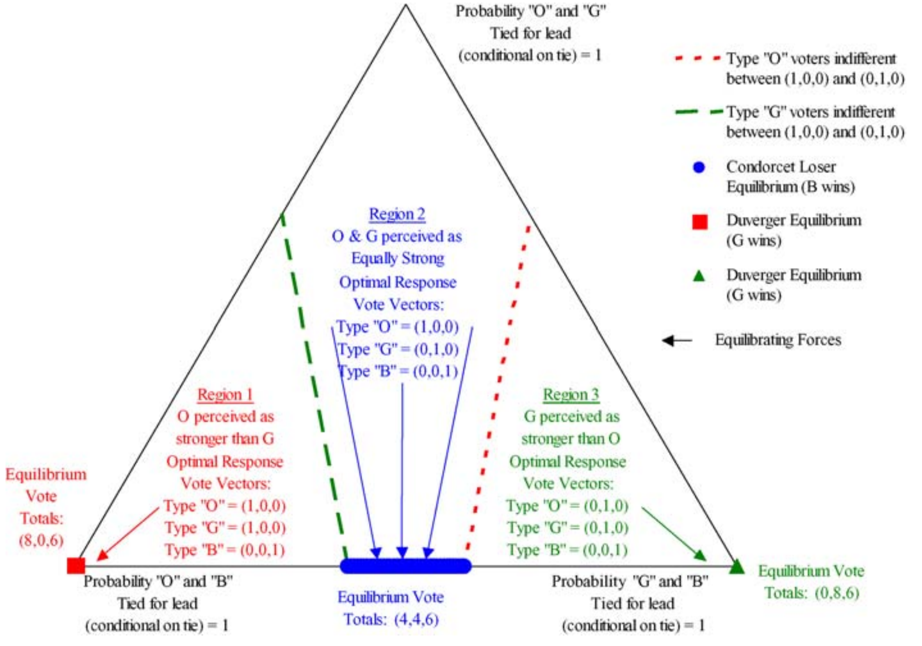

Figure 2. Perceived relative strength continuum representing equilibria for the electorate profile in Figure 1 according to Myerson and Weber's (1993) model. Vote vectors are given in the order of votes for O, G and B. Here, optimal vote responses depend only on the perceived relative strengths of O and G. If O seems much stronger than G, all majority voters vote for O. O wins with 8 votes, followed by B with 6 votes and G with 0 votes. If G seems much stronger than O, all majority voters vote for G. G wins with 8 votes, followed by B with 6 votes and O with 0 votes. These are Duverger equilibria because only two candidates receive positive vote totals. The other equilibrium results when neither O nor G seems strong enough to "swing" one majority voter type or the other and the majority splits. Then B wins the election with 6 votes, followed by O and G with 4 votes each. This coordination failure results in the Condorcet Loser (B) winning the election. This is also not a Duverger-type equilibrium since all three candidates received a significant number of votes.

3. Results

3.1. Candidate Winning Frequencies

Figure 3 shows the candidate winning frequencies (on a simplex) for each type of election. Major tendencies in the data are discussed there. Briefly, without a coordinating signal that distinguishes between majority-preferred candidates, the majority voters are unable to coordinate effectively. In contrast, when a coordinating signal distinguishes between the majority-preferred candidates, the leading majority-preferred candidate generally wins the ensuing election. The outcome is typically Duverger-like in the sense that the trailing majority-preferred candidate receives few, if any, votes. However, notice that the coordination failure is not perfect. The Condorcet Loser still wins a considerable

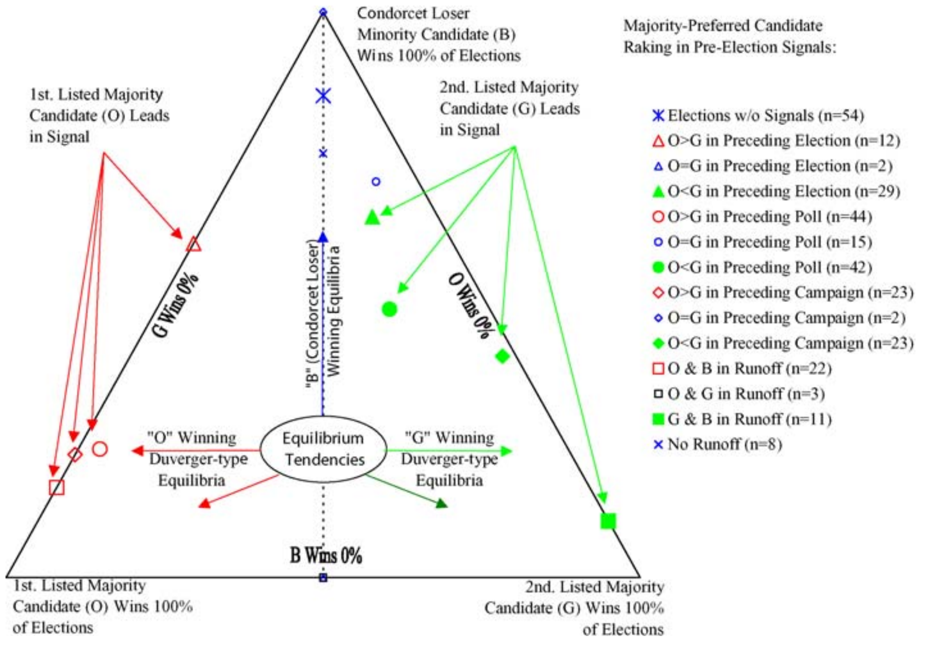

Figure 3. Candidate winning frequency simplex in three-way experimental elections with electorate profiles corresponding to Figure 1. The following pre-election signal type/election outcome relationships hold: (1) No coordinating signals ("no talk" in context, large ∗) result in frequent Condorcet Loser wins. (2) Previous election results ("common history" in context, large Δ and large ▲ and small Δ at the bottom center) are the least effective coordinating signal in defeating the Condorcet Loser. (3) Non-binding pre-election polls ("cheap talk" in context, large ○, large ● and small ○) are more effective in defeating Condorcet Losers. (4) Costly campaign contributions ("costly talk" in context, large ◊, large ◆ and small ◊ at the apex) are still more effective in defeating Condorcet Losers. (5) A majority requirement/runoff structure ("binding talk" in context, large □, large ■, small □ at the bottom center and small X) is the most effective in defeating Condorcet Losers. The following pre-election signal result/election outcome relationships hold: (1) No coordinating signals (large ∗) and coordinating signals that do not distinguish between the majority-preferred candidates (small Δ at bottom center, small ○, small ◊ at the apex, small □ at the bottom center and small X) result in frequent Condorcet Loser wins. (Note the small numbers in most of the latter cases.) (2) No coordinating signals (large ∗) and non-distinguishing signals (small Δ at bottom center, small ○, small ◊ at the apex, small □ at the bottom center and small X) result in relatively even majority candidate splits when the Condorcet Loser does not win. (3) When "O" leads "G" in the coordinating signal (large Δ, large ○, large ◊ and large □), "O" generally wins with Duverger-like outcomes (low "G" vote totals). (4) When "G" leads "O" in the coordinating signal (large ▲, large ●, large ◆ and large ■). "G" generally wins with Duverger-like outcomes (low "O" vote totals).

fraction of the time. Thus, coordinating signals aid in overcoming Condorcet Losers and the coordination seems intuitive (on the leader in the signal). However, the coordination is far from perfect. Types of signals are ranked in the following order according to their ability to aid coordination and defeat the Condorcet Loser. Previous election results prove least effective in aiding coordination and defeating the Condorcet Loser. This is followed by non-binding pre-election polls, costly campaign contributions and elections with majority requirement/runoff structures, in order of increasing effectiveness.

3.2. Other Results

The papers discussed here contain a variety of other results that may interest readers. In particular, all discuss individual voter behavior and the degree of and rationality of strategic voting. Voters differ in their strategies, but strategies generally appear rational in the sense that voters cast few dominated votes and, further, strategies appear consistent with "perfect" equilibria (in the sense of Myerson and Weber, 1993). Rietz (1993) discusses in detail what underlying model best fits observed behavior in Felsenthal, Rapoport, and Maoz (1988), Felsenthal (1990), Rapoport, Felsenthal, and Maoz (1991) and Forsythe et al. (1993, 1996). In contrast to what bloc voting models might predict, voters with the same preferences often seem to vote according to different strategies. Thus, the individual voting models explain the data better because voters are allowed to act as individuals.

Each paper discusses the degree to which elections obey Duverger's Law. Typically, when the majority voters can coordinate, they do so quite well and the equilibria appear quite Duverger-like. However, the results show two necessary conditions for Duverger's law to hold under plurality voting. First, split-majority voters must have a signal that allows them to focus on a particular candidate. Second, this signal must separate the two majority-preferred candidates sufficiently for one to become focal in order for coordination to occur.

In addition, Forsythe et al. (1993, 1996) look at election dynamics across series of repeated elections. They find that only the most recent signal seems relevant in coordination. Forsythe et al. (1996) study approval voting and the Borda rule as well. Rietz, Myerson, and Weber (1998) also discuss approval voting briefly. They find that all three voting rules are subject to Condorcet Losers winning elections. In contrast to the Duverger-like outcomes under plurality voting, results under approval voting and the Borda rule tend to close three-way races. (We would not expect Duverger's Law to hold under these voting rules and, in the experiments, it does not.) Rietz, Myerson, and Weber (1998) also discuss the rationality of campaign contribution levels. Using a variety of measures, they find that finance levels appear quite rational.

4. Conclusions and Other Issues Studied with Similar Experiments

The results from these papers clearly show that subjects are aware of the Condorcet Loser problem and act strategically to avoid it. Depending on the signals they use to coordinate their vote, they are more or less successful. The results show how Duverger's law arises from this strategic interaction, highlighting the conditions necessary for it to arise. The results also accord well with Myerson and Weber's (1993) concept of voting equilibria. Few voters cast non-equilibrium votes and, given a coordinating signal, most voters in a cohort cast votes consistent with a single equilibrium.

In closing, I note that several other papers use similar experimental designs to study different topics related to election systems. For example, Gerber, Morton, and Rietz (1998) compare voting rules in a somewhat different election system. They extend Myerson and Weber's (1993) theory to analyze straight voting and cumulative voting in multi-member districts (i.e., those in which two candidates each win a seat in a two-seat, three-way election). Again, in the experimental tests, voters' actions appear largely rational and equilibria appear consistent with rational modeling. Using a similar design, Forsythe, Rietz, and Weber (1994) study behavior in two-way elections when voting is costly. They find that candidates who would surely lose elections without costs sometimes win under costly voting because voters frequently abstain. Turnouts vary with cost levels and electorate sizes. Finally, also using a similar design, Peterson (1998) explores the "California effect" (the supposed reduction in turnout on the West Coast that results from early projections of East Coast outcomes). He finds support for the idea that knowing early election returns depresses turnout among those who vote later in the laboratory. Thus, the basic experimental design and theory behind the papers discussed here can be extended to study a variety of other interesting issues surrounding elections and voting systems.

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