Electoral System and Number of Candidates: Candidate Entry Under Plurality and Majority Runoff

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1 Introduction

We know that the type of electoral system used to elect public officials has a decisive impact on the number of competing candidates. Duverger (1951) shows that the plurality rule produces two-candidate (or two-party) systems whereas proportional representation rules produce multiple-candidate (or multiple-party) outcomes. The multiplication of candidates/parties has both advantages and drawbacks for the functioning of democracy. For example, voters may have difficulties identifying the candidate/party that is the closest to their political preference when there are a lot of options. For this reason, the overall amount of correct voting tends to decreases as the number of parties increases (Lau et al. 2014). However, governments tend to be less corrupted when the number of competing parties is large. Under these circumstances, voters do not hesitate to punish corrupted rulers as they have more alternatives to choose from (Tavits 2007).

A specific puzzle remains unsolved about the majority runoff rule. Several theoretical works come to the conclusion that majority runoff defines a structure of incentives, for candidates and for voters, for which the equilibria are two- or three-candidate contests (Bouton 2013; Callander 2005; Cox 1997; Osborne and

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Slivinski 1996). However, empirical analyses reveal that this electoral system produces, on average, many more competing candidates than plurality (Blais and Loewen 2009; Shugart and Carey 1992; Golder 2006; Jones 1999; Taagepera and Shugart 1994). There is thus a missing element in this theoretical literature to explain why outcomes in majority runoff elections differ so much from those produced by plurality elections. Duverger (1951) argues that the difference is due to voting behaviour, as, he says, there are more strategic voters in plurality than in majority runoff elections. However, recent studies show that voters engage in strategic voting to almost the same extent under both electoral systems (Abramson et al. 2010; Blais et al. 2011; Van der Straeten et al. 2010). Thus, the difference should be due to another factor. In this chapter, we assess whether this factor may be candidates' strategic entry.

To provide new insights on this topic, we conducted a series of laboratory experiments simulating elections where subjects played the role of candidates and had to decide whether to run for election or not. Half of these elections are held under plurality and half are held under majority runoff (each subject thus participated in both types of elections, the order varies randomly). Unlike previous research on the topic, our experimental game does not rely upon a citizen-candidate model, where the utility of a subject is, partially or entirely, derived from the distance between herself and the winning subject on an ideological spectrum (Cadigan 2005; Dhillon and Lockwood 2002; Osborne and Slivinski 1996). We build upon the political science literature (Cox 1997; Downs 1957; Strøm 1990) and construct a game where subjects benefit from winning the election (and not from being close to the winner). We believe this structure of incentives is closer to the reality of the political world where the utility political actors derive from ideological considerations is marginal compared to the utility they derive from winning. Also, for the reason stated above, we control for differential voting strategies by imposing absolute sincere voting in all elections. We use sincere voting as a benchmark for the sake of clarity, as we suspect subjects would have difficulties to fully understand a realistic but complex strategic voting's benchmark. Patterns of strategic voting can be rather sophisticated, in particular in majority runoff elections (see Van der Straeten et al. 2016). In imposing sincere voting, we are able to isolate the effect of the electoral system on candidates' decision to enter elections, independently from voters' decision to vote sincerely or strategically, and independently from anticipation of voters' strategic behaviour.

In the coming sections, we first provide some theoretical foundations for the study of the effect of electoral systems on the number of competing candidates; second, we describe the protocol of our experiment and discuss the theoretical predictions; and third, we report the results. The evidence shows that, although the number of candidates is greater than predicted by theoretical equilibria under both electoral systems, subjects follow some sorts of rational logic and learn from previous elections' results. However, we do not find any difference in the number of competing candidates and in the way subjects behave under the two electoral systems. We thus reaffirm the mystery of the unexpected high number of competing candidates under majority runoff.

2 Electoral Systems and the Number of Competing Candidates

We have known for a long time that the electoral system strongly influences the number of candidates competing in an election. In this chapter, we study candidate entry under two electoral systems: plurality and majority runoff.

A plurality election is an election where the candidate who receives the highest number of votes is elected. Majority runoff refers to two-round elections where the two candidates who receive the highest score at the first round compete head-to-head in a second round. In the second round, the candidate who receives the highest number of votes is elected. This electoral system is designed to ensure that the elected candidate is supported by a majority of voters (in case a candidate obtains a majority of the votes at the first round, she is directly elected and no second round is organized).[1] Majority runoff is the electoral system that is the most commonly used to elect presidents in contemporary democracies (Reynolds et al. 2005).

According to Duverger (1951), plurality rules should produce elections with two candidates. This effect is due to two inter-related elements: strategic voting and strategic candidate entry. First, voters have incentives to desert their most preferred candidate if this candidate is not viable. The rationale is that voters anticipate that some candidates have no chance of being elected and cast their vote in favour of a candidate that has some chances, or more precisely their preferred candidate among those that have chances. In doing so, they maximize their chances of affecting electoral results. For example, if there are three candidates and only one winner, the supporters of the weakest candidate should desert that candidate and support the candidate that they prefer among the top two, since they can potentially make a difference between these two. This is usually referred to as strategic voting.

Second, candidates, being aware of voters' strategic considerations and anticipating them, have no incentive to enter elections if they are not viable. For the reason stated above, they have no chance of winning. If we assume that the goal of a candidate is to win the election, the existence of even a small cost associated with running (for instance, the cost of campaigning) should deter her from entering. In turn, there should be only two competing candidates under plurality, the two that are most viable.

This prediction might or might not hold under majority runoff. According to Duverger (1951), there should be more competing candidates under this electoral system. He argues that, in the first round voters tend to cast a vote for the candidate they prefer regardless of whether she is viable or not (i.e., whether she has a chance to advance to the second round and to win the election). The rationale is that in doing so, voters signal their real political preference to the two candidates that will

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[1]Other variants of the two round majority system exist, for which all the candidates who pass a certain vote threshold at the first round are qualified to the second round. In this chapter, we do not consider this less common electoral system.

compete in the second round, without fearing wasting their vote because the actual winner will be elected at the second round.

Under such assumptions, even non-viable candidates have incentives to enter an election under majority runoff according to Duverger (1951). They receive votes at the first round from voters willing to signal their policy preferences. Therefore, even if they are not qualified for the second round, they are in a position to bargain with the candidates that remain in the second round. Assuming that their electorate will follow their instruction at the second round, they are able to negotiate their formal support with one of the two qualified candidates in between the two rounds.

However, other scholars make different predictions regarding the number of competing candidates under majority runoff (Bouton 2013; Callander 2005; Cox 1997; Osborne and Slivinski 1996). First, they argue that voters should fear that the viable candidate for which they would have voted under plurality will not be qualified to the second round if they do not vote for her at the first round under majority-runoff (or that there will be no second round if a candidate obtains a majority of the votes at the first round). For this reason, they have incentives to vote strategically and to desert they preferred candidate in the first round if this candidate is not viable (for reasons that are similar to those mentioned above when we discussed strategic voting under plurality). At the end of the day, they argue that the votes should also concentrate on the viable candidates under majority runoff.

Reflecting on this last consideration, Cox (1997) and Bouton (2013) argue that, just as under plurality, non-viable candidates have no incentive to enter an election if they expect to be deserted by their electorate because of strategic voting. If the goal of the candidates is to win the election, the majority runoff rule should thus produce two-candidate elections. There is a variant of this prediction, depending on how we define the goal of the candidates and what it means to be viable. If the goal of the candidates is to advance to the second round (and being viable means having a chance to advance to the second round), the majority-runoff should lead to a three-candidate contest. The number of candidates that have a chance of winning is equal to the number of winners (the two qualified candidates in this case) plus one.

As mentioned in the introduction, in real-life elections, we observe many more competing candidates under majority runoff than under plurality (Blais and Loewen 2009; Shugart and Carey 1992; Golder 2006; Jones 1999; Taagepera and Shugart 1994). We still do not know why.

According to Duverger's (1951), the difference between plurality and majority runoff is due to differences in strategic voting (see above). There are more competing candidates under majority runoff because fewer voters engage in strategic voting under this electoral system. Observational and experimental[2] studies show that the type and proportion of strategic voting differ somewhat in plurality and majority runoff systems (Abramson et al. 2010; Blais et al. 2011; Van der Straeten et al. 2010). Optimal strategic voting under majority runoff requires more complex

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[2]Laboratory experiments are especially useful to address this question, as they allow controlling the supply side of elections such as the number of candidates or they policy platforms.

strategies than the bare desertion of non-viable candidates. Recent laboratory experiments show that strategic voters rarely use sophisticated strategies (Blais et al. 2011; Van der Straeten et al. 2016). However, all these studies also show that many voters do vote strategically under majority runoff. Therefore, the amount of strategic voting alone cannot explain the empirical differences in the number of candidates between the two systems. For this reason, in this chapter, we focus on the decision of candidates to enter elections, which may be the missing element explaining why real-life observations are at odds with theoretical predictions.

To do so, we conducted a laboratory experiment where subjects play the role of candidates in elections organized under plurality and majority runoff. We compare the number of entering candidates in both electoral systems and investigate the heuristics used by the candidates when making their decision. The advantage of our laboratory experiment is that we can hold voters' behaviour constant and known to the candidates. In particular, in our game all 'voters' cast a sincere vote. This is obviously a simplification of the reality of elections but it allows us to isolate the effect of the electoral system on candidate entry from differences in levels of strategic voting.

3   Protocol and Theoretical Predictions

Four groups of nine subjects are randomly recruited among volunteers who signed up on the web page of the Cirano experimental economics laboratory. The experiment was conducted in French on October 1 and 2, 2013 in Montreal (Canada). Before starting, the subjects are told they are about to participate in an experiment about elections where they will play the role of candidates. Each session takes approximately an hour and a half.

During a session, 60 consecutive elections are held. For each election, subjects have to decide whether to enter or not (as candidates). Once this decision is made, an automatic election is organized (automatic in the sense that the 'voters' cast a vote in a predictable way, see below). The program calculates the number of votes received by each entering subject and one of them is declared the winner. In case there is no entering subject, no one wins. Half of the elections are organized under plurality, the other half are organized under majority runoff (each subject plays under both systems). Under plurality, the entering subject who receives the most votes wins. Under majority runoff, an entering subject is elected at the first round if she receives a majority of the votes. If no candidate reaches this threshold, a second round is organized with the two entering subjects who received the most votes at the first round. The number of votes is then re-calculated between the two qualified subjects only. At the second round, the qualified candidate who receives the most votes wins.

At the beginning of the session, each subject receives 60 points. Entering an election costs one point and the winner of the election receives five points. As we mentioned in the introduction, it is realistic to consider that entering an election is

costly for candidates (because they have to run an effective campaign). It is also reasonable to assume that most of the utility they may derive from participating in an election comes from the fact of winning the election. Our protocol reflects this structure of incentives. However, contrary to Duverger, we do not assume that the candidates can bargain in-between the two rounds. They do not derive any utility from the number of votes they receive at an election. This is a simplification of the reality of an election but it allows us to isolate the effect of the electoral system on the decision of candidates to enter the election and the strategies they adopt to maximize their chances of winning.

For two of the four groups, the first 30 elections are held under plurality, while the remaining 30 are held under majority runoff. This order is inverted for the two other groups. We alternate the order of the electoral system so as to isolate their effect from that of fatigue or learning. At the end of the experiment, the sum of points saved and/or won by each subject is calculated and translated into money. A point is worth CAD $0.25. Each subject also receives a fixed CAD $15 for showing up.

At the beginning of the experiment, subjects are randomly assigned one of nine positions from 5.5 to 85.5, on a scale ranging from 1 to 90.[3] This position is re-assigned randomly every three elections. This scale, represented in Fig. 1, reproduces the classic left-right ideological continuum. The positions go from extreme left to extreme right, through a central position. Though the scale is shown to subjects, the correspondence with ideology is not mentioned in the instructions. The position of each subject is fixed during three elections as a way to increase their chances of adopting a well-thought strategy. In real-world elections, candidates typically participate in several elections, and they have the opportunity to learn from their previous experience. Each dot on the scale in Fig. 1 represents a voter (there are 90 voters). These voters automatically vote for the subject that is the closest to their position. They are thus sincere voters. The positions of the subjects are such that each of them has ten voters who are closest to them.

In each election, each subject has to decide whether to enter or not. This decision is made simultaneously by all the subjects. The voters who are close to a subject who decides not to enter 'go' to the closest entering subject. For example, if subject B, who is assigned position 15.5, decides not to enter, five of her voters go to subject A, while the other five voters go to subject C (assuming subjects A and C both decide to enter). To add uncertainty and to get closer to the reality of

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[3]We acknowledge that in reality candidates are not assigned to a position on the left-right scale and that they can change their position over time. We make this simplification so as to isolate the effect of the electoral system on the decision to enter the election from the decision to choose a position that maximizes a candidate's chances to be elected. This would have opened our game to other theoretical considerations concerning candidate spatial positioning. We decided to keep the protocol as simple as possible to make sure subjects understand the rules. We decided to spread the nine candidates along the 90-point spectrum to represent the variety of left-right positions that are likely to exist in real life.
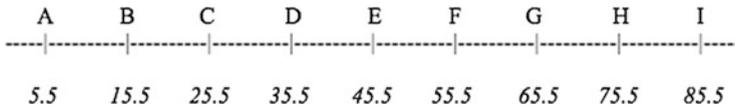
Fig. 1 Subjects' positions on the 90-point scale

elections, only 50 out of the 90 voters are counted to designate the winner (as in real-life elections, not all voters turn out). These 50 'participating' voters are randomly chosen at each election.

After taking the decision to enter or not, the results of the election (including the decisions made by other candidates, the number of votes received by each of them, and the ultimate winner) is shown to the subjects. In majority runoff elections, the results of the first and second round are successively shown on two separate screens.

If we think in terms of theoretical equilibrium, the number of entering candidates should be low or moderate. For example, the situation in which only the candidate positioned at the median of the 90-point scale (i.e. position E) enters is a Nash equilibrium. Under both plurality and majority runoff, she would defeat any other candidate in a pair-wise competition. Therefore, none of them should enter.

With a cost of entry of one point and a gain of winning of five points, there are six Nash equilibria under plurality rule and four under majority runoff.[4] The following configurations are equilibria under both plurality rule and majority runoff:

– Candidate E alone
– Candidates D and F
– Candidates C and G

There are three extra equilibria under plurality rule:

– Candidates B, E and H
– Candidates A, F, and G
– Candidates C, D, and I

There is one extra equilibrium under majority runoff:

– Candidates B, D, F and H

From this equilibrium analysis, we can make two observations. First, the predicted number of entering candidates is rather low. Under plurality, they should be at most three, while under majority runoff they should be at most four (but not three). Second, the extreme positions (A and I) are never part of any equilibrium under majority runoff. We should thus expect these positions to be more deserted by subjects in elections held under this electoral system. Similarly to the theoretical models that assume that voters act strategically (see above), we should not observe a much higher number of competing candidates under majority runoff.

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[4]See the Appendix for a full description of the equilibrium analysis.

Finally, it is worth mentioning that if a subject expects that many other subjects are not entering the game, it is not unreasonable to take a chance. Along this line, another benchmark for the number of entering candidates is five. Given the game payoff, the expected gain of a subject who decides to enter is non-negative as long as she expects that only four other subjects also enter. If there are exactly five subjects who decide to enter, the total expected gain of the entering subjects is equal to the total expected gain of those who decide not to enter (i.e. 0). Thus, five entering candidates is an upper bound for the overall number of entering subjects.

4   Results

We present the results in two parts.[5] First, we report the results regarding the number of entering subjects; then, we look in more details at the heuristics that the subjects used when deciding to enter or not.

Table 1 reports the average number of entering subjects and the average gains (in points) of these subjects in total and by electoral system. On average, 5.4 subjects (out of a maximum of 9) enter the 240 experimental elections. This average is similar for the 120 elections held under plurality and for the 120 elections held under majority runoff, although the standard deviation is slightly larger under the former (1.7, compared to 1.4).

The average number of entering subjects is close to the benchmark situation mentioned above where five subjects enter at each election (this benchmark situation corresponds to the situation where the mean gain of not entering equals the mean expected gain of entering). However, this number is higher than what we could expect from our Nash equilibrium predictions according to which at most four subjects should enter under majority runoff, and at most three subjects should enter under plurality (see above). Reflecting this pattern, the average gain is 57.4 points (standard deviation of 12.3, similar under both electoral systems). This number is slightly lower than what a subject gained if she did not enter at any election (i.e. 60 points). In other words, subjects enter, on average, too frequently. They would gain slightly more if they did not enter at all.

Several explanations can be found to give sense to this pattern. First, subjects may overestimate their chances of winning. This could result from the complex coordination problem posed by the experimental game. It is very hard for the subjects to anticipate who is going to enter. The information they have while making their decision is minimal. Besides, the uncertainty brought by the fact that 50 out of the 90 voters are randomly picked up at each election to determine

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[5]The replication material (including the Z-tree program used to conduct the experiment in the laboratory, the slides used to explain the instructions to subjects during the experimental sessions, the dataset and the stata's syntax) is available on the corresponding author's website (www. damienbol.eu).

Table 1 Average number of entries and points obtained

	Plurality	Majority runoff	Total
Number of entries (mean)	5.41 (1.69)	5.38 (1.43)	5.40 (1.56)
Points obtained (mean)	28.64 (10.43)	28.75 (8.49)	57.39 (12.29)
N	120	120	240

Note: Standard deviations are in parentheses. No differences between plurality and majority runoff are statistically significant at a level of 0.1

the winner further increases the uncertainty of the results. Under such circumstances, it is perhaps reasonable for subjects to take a chance in entering the game. This problem is also likely to be found in real-life elections. As mentioned above, the candidates are not aware of the decisions of all their opponents at the time they decide themselves whether entering or not. They may thus overestimate their chance of winning if they wrongly anticipate the number of opponents entering.

Second, this high entry rate may be partly due to subjects' fatigue. The experiments last around an hour and a half. Not entering an election, and not having the thrill of having a chance to win, is a rather boring strategy, which is difficult to maintain all the time. It is reasonable to think that in addition to monetary incentives, the subjects also enjoy playing an experimental game. This might push them to enter the election even if they believe that their chance of winning is rather slim.

With our data, it is impossible to sort out the relative importance of these two factors in the explanation of the high number of entering subjects. However, what is important here given the goal of our study is that the number of entering candidates is similar under plurality and majority runoff.

Figure 2 reports the evolution of the number of entering subjects in all four sessions we organized. This number seems to follow a saw tooth pattern. This is not surprising given the relationship between the expected gain of an entering subject and the number of other entering subjects. Subjects attempt to anticipate the number of entering subjects by looking at the number of entering subjects at the preceding election. If there were few competing candidates, they take a chance and enter the subsequent election.

From Fig. 2, we can also observe a slight decline in the number of entering subjects from the first to the last election. In all four sessions, subjects seem to learn that entering is often not the optimal strategy. However, this effect is small and is similar in elections held under plurality and under majority runoff. We thus cannot rule out the hypothesis that the discrepancy between the observations and the received theory is due to the fact that theory emphasizes equilibrium while we are contemplating the system out of equilibrium. By repeating this relatively simple game no less than 60 times, it seems that we gave these groups the chance to settle if they were ever to do it within reasonable time, and they don't. Unfortunately, apart from questioning the equilibrium hypothesis, this remark does not tell us much; in particular it tells us nothing about the difference between plurality and run-off.

To better understand these results concerning the number of entering subjects, we now turn to the analysis of how the subjects make their decision. When deciding
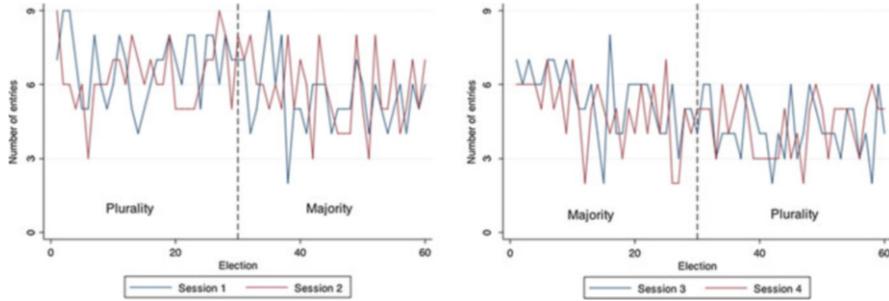
Fig. 2 Evolution of the number of entering subjects

whether to enter or not, subjects could rely on two pieces of information: their position on the 90-point scale and the results of previous elections. In real-life elections, the same pieces of information are available to candidates.

Table 2 reports the entry rate by position. Since the 90-point scale is symmetric, we pool together mirror positions. We see that the entry rate at most positions (B, C, D, F, G, and H) is around 64–69 % under both plurality and majority runoff. The central position is in contrast a bit more deserted than others (around 55–56 %). It also appears that, under both systems, the subjects enter less often when they are assigned an extreme position (45 % under plurality and 43 % under majority runoff). Contrary to what we could have expected from our equilibrium analysis, these extreme positions are not more deserted under majority runoff than under plurality.

These differences of entry rate by position actually reflect some sort of learning process. It appears that subjects enter more often when they are assigned a position that has often won in the past. Table 3 reports the winning rate among entering subjects by position. It reveals that the extreme positions have the lowest winning rate (6 % under plurality and 2 % under majority runoff). This is close to what we know about real-life elections held under plurality and majority runoff rules: extreme candidates rarely, if ever, win.

Subjects located at the central position under plurality also have very low chances of winning (8 %). Similarly, but to a lesser extent, the wining rate of entering subjects located at a second extreme position (B or G) are low (15 %) under majority runoff. In contrast, subjects assigned other positions have a similar winning rate of around 20–25 % (under both systems). When these statistics are confronted to the entry rate by position reported above, we see that the decisions made by subjects follow a winning logic. The positions with the lowest entry rates are those with the lowest winning rates.

The only exception is the central position under majority runoff. Although it has a very high winning rate (22 %), subjects in position E seldom enter the race. This apparent paradox makes sense when we look at the qualifying rate at this position (i.e., the proportion of entering candidates qualified for the second round at this position). Only 23 % of subjects who enter once assigned to this central position are

Table 2 Entry rate by position

Position	Plurality (%)	Majority runoff (%)	Total (%)
A or I (extreme)	45	43	44
B or H	65	65	65
C or G	66	64	65
D or F	67	69	68
E (central)	55	56	55
All	60	60	60

Note: No differences between plurality and majority runoff are statistically significant at a level of $p < 0.1$. Differences between the entry rate at position A and I, and at position E, are statistically different from the entry rate at other positions at a level of $p < 0.01$ (in total, under plurality, and under majority runoff)

Table 3 Winning rate among entering subjects

Position	Plurality (%)	Majority (%)	Total (%)
A or I (extreme)	6	2	4
B or H	25	15	20
C or G	26	21	23
D or F	18	28	23
E (central)	8	22	15
All	18	19	19

qualified to the second round of majority runoff elections (compared to a qualifying rate between 40 and 50 % for other positions). However, when it qualifies to the second round, position E is almost always winning. Given that the entry rate at this central position is rather low under majority runoff, we can reasonably infer that the subjects rely both on the winning and qualifying rates (although there is no gain associated to qualification to the second round). This is in line with Cox' (1997) and Bouton's (2013) theory presented above, where candidates are assumed to be motivated by a potential qualification for the second round.

To further investigate the decision of candidates to enter an election under plurality and majority runoff rules, we run logit regressions predicting the decision to enter of each subject with a series of variables. Since we address the question of how much subjects learned from previous elections, we restrict ourselves to the second and third elections of each series of three elections. As mentioned above, the positions of all subjects remain stable during a series. We thus expect to observe some learning.

Table 4 reports the results of three models. In the first model, three variables measuring the rationality of the subject's decision-making are included: (1) A dummy variable accounting for whether entering is an optimal strategy for the subject (meaning that her gain is greater if she enters than if she does not, when we take into account the decisions made by the other subjects), (2) a dummy variable accounting for whether entering was an optimal strategy for the subject at the preceding election, (3) the cumulative frequency of wins of subjects located at her position since the beginning of the experiment. All three variables are

Table 4 Explaining subjects' decision to enter

	Model 1		Model 2		Model 3	
	β	Exp (β)	β	Exp (β)	β	Exp (β)
Predictors						
Majority runoff	–0.19 (0.11)	0.91 (0.10)	–0.06 (0.18)	0.94 (0.16)	–0.25* (0.12)	0.78* (0.10)
Optimal entry	0.12 (0.14)	1.13 (0.15)	0.12 (0.20)	1.12 (0.22)	0.02 (0.15)	1.02 (0.15)
Optimal entry (lagged)	0.35* (0.14)	1.42* (0.19)	0.20 (0.20)	1.23 (0.23)	0.34* (0.15)	1.41* (0.21)
Frequency of wins at position (lagged)	1.31** (0.37)	3.52** (1.30)	1.61** (0.52)	4.73** (2.45)	0.97* (0.46)	2.68* (1.21)
Optimal entry × Majority runoff			0.02 (0.27)	1.03 (0.27)		
Optimal entry (lagged) × Majority runoff			0.30 (0.27)	1.35 (0.37)		
Frequency of wins at position (lagged) × Majority runoff			–0.57 (0.66)	0.58 (0.38)		
Controls						
Subject's frequency of wins					1.12 (0.60)	3.09 (1.85)
Subject's frequency of entries					3.33** (0.27)	27.91** (7.45)
Attitude towards risk (0–10)					0.07** (0.03)	1.08** (0.03)
Position E (reference)						
Positions D and F	0.38 (0.20)	1.48 (0.20)	0.36 (0.21)	1.44 (0.30)	0.56* (0.26)	1.76* (0.41)
Positions C and G	0.10 (0.21)	1.11 (0.23)	0.09 (0.21)	2.16 (0.23)	0.23 (0.24)	1.25 (0.30)
Positions B and H	0.16 (0.20)	1.17 (0.24)	0.13 (0.21)	1.66 (0.24)	0.22 (0.23)	1.24 (0.29)
Positions A and I	–0.29 (0.20)	0.75 (0.15)	–0.30 (0.20)	1.72 (0.15)	–0.34 (0.27)	0.71 (0.16)
Constant	–0.11 (0.17)	0.90 (0.16)	–0.12 (0.19)	0.89 (0.16)	–2.58** (0.28)	0.08** (0.02)
Diagnostics						
Chi^2	74.29**		75.08**		350.91**	
Log-likelihood	–946.77		–945.88		–808.50	
N	1440		1440		1440	

Note: Entries are β coefficients, and odd ratios Exp (β), from logit regressions. The dependent variable is entry at each election. Standard errors are in parentheses. *p < 0.05, **p < 0.01

hypothesized to be positively associated with the decision to enter. We also add a dummy variable accounting for the main treatment of our experiment, i.e. the electoral system (majority runoff or plurality), and controls for the positions of the subjects on the 90-point scale.

The results of Model 1 reveal that subjects tend to adopt a rational strategy. The odds of entering at the next election of a subject for whom it was optimal to enter at the preceding election are 1.42 (statistically significant at a level of $p < 0.05$). Also, an increase of 100 %-point in the cumulative frequency of wins at her position multiplies her odds of entering by 3.5 (statistically significant at a level of $p < 0.01$). Model 1 thus supports the hypothesis according to which subjects learn from the results of the previous elections to make a decision to enter or not. This pattern is also likely to exist in real-life elections where candidates rely on past results (probably updated by more recent polls) in order to make an informed decision to enter an election or not.

However, the results of Model 1 show that there is no effect of the optimal entry at the present election variable on the decision to enter. This suggests that the subjects are not perfectly rational. However, this is not really surprising given the nature of the experimental game and how hard it is to predict, at the time of making the decision to enter or not, which other subjects will also enter and whether it is an optimal decision to enter (see above). The fact that 50 out of 90 voters are randomly selected to decide the winner does not facilitate this calculus. Importantly, the results of Model 1 also reveal that there is no difference in the probability of entering under plurality and majority runoff.

To dig deeper in the potential differences in the behaviour of subjects under the two electoral systems studied in this chapter, we estimate Model 2, which includes the same predictors than Model 1 and interacts the rational strategy variables with the dummy variable accounting for the electoral system. As shown in Table 4, none of the interaction variables is statistically significant. This suggests that the way subjects make their decision to enter is similar under plurality and majority runoff.

Finally, to further test the robustness of our findings concerning the learning process of the subjects engaged in our experimental game, we estimate Model 3, which includes the same predictors than in Model 1 and adds three extra controls accounting for the personality of the subject and her propensity to enter: (1) her cumulative frequency of wins since the beginning of the game, (2) her cumulative frequency of entries since the beginning of the game, (3) and her attitude towards risk (whether she is a risk-taker or not on a scale from zero to ten, asked in a post-experiment questionnaire). The results of Model 3 show that these three individual factors are indeed strong predictors of the decision to enter the race, and thus that other non-rational variables also come into play. Most importantly, however, the effect of the two main 'rational' variables diminishes only slightly and remains clearly significant when these three strong controls are added. This confirms that the subjects take into account the results of the previous elections when deciding to enter or not.

Two final remarks can be made concerning the results of Table 4. First, it is worth mentioning that once the learning variables are added, the position assigned to the subject is not a good predictor of her decision to enter. This suggests that it is not initially obvious for subjects to make their decision based on this single piece of information. But as the experiment progresses they can see which positions give them better chances of winning, and they do take that information into account.

Second, from Model 3, we observe that all other things being equal, the odds of a subject's decision to enter are 22 % lower under majority runoff than under plurality (statistically significant at a level of $p < 0.05$). This effect is neither predicted by nor contradictory with the equilibrium analysis mentioned above, stating that the number of entering subjects can be one, two or four under majority runoff, and one, two or three under plurality. However, this contradicts the initial observation that the number of competing candidates is the same under majority runoff and plurality. It is important to note that the effect is not significant in the two other specifications (Tables 1 and 2), and in bivariate analyses.

To sum up, in our laboratory experiment, the number of entering subjects is very similar under plurality and majority runoff rules, and the rationality they adopt to make their decision to enter or not an election is the same under the two systems.

5 Conclusion

How electoral systems impact electoral results has always fascinated social scientists. Although there are numerous studies on how these systems impact voting behaviour, we know little about how they impact the decision of candidates to enter elections. To provide new insights on this topic, we conducted a laboratory experiment where subjects played the role of candidates and had to decide whether to enter in 30 elections held under plurality and 30 elections held under majority runoff.

The advantage of our design is that strategic voting is neutralized (i.e. we impose absolute sincere voting). According to Duverger (1951), the difference in the number of competing candidates under plurality and majority runoff is explained by differences in levels of strategic voting in these two electoral systems. However, many studies show that voters also engage in strategic voting under majority runoff. The goal of our experiment is to isolate the effect of the electoral system on the decisions of candidates, independently from the presence of strategic voting and its anticipation by candidates.

Furthermore, unlike previous research, our experimental game did not rely upon a citizen-candidate model. We built upon the political science literature and constructed a game where subjects benefit from winning (not from being ideologically close to the winner) and pay a cost for entering and losing. Although we had to make a number of simplifications compared to real-life elections, we believe this structure of incentives is closer to the reality of the political world where the utility that political actors derive from ideological considerations is marginal compared to the utility derived from winning.

We draw three conclusions from our laboratory experiment. First, the results show that subjects enter elections too frequently. On average, there were a bit more than five out of nine entering subjects. While this average somehow reflects the payoff structure of the experiment (the entry cost was one point and the winning gain was five points), the theoretical equilibriums predicted a lower number of

entries (at most four under majority runoff, and at most three under plurality). The high number of candidates may be due to the fact that subjects overestimate their chances of winning and have difficulties anticipating the decisions of other subjects. This finding is also likely to be found in real-life elections. At the time of making a decision regarding their own entry, candidates do not usually know what their potential opponents will decide.

Second, subjects were randomly assigned a position on a 90-point scale every three elections. Our results show that they did not run when they were given non-winning positions. However, our analyses reveal that this strategy was implemented gradually and indirectly. As the experiment progressed, the subjects learned which positions had more (and less) chances of winning. This observation can also be transposed to understanding candidate entry in real-life elections. Candidates are likely to learn gradually and indirectly about their chances of winning on the basis of the outcomes of previous elections.

Finally, throughout our analyses, we did not find any difference between majority runoff and plurality. Our results suggest that the number of entering subjects and the way they take their decision to enter or not is similar under both electoral systems. In line with many pieces of literature (Bouton 2013; Callander 2005; Cox 1997; Osborne and Slivinski 1996), we thus reaffirm the mystery of the unexpected high number of competing candidates under majority runoff observed in reality.

We can think of several factors that are not considered in our experimental game that would explain this mystery. Perhaps, the most obvious is that in our experimental game we do not consider the possibility that candidates can be motivated by other goals than winning. Another one is that we assume in our protocol that the candidates take the decision to enter an election independently from the party they belong to. Guinjoan (2014) argues that parties are complex organisations that are driven by multiple goals such as the activation of local party section or the possibility of raising public awareness about certain issues. For parties, winning is only one goal among many. Duverger (1951) even mentions a similar point: candidates who know they have no chance may still have incentives to enter an election under majority runoff. In doing so, they increase their visibility and can hope to obtain some votes (because voters do not all vote strategically), which they might use to influence the result of the second round. Duverger indeed considers the possibility of losing candidates bargaining with qualified candidates in-between the two rounds to offer them their official support. This search for visibility is even more likely if we consider the existence of national parties with goals that transcend the outcome of one particular election. Because they participate in other elections, parties need constant visibility and are likely to endorse a candidate for an election (and pay her entry cost) even if she has no chance of winning.

Finally, it is worth mentioning that most of observational studies of the effect of majority runoff elections on the number of candidates rely on data about elections in France. France is the only consolidated democracy that has been using majority runoff for a long period of time (more than 50 years now). Their results can thus be also due to another contextual factor that is very specific to this country such as the rules regarding party financing. For all these reasons, future work is needed to further elucidate the mystery of majority runoff.

Appendix: Game-Theoretical Equilibria

In this Appendix, we compute the equilibria of a nine-player game, which mimics the laboratory experiment presented in this chapter. The game is identical to the experiment except that it is supposed to be one-shot, whereas in the experimental sessions, we repeat the game three times with fixed positions for all players. We first consider a streamlined version of the game (full information game), neglecting the uncertainty due to the random choice of 50 out of 90 voters. Then, we study the game with uncertainty, taking into account this random draw of voters. Below, we also discuss, in view of the results, the pertinence of the equilibrium approach.

In the full information game, all nine players know the payoffs with certainty. If we consider that all 90 voters are turning out, the situation in which only the median player (i.e., the candidate located at position E) enters is a Nash equilibrium under both plurality and majority runoff. This player would indeed defeat any other player in a pair-wise competition. None of them should thus enter.

With a cost of entry of 1/5, as in the experiment presented in the chapter (to simplify the analysis, the gain from winning an election is normalized to one), there exist six pure Nash equilibria under plurality, and three pure Nash equilibria under majority runoff.

The three equilibria under majority runoff are: (such as in the chapter, the players are denoted A, B, C, ... I)

- {E}: Only player E (the median player) enters. Her payoff is of $1 - (1/5) = 4/5$.
- {D,F}: Players 4 and 6 enter with a payoff of $(1/2) - (1/5) = 3/10$.
- {C,G}: Players 3 and 7 enter with a payoff of $(1/2) - (1/5) = 3/10$.

It is easy to check that these three situations are equilibria. It is more tedious to make sure that there is no other equilibrium; we achieved this with the help of a computer.

The three situations above are also pure strategy Nash equilibria under plurality. However, there are three more equilibria under plurality, which involve three entering players with a payoff of $(1/3) - (1/5) = 2/15$:

- {B,E,H}: A symmetric situation with the centrist and two rather extreme players.
- {A,F,G}: A non-symmetric situation involving one extreme player.
- {C,D,I}: The mirror situation of the previous equilibrium.

It is interesting to observe that the reasoning that if there are five entering players or less my probability of winning is 1/5 or more, and thus that my entering cost is covered, is not sufficient. It is true that if six players enter, then at least one of them has a chance of 1/6 or less to win, and should thus not enter. If there are exactly five entering players, these players have a probability of winning of 1/5 only if they have equal chances. As soon as they do not have equal chances (and they never have), the probability of winning of at least one of them goes below 1/5. This(-ese) player(s) should thus not enter. The situation where there are five entering subjects is thus really an upper bound (and a crude one) for rational entry.

Let us now consider the game with uncertainty on turnout. If there were 89 participating voters instead of 90 (as in the full information game), the payoffs of the candidates would arguably be extremely close to those of the full information game, and therefore the equilibria would be the same. Now, with 50 voters turning out, as in the experiment, the noise introduced in the game is more important. To compute the payoffs in that case, we used computer simulations: with n independent random draws of 50 out of 90 voters, one can compute the average payoff of each candidate over these n draws. By the law of large numbers, these payoffs converge to the exact payoffs when n becomes large. We observed empirically that the payoffs do not vary by more than 1 % for $n = 10,000$ draws.

In order to obtain the set of all equilibria in the game with uncertainty, we computed the payoff of each candidate for each configuration, and checked for each configuration if it was an equilibrium (this is the case if each candidate wins with a probability higher than 20 % and if once another candidate enters, she wins with a probability lower than 20 %). It appears that all the equilibria of the game with full information are still equilibria. Moreover, there is an extra equilibrium in the game with uncertainty under majority runoff: {B,D,F,H}. Besides, there exists no other equilibrium. In the following paragraphs, we provide some insights on these results.

First, it is easy to show that the single-player (median player) equilibrium is still an equilibrium (under both plurality and majority runoff). If the other candidates do not enter, player E is obviously right to pay the entry cost, as she will win. In contrast, other players should not enter. Consider player D, if she enters, she obtains the 'turning out' voters located at positions between 1 and 40 (on the 90-point scale), while player E obtains those located at positions between 41 and 90. Player D wins if the number of her 'turning out' voters is strictly larger than the number of 'turning out' voters of player E, wins with probability of 1/2 if these numbers are equal, and loses otherwise. Player D wins with an approximate probability of 12 %. This probability is less than 1/5, which means that she should not enter. The situation is similar (or even worse) for other players. The single candidate equilibrium is an equilibrium of the game with uncertainty.

The equilibrium {D,F} is also still an equilibrium of the game with uncertainty (under both plurality and majority runoff). The expected payoff of player D and F is (by symmetry) $(1–2)–(1/5) > 0$, just like in the situation where all 90 voters are counted. If player C enters, she obtains the 'turning out' voters located at positions between 1 and 30, player D obtains those located at positions between 31 and 45, and player F obtains those located at positions between 46 and 90. Under plurality, the chances of player F are larger than 97 %. Therefore, player C should not enter (under both plurality and majority runoff). Here again, the situation is even worse for the other players. Similarly, {C,G} is an equilibrium of the game with uncertainty under both electoral systems. In that case, the most dangerous challenger is player E. If E enters, she wins with a probability smaller than 1 % under plurality, and with probability 2 % under majority runoff.

With three candidates, {B,E,H} is an equilibrium of the game with uncertainty under plurality, but not under majority runoff. In this configuration, player B obtains the 'turning out' voters located at positions between 1 and 30, player E

obtains those located at positions between 31 and 60, and player H obtains those located at positions between 61 and 90. As a result, each candidate wins with probability 1/3 under plurality, and this configuration is an equilibrium. However, player E is much more likely to win under majority runoff, as she almost surely wins when she reaches the second round. Under this electoral system, E wins with probability 67 %, whereas B and H win with probability 17 % each. Hence, {B,E,H} is not an equilibrium, but it is not far from being one.

With four candidates, {B,D,F,H} is not an equilibrium of the game with uncertainty under plurality, but it is under majority runoff. In this configuration, player B obtains the 'turning out' voters located at positions between 1 and 25, player D obtains those located at positions between 26 and 45, player F obtains those located at positions between 46 and 65, and player H obtains those located at positions between 66 and 90. Under plurality, the two central candidates (D and F) win with probability 7 % only, which explains that {B,D,F,H} is not an equilibrium. However, under majority runoff, these central candidates are advantaged when they reach the second round, as they almost surely win. It appears that players D and F reach the second round with probability 25 % and win with probability 24 %, whereas player B and H win with probability 26 %. Hence, {B,D,F,H} is an equilibrium. Note that this result is related to the noise introduced in the game: in the full information game for instance, players D and F receive a strictly lower number of votes than players B and H, and they never reach the second round.

Finally, with five candidates, one can wonder whether {A,C,E,G,I} is close to being an equilibrium of the game with uncertainty. The computation yields a probability of winning for extreme candidates (A and I) of 3 % under plurality and lower than 1 % under majority runoff. This configuration is thus far from being an equilibrium.

The equilibrium analysis leads us to conclude that there should be a low or moderate number of entering players: at most three under plurality, and at most four under majority runoff. However, one should note that this is really a typical equilibrium reasoning. If I think that few other players are running, it is not unreasonable to take a chance. Suppose for instance that I am the median candidate and that I observe that in the past elections, four or five players were entering, it becomes very reasonable for me to enter under majority runoff.

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