

VOTER PREFERENCES, ELECTORAL SYSTEMS AND THE NUMBER OF POLITICAL PARTIES – AN EXPERIMENTAL STUDY

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Abstract: We examine the impact of electoral systems and social heterogeneity on levels of sincere and strategic voting. We then assess the impact of these electoral and social structures and voting behaviors on the number of parties. The study is based on experiments conducted with groups of 21 participants. The experiments consist of a series of elections which involve four parties. Two main treatments were applied. First, we designed four different kinds of voter distributions by modifying the number of subjects at the same political position. Second, there were two kinds of electoral systems, plurality rules and proportional representation rules, under which the subjects voted. Overall, our results support Duverger's Law and Hypothesis.

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The literature on strategic voting and the number of political parties generally takes as a starting point Duverger's propositions: Duverger's Law and Hypothesis. Duverger's Law claims that "the simple-majority single-ballot system favors the two-party system" (Duverger 1954, 217) and Duverger's Hypothesis states that "the simple-majority system with second ballot or proportional representation favors multipartyism" (Duverger 1954, 239). According to Duverger's propositions, plurality systems impose two effects leading to a two-party system: a mechanical and a psychological effect. The mechanical effect is the propensity of the simple-majority single-ballot system to under-represent the second and third political party contenders when translating the number of votes into seats. In this sense, the winning party in this electoral system is generally over-represented. This mechanical effect imposes a constraint on the emergence and the viability of multiple political parties. On the other hand, the psychological effect consists of voters' assessment that small parties are not "viable" in the system – that their votes "will not count" if they vote for small parties – and that they should desert them in favor of a more viable one. Duverger also makes the claim that in contrast to a plurality system, a proportional system will not – or at least not to the same degree – under-represent the proportion of the votes that a losing party received when translating the number of votes into seats. The psychological effect should also be less important under a proportional system because voters could always perceive that their vote will give a party a better chance of getting one more seat. To sum up Duverger's psychological effect, we should observe more strategic and less sincere voting under a plurality system than under a proportional system.

Duverger's propositions are mainly rooted in an institutionalist approach where institutions are the main factors influencing the number of parties by the interaction of a mechanical and a psychological process. This view has come to be criticized by scholars who favor sociological explanations when studying political phenomena (Campbell 1958; Grumm 1958; Lipset and Rokkan 1967; Taagepera and Grofman 1985). For instance, Taagepera and Grofman made the assumption that the number of parties is a function of the number of cleavages in the society. The more fractionalized the society, the greater the number of political parties. They show that $N = I + 1$, where N is the number of parties and I is the number of salient issues. Thereafter, Ordeshook and Shvetsova brought together the institutionalist and sociological approaches and thus "consider the possibility that similar institutions in different social contexts yield different outcomes" (Ordeshook and Shvetsova 1994, 100). Their results sustain the interaction effect explanation:

[...] if the effective number of ethnic groups is large, political systems become especially sensitive to district magnitude. But if ethnic fractionalization is low, then only especially large average district magnitudes result in any "wholesale" increase in formally organized parties. Finally, if district magnitude equals one, then the party system is relatively "impervious" to ethnic and linguistic heterogeneity [...] (Ordeshook and Shvetsova 1994, 122).

This conclusion is also supported by Cox in *Making Votes Count* (1997):

The effective number of parties appears to depend on the product of social heterogeneity and electoral permissiveness, rather than being an additive function of these two factors. The intuitive formulation of this finding is that a polity can tend toward bipartism either because it has a strong electoral system or because it has few cleavages. Multipartyism

arises as the joint product of many exploitable cleavages and a permissive electoral system. (Cox 1997, 221)

If these electoral and social structures have obviously an impact on the number of parties we have to keep in mind that these structures have an influence on voters' behavior and that these behaviors could also affect the number of parties. As argued by Duverger, one of the reasons at the individual level that could explain the number of parties is the level of strategic and sincere voting that we observe in a political system. Our objective in this paper is to test these previous theories in using an experimental design.

Hypotheses

Our first objective is to compare sincere and strategic voting behaviors in different kinds of electoral systems and with different voter distributions. We test Duverger's psychological effect that states that levels of strategic voting are greater under a plurality system than under a proportional system and conversely that levels of sincere voting are greater under a proportional system than under a plurality system. Our second objective is to answer the question what determines the number of political parties in a political system? We test Duverger's propositions that a PR system generates a greater number of parties than a plurality system. Moreover, our experimental design allows us to take into account the fractionalization of the voter preferences and thus to test Cox (1997) and Ordeshook and Shvetsova's (1994) theory on the interaction of social and electoral structures and their impact on the number of political parties. Our third objective is to link the voting behaviors at the micro level with their effects on the number of parties at the macro level. According to Duverger's psychological effect, strategic voting should reduce the number of parties. We will thus assess how different kinds of voting behaviors affect the number of parties. The experimental design that we propose below allows us to test these hypotheses.

The Experimental Design¹

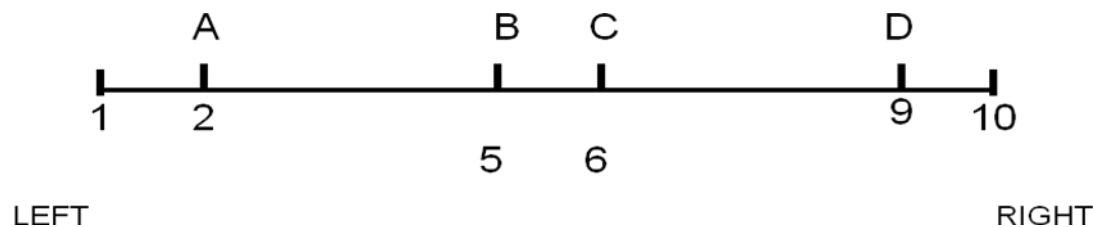
Why using an experiment to test these theories? An experiment has the advantage of allowing the experimenter to intervene in the *data generating process* (Morton and Williams 2008). An experiment thus offers an extremely high level of control over the subject preferences and stimuli. On the preferences side, our experiment imposed preferences to participants – which party they preferred. On the stimulus side, we designed two treatments regarding electoral systems and social fractionalization. In monitoring these preferences and stimuli in the experiment, we could better isolate the impact of these stimuli on participants' behavior when considering their preferences. Therefore, the great advantage of this kind of laboratory experiment is the possibility to draw causal relationship between our variables of interests and to explain the mechanism within these relationships. We could thus test existing theories – as those described above – and better explain some of the processes that we have a hard time to deal with

¹ The experiments were run at the CIRANO computer lab – Montreal (Canada). The recruitment was undertaken by CIRANO staff with the use of ORSEE software (Greiner 2003). The subjects were mainly undergraduate and graduate students. Each subject received 15\$ for participating in the experiment plus an additional amount which was expected to average approximately 15\$, depending on the decisions of the subject and those of the other subjects. During the session, each subject was sitting in front of a computer to complete the experiment. The experiment was programmed and conducted with the experiment software z-Tree (Fischbacher 2007).

at the real-world level. For example, to assess the relationship between voting behaviors and their influence on the number of parties would request from scholars to gather several databases at the election level combine with their respective election surveys at the individual level. This process requires a great deal of times and funding and has also its part of uncertainty regarding matching-questions in different surveys. In using an experimental design, we avoid such issues. Moreover, an experimental design allows us to have as variation as we want regarding the permissiveness of the electoral system, the level of social heterogeneity, the number of parties competing, the number of voters and their level of information, the level of competitiveness between the parties, and so on.

The experiment builds on work conducted by Blais who tests Cox's and Duverger's arguments about the propensity to vote strategically and sincerely in one-round and two-round elections (Blais et al. 2007). In the following experiment, several elections were simulated where each subject was randomly assigned a political position on a 1 to 10 left-right scale – see figure 1. Each subject had to vote for one of the four political parties, each associated with a different position on the same scale. Political party A was at 2, party B was at 5, party C was at 6 and party D was at 9.

Figure 1 – 1 to 10 Political Position Scale



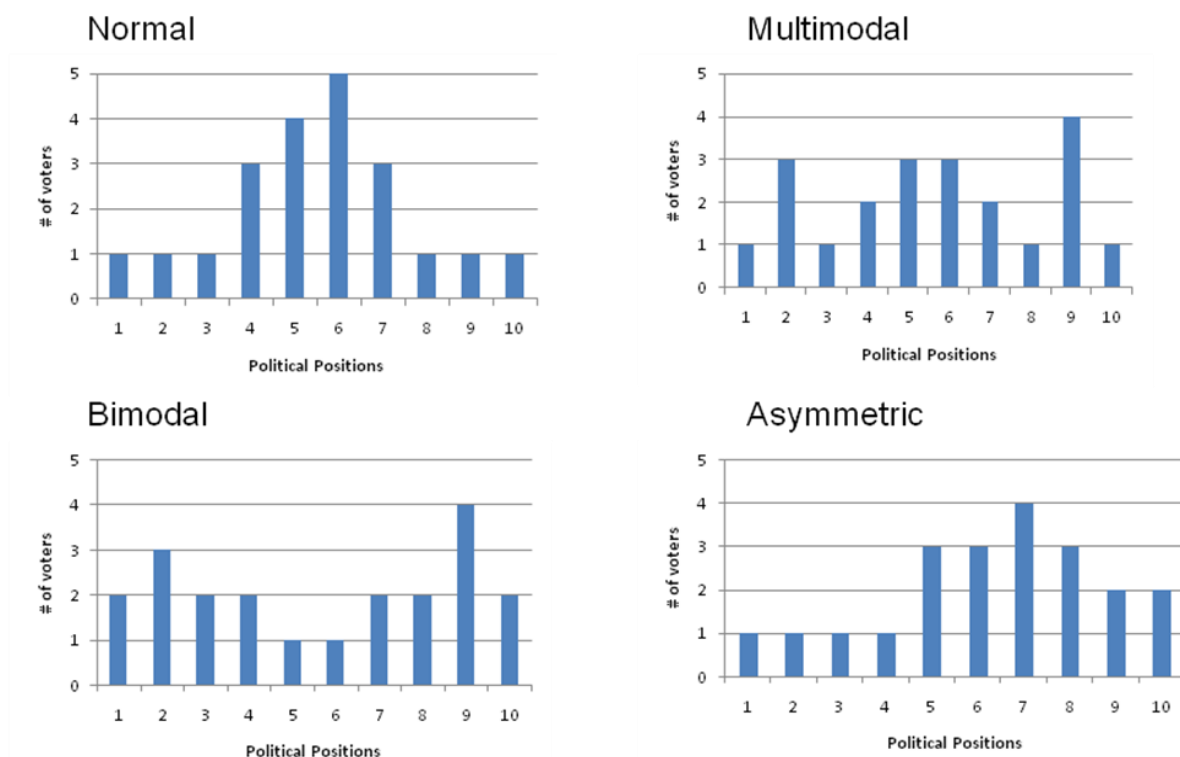
Three different treatments were applied. First, to simulate the impact of social structure we designed four different kinds of voter distribution by modifying the number of subjects at the same political position – see figure 2². Second, there were two kinds of electoral systems, plurality rules and proportional representation rules, under which the subjects voted³. A third treatment was introduced in the fourth and fifth election of each series of five elections in order to reproduce the cost of voting. For these elections, a point was deducted from the subject's payoff if the subject voted. Four groups of 21 subjects participated in the experiment⁴.

² Note that the distributions are not perfectly normal, bimodal and multimodal, but we refer to these names in the paper for the sake of simplicity.

³ We also performed other experiments with two different variants of proportional rules. The results are more ambiguous in these cases. Overall, we run experiments that tested four different kinds of electoral system. These experiments were replicated in Paris and will be run in Bruxelles in July.

⁴ The four groups completed the four different settings of voter distributions. Of these groups, two did the experiment under plurality rules and two under proportional representation rules. For each electoral system, one group began the experiment with the simplest voter distribution (normal) and ended with the more complex (asymmetric); and the other group began with the most complex distribution (asymmetric) and finished with the simplest one (normal). There were five elections by kind of distributions for a total of 20 elections by subject and group.

Figure 2 – The Four Voter Distributions



At the beginning of each series of five elections, each subject was randomly assigned a new political position. Subjects were aware of the electoral rules under which they were voting. They were also aware of the voter distributions and they knew the payoff associated with each political party / coalition. At each election, the subjects were invited to vote for one of the four parties. After each election, the results were made public and each subject knew his or her gain. The subject's gain corresponded to points that were converted into money at the end of the experiment: total points divided by 10 equals the amount of money. Subject's gains were determined by the winning political party under the plurality rules and by the winning coalition of political parties under the proportional rules. Under plurality rules, it was the political party with the most votes that won the election. The subject's payoff was computed as ten minus the distance between the subject's position and the winning party's position⁵: the smaller the distance, the higher the gain. To determine the winners under proportional rules, the parties were ranked according to their share of the vote and the top two parties formed the winning coalition. The subject's payoff was computed as ten minus the distance between the subject's position and the position of the 1st party of the coalition plus ten minus the distance between the subject's position and the position of the 2nd party of the coalition and this sum was then divided by two⁶.

⁵ Under plurality rules, subject's payoff = $10 - |\text{voter's position} - \text{winning political party position}|$

⁶ Under proportional rules, subject's payoff = $[(10 - |\text{voter's position} - 1^{\text{st}} \text{ party position}|) + (10 - |\text{voter's position} - 2^{\text{nd}} \text{ party position}|)] / 2$.

Voting Behavior

Empirical Model

In this section, we examine levels of sincere and strategic voting under each setting. According to Duverger, we expect to observe more sincere voting under PR rules. We also make the assumption that the more fractionalized a voter distribution the greater the level of sincere voting: voters have less incentives to vote strategically if each party seems as much viable as the other. In order to test these assumptions, we run two OLS regressions⁷ where the level of strategic and sincere voting at each election are the dependent variables and where the independent variables are the *permissiveness* of the electoral system and the *fractionalization* of the voter preferences. In order to compute the level of strategic voting at each election we follow Blais et al.'s (2001) definition: “two conditions must be met for a vote to be construed as strategic. The person must have voted for a party (candidate) that was not the most preferred, and she must have done so because of her expectations about the outcome of the election” (Blais et al. 2001, 344). Consequently, we compute a vote as a strategic one (coded 1) if a voter deserts her preferred party in favor of a party to which she gives a greater chance of winning otherwise the vote is coded 0. Then, we compute the strategic voting mean for each election. On the other hand, a vote is coded as sincere if a participant votes for her preferred party – the party the closest to her that gives her the higher payoff (see table A in appendix for detailed payoff). As for the level of strategic voting, we then compute the mean of sincere votes for each election.

Electoral system permissiveness (*permissiveness*) is a dummy variable coded 0 if the election has been held under plurality rules and 1 if the election has been held under proportional rules. Our measure of social heterogeneity is somewhat different than the one in the literature. Ordeshook and Shvetsova (1994) measure social heterogeneity in terms of ethnicity: $ENETH = 1/\sum g_i^2$, where g_i is the proportion of the population in ethnic group i . Instead, our experimental translation of social heterogeneity is the four different voter distributions (normal, multimodal, bimodal and asymmetric). For each of these distributions, we compute a measure of voter fractionalization: $fractionalization = 1/\sum p_i^2$, where p_i is the proportion of voters at each party position if each voter votes for the party closest to her – see table 1. We then subtract from *fractionalization* its minimum value (3.37) and divide it by its maximum value after this subtraction. This computation ensures that *fractionalization* values are bounded between zero and one. The higher *fractionalization*, the more fractionalized the sincere vote distribution. We expect here that *permissiveness* and *fractionalization* have a negative impact on levels of strategic voting and a positive impact on levels of sincere voting. We also include in the models the variable *elections order* – which represents the elections order within each series (1 to 5) – in order to assess if there is an increase or decrease of strategic and sincere voting “over time”⁸.

⁷ Note that we perform OLS regressions in the analysis mainly to facilitate the interpretation of the results. Our main variables of interests (permissiveness and fractionalization) are all orthogonal due to the experimental design.

⁸ Cost of voting is introduced as a control variable because it is correlated with elections order. Cost of voting is a dummy variable coded 1 if the election is held under the cost of voting treatment and 0 otherwise.

Table 1: Sincere Vote Share in the Four Distributions

Political Position	# of voters Sincere Vote	A		B		C		D		Fractionalization			
		1	2	3	4	5	6	7	8		9	10	
Normal Distribution		1>	1	<1	3>	4	5	<3	1>	1	<1	3	3.37
Multimodal Distribution		1>	3	<1	2>	3	3	<2	1>	4	<1	6	3.97
Bimodal Distribution		2>	3	<2	2>	1	1	<2	2>	4	<2	8	3.37
Asymmetric Distribution		1>	1	<1	1>	3	3	<4	3>	2	<2	7	3.59

< and > indicate that sincere voters will vote for the party to the left or right, respectively, of their assigned position.

Results

Table 2 presents OLS regressions where the dependent variables are the percentage of strategic and sincere voting at each election. The results support the fact that there is slightly more strategic voting under plurality rules than under PR rules – column 1- *Strategic*. Nevertheless, the difference is not significant at the 0.1 level. Column 3 – *Sincere* also shows that there seem to be higher levels of sincere voting under the plurality system: on average there is two more participants voting sincerely under the plurality system than under the PR system (2 divided by 21 equals 0.0952). This result is at odd with common wisdom and with Duverger’s propositions. The results also show that voters are more prone to vote sincerely under fractionalized distributions and thus that they have less incentive to act strategically. In a distribution where each party is as much viable as the others voters will logically vote more sincerely.

The formation of coalitions and an electoral system with two winners are not common features of the Canadian electoral system. In this sense, there may be a “political culture” effect linked to participants’ lack of familiarity with these concepts. It is thus possible that there is a learning effect in the experiment where the impact of *permissiveness* changes “over time”. When we introduce an interactive term “*permissiveness X elections order*” in each model – see results in columns 2- *Strategic* and 4- *Sincere* – it appears that the impact of *permissiveness* on levels on strategic voting decreases “over time”. At the first election of a series, there is no difference in levels of strategic voting under both electoral systems while at the fifth election there is more strategic votes under the plurality system (significant at the 0.1 level; gap of 6 points of percentage). At the opposite, column 4 – *Sincere* shows that there is no interaction effect between *permissiveness* and *elections order* that conditions levels of sincere voting. There is an always lower level of sincere votes under the PR system than under the plurality system. As a result, there is no “political culture” effect as we assumed. In fact, when we look more attentively at the trends we note that levels of strategic voting are increasing “over time” under both systems but

that the increase is more important under the plurality system than under the proportional system. On the other hand, levels of sincere voting are quite stable “over time” under both electoral systems. Overall, it thus appears that voters under plurality rules come to coordinate themselves on the most viable parties more importantly “over time” than voters under PR rules.

Table 2: OLS Regression of the Level of Strategic and Sincere Voting

	1 - Strategic	2 - Strategic	3 - Sincere	4 - Sincere
Permissiveness	-2.88 (2.13)	1.77 (5.10)	-9.59*** (2.70)	-9.42 (6.10)
Fractionalization	-4.13* (2.53)	-4.13* (2.51)	7.47** (3.37)	7.47** (3.40)
Elections Order	2.57* (1.46)	3.34** (1.62)	-0.18 (1.78)	-0.15 (2.15)
Permissiveness X Elections Order		-1.55 (1.54)		-0.06 (2.04)
Cost of Voting	-4.22 (4.30)	-4.22 (4.31)	-2.19 (5.23)	-2.19 (5.27)
Constant	21.53*** (3.83)	19.20*** (4.47)	67.49*** (4.77)	67.40*** (6.01)
N=80; R-squared	0.0993	0.1121	0.1994	0.1994

*: Significant at 0.1; **: Significant at 0.05; ***: Significant at 0.01.

According to Cox, it is also possible to observe under a PR system a type of strategic voting that has an “amplification effect” instead of a reductive effect on the number of parties (Cox 1997). In this type of strategic voting, voters could desert their preferred party if it is perceived to be “too strong” in favor of their second preferred party that is less likely to win as many seats or votes (Cox 1997, 121-122). Following Cox, we compute a variable to assess the level of “strategic amplifying votes” under the proportional system. We code a vote as a *strategic amplifying vote* if a voter deserts her preferred party if the latter is one of the two most viable parties in favor of a “non-viable” party that is her second preferred party according to the coalition payoff— see tables A and B in appendix. For example, voters at position 1, 2 or 3 under the bimodal distribution have party A and coalition AB as their preferred party and coalition respectively. These voters could perceive party A as very likely to win a seat due to the voter distribution – see table 1. In this sense, if these voters desert party A in favor of party B we code their vote as a *strategic amplifying vote*. Then, we compute the mean of *strategic amplifying votes* at each election. In fact, it appears that levels of *strategic amplifying vote* are quite modest under the normal and asymmetric distribution (4%) while more important under the bimodal distribution (10.0%)⁹. We will test in the next section if this kind of strategic voting has really an amplification effect on the number of parties as suggested by Cox.

⁹ Note that there is no “strategic amplifying vote” under the multimodal distribution because the four political parties are objectively as viable as the others according to table 1.

A Typology of Voting Behavior

At this point, we identified two types of voting behaviors that appear under both electoral systems – strategic and sincere voting – and another kind that appears only under PR rules. Table 3 presents the proportion of the vote choice that fits into these categories for each electoral system. If the proposed typology describes particularly well the voting behaviors under the plurality system – only 5% of the votes do not fit into one of the categories – there is still a considerable proportion of the vote choice that does not fit into one of these categories under the proportional system – about 13% is not explained by our model. This proportion is significant and request more investigation.

Another possibility that we must consider under the proportional system is that voters vote for their second preferred party according to their coalition payoff without being a strategic or strategic amplifying vote. For example, voters at position 5 under the normal distribution have coalition BC as their preferred coalition and party B as their preferred party. Nevertheless, these voters could perceive parties B and C as just as likely to win a seat and thus conclude that there is not a great difference in voting for one of these parties. For these voters, voting for party B or party C could be the same and therefore voting for party C could still represent a sincere vote for their preferred coalition. Contrary to a *strategic amplifying vote* they do not vote for party C because they perceive it as less likely to win and contrary to a strategic vote they do not desert party B because they perceive it as not viable. When considering this *coalition voting*, there is now only 3.4% of unexplained votes under the proportional system. *Coalition voting* thus represents 9.8% of the vote choice under proportional rules.

One of the reasons why voters could cast such a *coalition vote* could be due to how the anticipated payoffs were presented to participants in the experiment under the proportional system. Before the beginning of the experiment, we presented to participants how payoffs were computed during the experiment. The explanations make it clear that the smaller the distance between a winning party in the coalition and a voter position, the higher the associated gain with this party. However, during the experiment we presented to participants only the payoffs associated with each possible coalition – see table B in appendix. This could have made these payoffs more important when participants made up their mind. So voters very close to two parties could come to think that both parties were their preferred parties because they were both part of their higher payoff – like voters at position 5 in the previous example. In the end, we must acknowledge that these *coalition votes* could be an artifact of our experimental design and that we must probably consider them as very similar to sincere votes. When we do so, it then appears that there is no difference in levels of sincere voting under both electoral systems. The next step now is to assess the influence of these types of voting behaviors on the number of parties.

Table 3: A Typology of Voting Behaviors

	Plurality	Proportional
Sincere	68.6	59.0
Strategic	26.1	23.2
Strategic Amplifying	0	4.5
Unexplained	5.3	13.2 (3.4)
Coalition Vote	0	9.8

Percentages are displayed.

The Number of Political Parties

Empirical Model

In this section, our analysis follows mainly Ordeshook and Shvetsova's (1994) and Cox's (1997) models. We take each election as a unit of analysis for a total of 80 elections. The dependent variable is the effective number of elective parties ($ENPV = 1/\sum v_i^2$, where v_i is party i 's vote share). We first run a model where the number of parties is a function of *fractionalization* and *permissiveness*. For the latter variable, the logic behind our computation remains roughly in line with Ordeshook and Shvetsova and Cox. Their studies use district magnitude, the number of legislative seats in a district, as the electoral system variable. The more seats there are in a district, the more proportional the system and the more political parties there are (Ordeshook and Shvetsova 1994). The plurality system in the experiment has one seat while the proportional system has two seats. The latter should thus be more permissive than the former. Note that we also introduce *elections order* to examine if there is a decrease in the effective number of elective parties "over time". Our expectations in this model are that both *permissiveness* and *fractionalization* should have a positive effect on the number of parties. Moreover, we also expect that the impact of *fractionalization* is conditioned by *permissiveness* consistent with Ordeshook and Shvetsova and Cox' results: the impact of *fractionalization* should be greater under the proportional system than under the plurality one.

Second, we run a model to assess the relationship between the different categories of voting behaviors (micro level) and the number of parties (macro level). In order to assess this relationship, we introduce in the previous model the level of *strategic*, *strategic amplifying* and *coalition voting* as independent variables. According to Duverger, a psychological effect makes voters deserting the least viable parties under a plurality system. This process should contribute to the decrease in the number of parties. We thus expect that the more strategic voting there is the smaller the number of parties. Note that we do not include the level of sincere voting in the model because the correlation of this variable with the level of strategic voting is quite significant and this could raise a multicollinearity problem. Moreover, this correlation makes that the impact of the level of strategic voting could practically be understood as the inverse effect of the level of sincere voting. Consistent with Cox, we also expect that the level of *strategic amplifying votes* has a positive effect on the number of parties. Our expectation regarding the *coalition vote* is ambiguous because the cause of this kind of voting behavior is not entirely clear. However, when voters desert their preferred party in a favor of a party for which they assess as viable as their preferred party this should reduce slightly the number of parties, at least if the movement is not symmetrical by voters having the other party as their preferred one.

Results

Table 4 presents the results of the OLS regressions where *ENPV* is the dependent variable. Consistent with our expectation, *permissiveness* has a positive impact on the number of parties: the more permissive the electoral system in the experiment the greater the number of parties. The effect of *fractionalization* is also in line with our prediction: the more fractionalized the distribution, the greater the ENPV. In comparing model 1 and model 2, we see that there is no interaction effect between *permissiveness* and *fractionalization* that conditions the number of parties in the experiment. Our results are thus similar to Powell's additive model. In studying 84

elections in 27 countries over the 1965-1976 period, Powell (1982) found an additive function that “allows the number of parties to be large either because there are many cleavages (regardless of how strong the electoral system is) or because the electoral system is very permissive (regardless of how few cleavages there are)” (Cox 1997, 207).

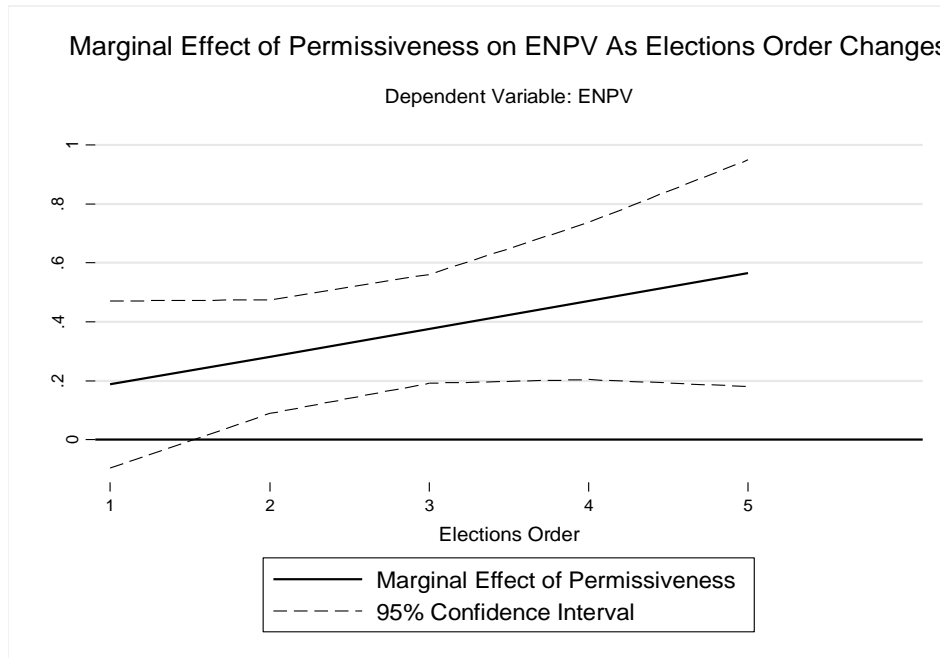
Table 4: OLS regression of ENPV

	1	2	3	Plurality	PR
Permissiveness	0.376*** (0.095)	0.390*** (0.132)	0.093 (0.206)		
Fractionalization	0.489*** (0.106)	0.508*** (0.155)	0.489*** (0.103)	0.455*** (0.162)	0.545*** (0.134)
Permissiveness x Fractionalization		-0.039 (0.213)			
Elections X Permissiveness			0.094 (0.072)		
% of strategic votes				-0.013** (0.006)	-0.017*** (0.006)
% of strategic amplifying votes					0.019** (0.00*)
% of coalition voting					-0.010** (0.004)
Elections order	-0.176*** (0.063)	-0.176*** (0.064)	-0.224*** (0.073)	-0.255** (0.095)	-0.014 (0.075)
Cost of voting	-0.027 (0.173)	-0.027 (0.174)	-0.027 (0.175)	0.172 (0.269)	-0.399* (0.216)
Constant	2.931*** (0.138)	2.924*** (0.139)	3.072*** (0.163)	3.450*** (0.245)	3.356*** (0.213)
N=80; R-squared	0.4599	0.4601	0.4742	0.5329	0.4987

*: Significant at 0.1; **: Significant at 0.05; ***: Significant at 0.01.

Because the results at the individual level suggest that there is an interaction effect between *permissiveness* and *elections order*, it is thus also possible to observe an interactive effect between these variables that conditions the number of parties. Figure 3 supports this claim based on the results of column 3 in table 4. Figure 3 shows the impact of *permissiveness* on the number of parties depending on the value of *elections order*. We see that the effect of *permissiveness* on the number of parties equals 0.2 at the first election while the effect increases to practically 0.6 at the fifth election of a series. Moreover, it appears that under both systems the number of parties is reduced “over time” but that the decrease is greater under the plurality system than under the proportional system. This result is consistent with the fact that there is more strategic voting “over time” under the plurality system and it highly suggests that there is a relationship between levels of strategic voting and the number of parties.

Figure 3: Marginal Effect of Permissiveness on ENPV Depending on Elections Order



In *Making Votes Count* (1997), Cox also supports empirically that the single-member single-ballot systems, multimember districts, and single-member dual-ballot systems all respect the $M + 1$ rule “according to which the number of viable candidates or lists in each system cannot exceed $M + 1$ (where M refers to the district magnitude for SMSP and PR, and to the number of first-round competitors who can advance to the second round for majority runoff)” (Cox 1997, 139). To be consistent with this rule, we should observe a difference of one in the number of parties between the plurality and the proportional system due to their district magnitude of one and two respectively. Figure 3 does not support this claim. Nevertheless, in looking more deeply at the pattern within each setting and by elections order – results not displayed – it appears that all distributions except the normal distribution come to respect the $M + 1$ rule at the fifth election. At the last election of a series, there is a difference of one in the number of parties between the electoral systems.

Voting Behavior and the Number of Parties

We examine now how voting behaviors at the individual level could explain the variation that we observe in the number of parties. If the proportional system generates a greater number of parties than the plurality system it is because voters are acting differently under both systems. Columns *plurality* and *PR* in table 4 present the results. The regressions are run separately for each electoral system due to the different kinds of voting behaviors that we observe under both systems. Under both electoral systems, the results demonstrate that strategic voting decreases the number of parties. Everything else being equal, if all voters cast a strategic vote the number of parties is reduced approximately by 1 – significant at the 0.05 level. Conversely, the effect of the level of *strategic amplifying votes* on the number of parties is positive and quite important. This is consistent with Cox’ assumption as described previously. The results under the PR system also show how the level of *coalition votes* has a negative effect on the number of parties as we

assumed above. In the end, these results support the relationship that exists between voting behaviors and their impact on the number of parties. Through the experiment, strategic coordination at the individual level had whether a reductive or an increasing effect on the number of parties depending on the electoral system.

Discussion

Our objective in this paper was to design an experiment in order to assess first, how different electoral systems and levels of social fractionalization affect voting behaviors and second, how these electoral and social structures combine to different kinds of voting behaviors condition the number of parties. In this sense, we test the theories proposed by Duverger, Cox, and Ordeshook and Shvetsova. Overall, we believe that our findings support their assumptions. On the voting behavior side, our experiment showed that there is higher levels of strategic voting “over time” under the plurality system than under the proportional system. This is mainly consistent with Duverger. Nevertheless, our results also support Abramson et al. (2009) study which demonstrates empirically that levels of strategic voting are very similar under plurality and proportional systems. Back to table 3, we must acknowledge that the difference in levels of strategic voting under both systems is rather marginal. As a result, the safest conclusion here is that there is a difference in levels of strategic voting that appears “over time” under both electoral systems as suggested by Duverger but that this gap is much less important than initially thought as supported by Abramson et al. study. Our analysis also supports Cox’ claim that it is possible to observe a form of strategic voting under a proportional system that increases the number of parties and thus that has an amplifying effect rather than a reductive one. On the other hand, results regarding levels of sincere voting under each electoral system are less conclusive because the plurality system seems to generate higher levels of sincere votes. However, it is possible that this finding is a consequence of the way we presented the anticipated payoffs under the proportional system as we discussed above. Therefore, if we consider *coalition votes* as a form of sincere votes, it appears that there is as much *sincere votes* under the proportional system as under the plurality system.

At the macro level, the two treatments that we designed in the experiment to translate the effect of electoral and social structures on the number of parties prove to be mainly positive. Studies have generally considered district magnitude as the main independent variable for translating the permissiveness of the electoral system. The more seats there are the more permissive the system. Based on this theoretical consideration, the proportional system in the experiment was supposed to be more permissive and thus to generate a greater number of parties because the proportional system has one more seat than the plurality system. As we illustrated, our results support the theory. This treatment proved to be positive and shows how a slight increase in district magnitude affects positively the number of parties. Moreover, our results support mainly the $M + 1$ rule which has been demonstrated empirically by Cox (1997).

The four distributions of voter preferences that we proposed in the experiment constitute clearly one of the paper contributions to the field of electoral experiment. The common setting in this kind of experiments is to distribute an equal number of participants at each political position (Blais et al. 2007). With these former experiments it is not possible to assess how different levels of fractionalization in voter preferences could influence the number of parties and voting behaviors. Our results suggest that when voter preferences are heterogeneous this influences

positively levels of sincere voting and the number of parties. This result thus supports the line of inquiries of scholars that highlight the importance of social fractionalization and cleavages when studying party systems (Lipset and Rokkan 1967; Taagepera and Grofman 1985).

Perhaps the only result that is less positive regards the interaction effect between the permissiveness of the electoral system and the level of social fractionalization and their impact on the number of parties. According to Ordeshook and Shvetsova, and Cox the impact of social fractionalization on the number of parties is greater when electoral systems are more permissive. In contrary with their findings, our model showed a negative but non-significant interactive effect. Why this is so? The most obvious reason seems to be linked to the interaction effect between *permissiveness* and *elections order*. As we showed above, the $M + 1$ rule is only respected at the fifth election of a series. The plurality system thus generates a higher number of parties at the beginning of each series than he “must generate”. It is thus possible that this pattern reduces the amplitude of the interaction effect between *permissiveness* and *fractionalization*. As a test, we run the interaction model only for the 3rd, 4th and 5th elections of a series and it appears that the interactive term has a positive sign in this case – nevertheless, the effect is still not statistically significant. Our suggestion here is to replicate the experiment in increasing the number of elections under each series. In such setting, we could probably observe the emergence of a positive interaction effect “over time” between the permissiveness of the electoral system and the level of social fractionalization that conditions the number of parties.

The paper is also original by the relationship that it draws between the micro and macro levels. There is obviously a relationship between voting behaviors and the number of parties. In line with Duverger and Cox, we put forward the idea through the paper that strategic, strategic amplifying and sincere voting represent the causal mechanisms that link the impact of the electoral and social structure on the number of parties. These structures induce some types of behaviors at the individual level that will then influence the number of parties at the macro level. Our results thus have implications for the literature on party systems and on strategic coordination at the individual. Both literatures should look more deeply at the relationship linking both levels.

External Validity

A last point that we need to address regards the external validity of our findings. As we know, experiments are very useful to establish causal relationships between variables but some scholars raise concerns concerning the generalization of the results at the real-world level. In our experiment, we imposed a preferred party to each participant and thus a specific gain/payoff associated with it. We are aware that we left out of the experiment some political factors that are normally quite influential in real elections. For example, partisanship and economic voting are considered as important factors influencing voters’ choice (Campbell et al. 1960; Lewis-Beck and Paldam 2000; Norpoth 1996) but they are not at play here. Moreover, because we assigned abstract positions to voters in the experiment, the latter do not have strong incentives to stay with the party that is nearest to them in contrast to real elections. In the latter, even if it is clear that a voter’s preferred party will not take power she could support it for several reasons related to her political loyalties or to her socio-economic predispositions, in order to send a “political message” and so on. In this sense, real voters are surely more attached to their political beliefs than in the experiment. This could explain why levels of strategic voting in the experiment fluctuated

between 0% and 46% (mean of 25%) while levels are lower in real elections: between 5% and 17% according to Alvarez and Nagler's review of the literature (Alvarez and Nagler 2000, 59).

This point brings us to the fact that this kind of experiment leads voters to act more strategically than they do in reality because they are not very attached to their experimental political position (even if the payoff is lower when a non-preferred party wins). As a result, the impact of structural factors— such as electoral systems and social fractionalization – on voters' strategic behavior could be overstated in this kind of experiments due to the absence of other relevant political factors that reduce these effects. Nevertheless, we have to underline that our purpose was not to generalize the level of strategic and sincere voting observed in the experiment to real-world elections. Our interests were rather in testing the direction and the form of the relationship between electoral systems, social fractionalization, voters' behavior and the number of elective parties as predicted in the literature. Consequently, we think that a great portion of our results supports and enhances the theories about the impact of these structural factors on voters' behaviors and on the number of parties.

Conclusion

A last point to be made is that the structural factors studied in this paper are just two of several factors that could influence the number of parties. Electoral laws could facilitate or impede the emergence of new political parties. Parties' expectations about the stability of the electoral system also provide different incentives to join coalitions and form new parties. None of these other factors that could influence the number of parties and thus the voters' set of choices are taken into account in this paper (see Blais et al., forthcoming). It is thus very possible that under a different set of choices the experimental results could differ. In other words, it is likely that the incentives to form new parties under the proportional system change the set of choices offered to voters, and this could affect voters' behavior and the competitiveness of party systems. Further experimental studies should take this important point into account.

Finally, we believe that experiments could be very useful to test existing theories but also to improve our understanding of their mechanisms as we demonstrated through this paper. In this sense, electoral experiment in computer laboratory constitutes a very innovative and original field that clearly deserves further investigations. In such setting, it is possible to shape our variables of interests in order to better understand the causal mechanism between them. In the end, experiments should be conceived as a complementary tool that helps scholars better understand real-world politics.

Appendix

Table A – Detailed Payoff According to Each Political Position under Plurality Rules

	Political Position									
Winning party	1	2	3	4	5	6	7	8	9	10
A	9.0	10.0	9.0	8.0	7.0	6.0	5.0	4.0	3.0	2.0
B	6.0	7.0	8.0	9.0	10.0	9.0	8.0	7.0	6.0	5.0
C	5.0	6.0	7.0	8.0	9.0	10.0	9.0	8.0	7.0	6.0
D	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	9.0

Bold numbers indicate the best voter payoff.

Table B – Detailed Payoff According to Each Political Position under Proportional Rules

	Political Position									
Coalition	1	2	3	4	5	6	7	8	9	10
AB	7.5	8.5	8.5	8.5	8.5	7.5	6.5	5.5	4.5	3.5
AC	7	8	8	8	8	8	7	6	5	4
AD	5.5	6.5	6.5	6.6	6.5	6.5	6.5	6.5	6.5	5.5
BC	5.5	6.5	7.5	8.5	9.5	9.5	8.5	7.5	6.5	5.5
BD	4	5	6	7	8	8	8	8	8	7
CD	3.5	4.5	5.5	6.5	7.5	8.5	8.5	8.5	8.5	7.5

Bold numbers indicate the best voter payoff.

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