

A Simultaneous Analysis of Turnout and Voting under Proportional Representation: Theory and Experiments

Aaron Kamm¹ & Arthur Schram²

¹*Hessian Ministry of Economics*

²*University of Amsterdam, the Netherlands, and European University Institute*

March 13, 2026

Abstract. In a system of proportional representation, we study the interaction between a voter's turnout decision and her party choice, and how these relate to party polarization. Models of strategic interaction with instrumental voting, such as Nash and Quantal Response, predict such interaction effects, while Naive Voting models do not. In particular, the instrumental voting models predict (i) a Polarization Effect: reduced strategic party choice when voting is voluntary makes voters more likely to vote for extreme parties (conditional on voting at all); (ii) an Extremist Effect: voters supporting extreme parties are most likely to vote; (iii) a Turnout Effect: party polarization increases voter turnout. We provide data from a laboratory experiment that provide some support for these theoretical predictions. In addition, we provide supporting empirical evidence from real-world elections. Thus, the interaction between turnout and strategic voting that has been neglected in most of the previous literature is shown to be important, as predicted by models of instrumental voting.

Please address correspondence to: Arthur Schram, Center for Research in Experimental Economics and political Decision making, Amsterdam School of Economics, P.O. Box 15867, 1001 NJ, Amsterdam, the Netherlands.

Email:

Kamm: aaronkamm1987@gmail.com

Schram: Schram@uva.nl

ACKNOWLEDGMENTS

The authors are very grateful for valuable comments by Jens Großer, Rafael Hortala-Vallve, Gary Charness (†), Emanuel Vespa, an associate editor, and three anonymous reviewers. Participants at the micro seminar of the EUI in 2017, the 6th NYU CESS conference (New York), the 9th IMEBE conference (Madrid) and the workshop on Voting Experiments (Montreal) also provided useful suggestions. Financial support from the University of Amsterdam Research Priority Area in Behavioral Economics is gratefully acknowledged.

1 Introduction

Do voters' decisions to turn out to vote and their party (or candidate) choice influence one another? For instance, is extreme voting more prevalent in voluntary than in compulsory voting systems? Does the voluntary or mandatory nature of voter turnout impact strategic voting? How does the degree of party polarization shape this interaction?

Surprisingly, these questions have received limited attention in voting studies (Kittel et al., 2014), even though voting has been an important part of the research agenda for over five decades. Most of the existing literature has focused on either analyzing the factors driving voter turnout decisions or explaining party choices separately, potentially missing crucial effects of their interaction. In fact, as early as 1957, Anthony Downs already suggested that these two decisions are intertwined (Downs 1957: 271). We advance the literature by integrating theoretical modeling, laboratory evidence, and field data to jointly examine turnout–choice interactions.

One possible explanation for this research gap is the inherent complexity of studying the interaction between voter turnout and party choice from a theoretical standpoint. Nevertheless, the issue remains highly important. The fact that many political-economic models build on findings from voting studies underscores the significance of addressing this challenge. Because such models hinge on assumptions about the voting phase, accounting for interaction effects between turnout and party choice could yield markedly different conclusions. A study by Krishna and Morgan (2015) illustrates this concern. Traditionally, the literature has asserted that majority voting is at odds with utilitarian welfare, primarily due to the dominance of the median voter's preferences in majority rule, rendering other voters' preferences inconsequential regardless of their intensity. However, these authors demonstrate that when turnout becomes endogenous and costly, majority voting can lead to a utilitarian outcome, as the strength of preferences now becomes a crucial factor. Therefore, endogenizing turnout fundamentally alters conclusions about this basic and extensively studied question.¹

While theoretical insights highlight the importance of endogenous turnout, empirical evidence remains relatively limited. There is, however, some evidence from the field that turnout and party choice interact. Notably, voluntary voting systems tend to result in more extreme party

¹ This example serves to illustrate the potential importance of interaction effects, but the mechanisms concerned are very different from the focus of our paper.

choice compared to mandatory voting systems; this notion is widely accepted as conventional wisdom.² In simpler terms, when abstention is possible, party choice often differs from cases where it is not. To illustrate this phenomenon, we examine election outcomes in the Netherlands and Belgium.³ Both countries enforced compulsory voting for many decades until the Netherlands transitioned to voluntary voting in 1970. Because these nations share similar political systems and ideologies, we compare the degree of extreme voting in the two countries in the two elections following the policy change. To facilitate this comparison, we devised an extremism index, calculated as the weighted average of absolute left-right scores (ranging from -10 to 10) obtained from the Manifesto Project Database (Volkens et al. 2010). A higher index value indicates a greater degree of extreme voting. Figure 1 visually represents the values of this index for the elections in the 10 years preceding and following the alteration in the voting rules.⁴

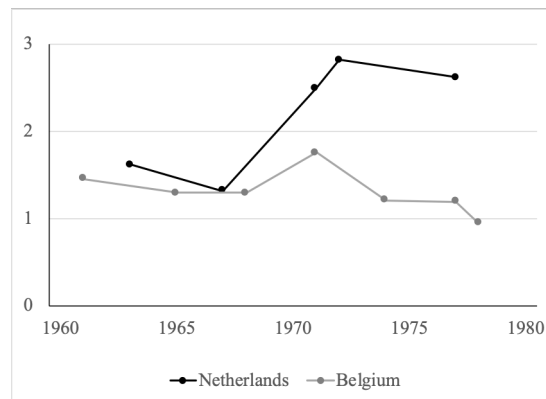


Figure 1: Extremism and Voluntary Voting

Notes. For each country, the lines show the value of the extremism index for the elections in the ten years before and after 1970 (when compulsory voting was abolished in the Netherlands).

The index increases dramatically in the Netherlands, while no substantial change in the index is observed in Belgium. Furthermore, this effect persists in the elections after the rule change.

Additional support from the field for the interaction between voter turnout and party choice is found in Weschle (2014). Drawing on observational field data collected across four countries,

² E.g., New York Times, November 6th, 2011.

³ Miller and Dassonneville (2016) also use this comparison in order to investigate the effect of compulsory voting on leftist vote shares. They offer a good discussion of the comparability of the two countries.

⁴ Data for all elections since the Second World War are available from the authors. In addition to the change in the Netherlands, Belgium introduced a ‘soft’ change in 2003, when it announced that non-voting would no longer be prosecuted. This was followed by a sharp increase in extremist voting in the following two elections, while no similar change was observed in the Netherlands. We refrain from presenting this effect in Figure 1 because the change was not a formal step to voluntary voting as in the Netherlands in 1970. More details are available upon request.

Weschle demonstrates that abstention plays a significant role in economic voting, where voters reward or penalize incumbent parties based on economic performance. In essence, economic conditions are shown to jointly influence both the decision to turn out and the choice of party.

Together, such theoretical findings, established wisdom, informal observations, and empirical investigations underscore the importance of studying the interplay between voter turnout and party choice. With this in mind, this paper addresses this issue. We employ a theoretical model to explore the existence and nature of potential interaction effects. Furthermore, we address the role of party positions by investigating whether the degree of party polarization correlates with the decision to turn out.

Our theoretical analysis allows us to predict three effects. First, there is a *Polarization Effect* when parties take extreme positions. This predicts that voters who cast a vote are more likely to vote for an extreme party when they can abstain than when voting is mandatory. The mechanism underlying this effect is that voluntary voting reduces the extent of strategic voting by the more extreme voters.⁵ The intuition for this effect is related to the fact that extremist voters are more likely to cast a vote (the second effect). As a consequence, the election becomes more of a run-off between the extreme parties than in the mandatory voting case. In turn, this reduces the expected benefit from voting strategically for a more moderate party. We denote the second effect as the *Extremist Effect*. The intuition is that there is more at stake for extreme voters because the worst-case scenario (the other extreme winning the election) is worse than for centrist voters. The third effect we derive is the *Turnout Effect*. This is that voters are more likely to vote when the polarization of party positions increases.⁶ Here, the reason is that increased differences across parties put more at stake in the elections for all voters.

Our analysis employs the pivotal voter framework, characterized by what is often called ‘instrumental voting’. In this context, voters make their choices based on instrumental considerations, such as policy preferences or the expected outcome. Instrumental motives have consistently been shown to play a substantial role in shaping voters’ decisions (e.g., Großer and Schram 2010, Palfrey 2009). This does not imply the exclusion of other motivations. The literature on ‘expressive voting’, for instance, studies the phenomenon where individuals cast

⁵ By strategic voting, we mean abandoning the most preferred party to favorably influence the election outcome. As explained below, there is also strategic voting (for extreme parties) by moderate voters in the equilibria we derive. Voluntary voting, however, reduces strategic voting more for extreme voters than for the moderate.

⁶ The term ‘polarization’ is used here to indicate party position, whereas it refers to voters’ party choice in the Polarization Effect. Whether polarization refers to voters or parties in this paper should be clear from the context.

their votes not solely based on instrumental considerations, but also as a means of expressing their identity, values, or emotions (Brennan and Hamlin 1998, Feddersen et al. 2009, Tyran 2004). Expressive motivations have been argued to increase polarization (Green 2004). Our analysis proceeds under the assumption that expressive motivations do not alter the comparative static predictions we derive in the pivotal-voter framework.⁷ Interestingly, in our study we observe polarization from voluntary voting even without expressive motivation. This suggests that in real-world politics affective polarization may also arise through mechanisms other than a psychologically driven in-group versus out-group dynamic (West and Iyengar 2022).

We complement the theoretical analysis with a laboratory experiment. The experiment allows us to test the model's predictions (in particular, the three effects that we derive) in a controlled environment. We opt for a laboratory experiment rather than an empirical examination utilizing observational data from actual elections since such data are rife with confounding factors. Laboratory control allows us to isolate those factors that are relevant for the theory. Additionally, it facilitates the measurement of causal processes, a feat unattainable with observational field data. Within the controlled environment of the laboratory, the experimenter can systematically introduce *ceteris paribus* variations to isolate the effects of interest. Nevertheless, to gauge the applicability of our findings beyond the laboratory, we also provide evidence of the three effects from real world elections.

Both our experimental findings and the supplementary empirical evidence provide some support for the three interaction effects we have derived. In particular, our experimental data support the polarization effect when parties are sufficiently dispersed across the policy space, but provide weaker support when they are more closely aligned. Evidence for the Extremist and Turnout Effects is stronger overall, although the turnout effect is less pronounced than predicted, largely because centrist voters cast a vote more frequently than anticipated. Indeed, the difference in turnout across voter types is smaller than theoretically predicted, both in our experimental data and in the observational data we consider. As discussed below, the prevalence of sincere next to instrumental voting appears to contribute to the divergence between our experimental findings and the theoretical predictions.

⁷ As pointed out by an anonymous reviewer, our conclusions might be affected if expressive motivations vary across voter bliss points (for instance, if extreme voters exhibit stronger expressive voting than moderate voters do). It is an empirical question whether this is the case, and, if it is, a theoretical question whether this difference affects our comparative statics. We leave both questions for future research.

Lastly, we note that our focus is on a system of proportional representation (PR), where party choice is inherently more complex than in majority systems.⁸ This setting allows a richer examination of interaction effects. Additionally, as argued in the next section, party choice in PR has received relatively limited attention in the existing literature, despite its widespread use in many countries, including a substantial majority of European Union member states. We also hope to contribute to the literature concerning (strategic) voting in PR. A fundamental characteristic of such systems is the frequent formation of coalition governments. This significantly influences the incentives guiding voters in their choices. Our model is explicitly designed to incorporate these incentives.

The remainder of this paper is structured as follows. In the next section we will discuss the related literature. Section 3 presents the theoretical model and its equilibrium predictions before testing these predictions with a laboratory experiment whose design will be presented in section 4. The data from the experiment will be analyzed in section 5. Section 6 provides evidence of the generalizability of our results and section 7 concludes and discusses possible avenues for future research. Finally, we provide a set of appendices in our electronic supplementary materials (ESM).

2 Related Literature

The interaction effect in voting depends on voters' strategic behavior, where they do not vote sincerely for their most preferred party. Consequently, our research question is closely linked to the literature on strategic voting. Traditionally, strategic voting has been viewed as most relevant in plurality systems (Niou 2001, Blais 2002), where supporters of less viable candidates risk 'wasting' their votes. In proportional representation (PR) systems, strategic voting arises for different reasons, as voters must anticipate the policies likely to result from post-election bargaining between parties (Austen-Smith and Banks 1988; Laver and Schofield 1998; Kedar 2005, 2009; De Sinopoli and Iannantuoni 2007, 2008; Indridason 2011).

Until the 1990s, strategic voting under PR received little attention. Duverger's (1955) seminal work suggests that PR votes translate proportionally into seats and government policy is a weighted average of party positions, suggesting limited scope for strategic voting (e.g., Cox

⁸ There are many variations in PR systems each with distinct electoral formula for distributing seats (Blais 1991, Gallagher 1991). Here, we assume a PR where voters are represented in an elected body in direct proportion to how they voted. For a detailed overview of political systems, see Blais and Massicotte (2002).

and Shugart 1996).⁹ Downs (1957), however, argues that voters should aim to influence final policies, not merely who enters parliament.¹⁰ This perspective highlights the importance of how seat distributions translate into policies (Kedar 2005, Indridason 2011, Cho 2014). Even if policies reflect weighted averages of party positions, voters may still vote strategically. Kedar (2005) shows that post-election bargaining can lead voters to support more extreme parties to offset moderation from coalition compromises. Similarly, De Sinopoli and Iannantuoni (2007, 2008) find equilibrium strategies that favor extremists. We extend this literature by introducing abstention and its interaction with party choice. Finally, Indridason (2011) demonstrates that when coalition formation leaves some parties powerless, strategic voting plays a key role in equilibrium. Overall, once policies are considered, Duverger's claim that PR precludes strategic voting no longer holds.

Empirical evidence suggests that PR voters understand the incentives for strategic voting. Kedar (2005) finds such behavior across four countries, with voters supporting extreme parties strategically. Strategic voting for centrist parties by those preferring more extreme options has also been documented in Israel (Abramson et al., 2010), Spain (Viñuela and Artés 2012), and the Netherlands (Bäck and Rosema 2008, Abramson et al., 2010). Moreover, Irwin and van Holsteyn (2012) show that Dutch voters can anticipate coalition outcomes and the resulting policy compromises. Given that voters have both the information and incentives to vote strategically, further study of strategic voting in PR is warranted. We focus on how strategic voting interacts with turnout decisions, particularly when post-election coalitions form through a known process, often termed 'coalitional voting' (Cox 2018).¹¹

Austen-Smith and Banks (1988) provide a foundational theoretical contribution to coalitional voting, analyzing a three-party model in a one-dimensional policy space with mandatory voting. They model coalition formation as post-election bargaining game and derive equilibrium voter and party behavior. An important result is that voters behave strategically in equilibrium.

⁹ For an exception, see Herrera, Morelli and Palfrey (2014).

¹⁰ It is interesting to note, however, that Downs was skeptical about strategic voting in PR. Because of the complexities involved, he concluded that voters in PR would use sincere voting as a heuristic (Downs, 1957: 163).

¹¹ There is a theoretical and empirical literature that allows for an interaction between turnout and party choice in plurality systems (for instance, Degan and Merlo, 2011, Feddersen and Pesendorfer, 1996), but this pays little attention to strategic voting.

However, the framework's scope is limited; it excludes abstention and may not generalize to more parties or alternative coalition processes.¹²

Empirical studies show that voters' party choices are influenced by expectations about post-election coalitions, as observed in Austria (Meffert and Gschwend 2010) and Israel (Blais et al. 2006; Bargsted and Kedar 2009). Cross-country analyses (Duch et al. 2010, Riambau 2016) likewise highlight the importance of coalitional reasoning. Moreover, strategic voting appears no less common in PR than in majoritarian systems (Abramson et al. 2010, Bargsted and Kedar 2009; Hobolt and Karp 2010).¹³ While these findings suggest that coalitional voting is widespread, survey-based evidence may be confounded. Experimental studies offer greater control; Duch and Tyran (2013) show that voters can anticipate coalition outcomes, and McCuen and Morton (2010) find strategic behavior consistent with Austen-Smith and Banks' (1988) model, albeit less frequent than the theory predicts.

Palfrey and Rosenthal's (1983) participation game has been central to understanding (instrumental) turnout decisions, with laboratory evidence supporting its predictions (e.g., Schram and Sonnemans 1996a, Levine and Palfrey 2007). Although most studies focus on plurality systems, some consider PR and find higher turnout in majoritarian systems (Schram and Sonnemans 1996b), unless the majority is substantially larger than the minority (Herrera, Morelli and Palfrey 2014, Kartal 2015). Yet, these studies typically consider only two parties and assume linear vote-payoff mappings, overlooking key features of PR.

A comprehensive joint analysis of turnout and party choice in PR systems with more than two parties remains missing in both theory and experimentation. We are aware of only two such studies, Kittel et al. (2014) and Blackwell and Calgano (2014). The former explore the interaction between pre-voting communication, turnout, and strategic voting but focus mainly on communication. Blackwell and Calgano (2014) experimentally investigate how distinct primary types affect turnout and strategic voting, finding that higher voting costs (leading to lower turnout) reduce strategic voting; this is consistent with our Polarization Effect.

¹² Herrmann (2014) investigates a decision theoretic model of coalitional voting with four or more parties. Given his focus on the effect of polls, the model is quite specific, however, and would need to be adapted to more generally explain strategic voting with four or more parties.

¹³ Kawai and Watanabe (2013) and Spenkuch (2018) offer an empirical analysis of strategic voting under plurality rule using election results and find a substantial number of strategic voters. For the case of PR, we are not aware of any such analysis.

In conclusion, existing research suggests that strategic voting matters in PR, but further theoretical and empirical work is needed to clarify how coalition formation shapes the interaction between strategic voting and turnout.

3 The model

In political science, the instrumental view of voting rooted in Downs' (1957) rational-choice model has long had its critics. Alternative traditions emphasize that voters often act for expressive, identity-based, or normative reasons rather than instrumental utility maximization (Brennan and Lomasky 1993; Green and Shapiro 1994; Momsen 2022). These approaches challenge the assumption that individuals vote to influence outcomes, instead framing voting as a means of expressing allegiance, moral conviction, or group identity. Because such motivations do not rely on outcome-contingent payoffs, non-instrumental theories generally do not predict strategic voting or turnout calculus; voters in these frameworks cast ballots sincerely or symbolically, regardless of pivotality or strategic incentives.

Likewise, the calculus of voting theory attributed to Downs (1957), where the turnout decision is determined by a comparison of expected benefits and voting costs, has been criticized for its inability to explain large-scale turnout. Instead, critics argue that turnout is determined by a sense of 'civic duty', largely independent of instrumental considerations (Riker and Ordeshook (1966). Note that if turnout is determined solely by a sense of civic duty, then there will be no interaction with the party choice decision.¹⁴ We subsume the non-instrumental theories of turnout and party choice under the term 'Naive Voting' and contrast them with an instrumental model that allows for strategic interaction between voters (e.g., Levine and Palfrey 2007), which requires a game-theoretic approach.

Our game-theoretic model fits in the long tradition of spatial voting (Downs, 1957; Black, 1958) that assumes that parties and voters are located in a policy space and that the payoff to a voter is decreasing in the distance between her position (her ideal point) and the implemented policy. Specifically, we assume that the policy space is one-dimensional and can be described by the line segment $[-10,10] \in \mathfrak{R}$, which may be interpreted as capturing a left-right spectrum of the political arena.

¹⁴ As will become clear below, our model does allow civic duty to play a role in the turnout decision, but there are also instrumental motivations when deciding whether to vote.

3.1 Voters

Five voters are randomly and independently located across the policy space.¹⁵ The distribution function from which their positions are drawn is discussed below. We follow the standard approach and assume that the utility a voter receives is decreasing in the squared difference between her ideal policy (given by her location in the policy space, x_i) and the implemented policy x^* . This leads to the following utility function:

$$U_i = -(x_i - x^*)^2 - c_i \quad (1)$$

Here c_i represents the net costs that a voter has to incur if she casts a ballot. The net costs of voting are given by the difference between the costs and benefits of casting a ballot, other than the benefits derived from influencing the policy outcome.¹⁶ We do not specifically model the costs and benefits of voting but make only an assumption concerning the net costs. These are assumed to be i.i.d. uniformly distributed on a domain that – due to the potential utility gains from the act of voting per se – may include negative values.

In every election, each voter has to decide whether or not she wants to cast a vote and thereby incur the net costs of voting. Conditional on deciding to vote she subsequently has to decide for which party to vote. In case of mandatory voting, the first step is (obviously) not applicable. The reasoning underlying this sequential decision process is that it seems natural that voters will only invest time and effort into making a party choice if they plan to cast a ballot.¹⁷ All voters make these decisions simultaneously and given that both the voters' positions and their voting costs are private knowledge, the decision can only be conditioned on the distributions of costs and positions, which are common knowledge. Furthermore, voters are unaware of how many voters decided to vote when making their party choice.

¹⁵ Of course, the number of five voters is not meant to represent large-scale national elections. It is sufficient, however, to derive the theoretical predictions for different types of voters. Our empirical analysis in section 6 speaks to the generalizability of this theoretical analysis.

¹⁶ The costs can be divided into two main categories: on the one hand it takes costly effort to get informed about the party positions and to decide for which party to vote. On the other hand, there are the opportunity costs associated with attending the election. The benefits of voting measure utility that a voter gets from the act of voting per se. These are generally attributed to the sense of civic duty mentioned above (Riker and Ordeshook 1968), and based on the notion that a voter 'feels good' when doing her civic duty of voting (and thereby avoiding the costs associated with violating the social norm of voting).

¹⁷ Schram (1992) and Thurner and Eymann (2000) report empirical evidence for this two-step decision process.

3.2 Parties

At the other side of the election there are three parties described by a policy position in the one-dimensional policy space. Since our focus in this paper is on voter behavior these positions are exogenously given and cannot be changed by the parties. Furthermore, the rules of coalition formation are fixed and therefore the parties have no choice regarding the coalition to form.

3.3 Government formation

The rules of government formation are the following (these are inspired by Indridason 2011 and reminiscent of Austen-Smith and Banks 1988):

1. If a party receives an absolute majority of votes cast this party unilaterally forms a government and the implemented policy x^* is equal to this party's policy position.
2. If no party receives an absolute majority of votes cast, the largest party is assigned the role of government formateur.¹⁸ This party then proposes a coalition to the parties it wants to cooperate with; if all these parties agree, the coalition is formed and the implemented policy is the average of the policy positions of the parties in the coalition weighted by the number of votes they received. When forming a coalition, the formateur tries to keep the implemented policy as close as possible to its own policy position while not including more parties in the coalition than needed for a majority.
3. If multiple parties have the most votes a fair random draw decides which of the largest parties is assigned the role of formateur.
4. If the coalition is rejected, bargaining breaks down and every party receives a payoff of $-\infty$.

Two things are important to note regarding these rules. Firstly, the rule that there are no more parties than necessary in the coalition does not mean that a minimal-winning coalition (i.e. the coalition with the smallest majority) is formed. Instead, it implies that coalitions that keep a majority even if one party would leave are not permitted.¹⁹ The reason that we restrict attention

¹⁸ An alternative assumption would be that the formateur is randomly chosen (as in Baron and Ferejohn 1989) with recognition probabilities proportional to vote shares. Both assumptions find empirical support (Diermeier and Merlo 2004; Ansolabehere et al. 2005). The role of a formateur could also be to select a set of parties that will bargain to form a coalition (Austen-Smith and Banks 1988; Laver and Shepsle 1990, 1996; Baron and Diermeier 2001; Cho 2014).

¹⁹ The difference can be seen in the following example: Suppose that there are 4 parties; parties 1 and 2 receive 5 votes each, 3 receives 10 votes and 4 receives 15 votes. The minimum-winning coalition would be a coalition

to coalitions that are not excessively large is that one rarely observes such coalitions in reality.²⁰ The second important thing to note is that rule 4 makes sure that any proposal in line with rule 2 will be accepted. We may therefore abstract from the bargaining process itself. Obviously, one could set up a more elaborate bargaining process like in Austen-Smith and Banks (1988) but given that parties are not active players in our model we deem this very simple process to be adequate. Finally, one can think of the rule that the policy implemented by a coalition is the vote weighted average of the policy positions of the parties in the coalition as reflecting the outcome of a bargaining process that is not explicitly modeled as opposed to explicitly modeling it (e.g., Budge and Laver 2016).

3.4 Equilibrium analysis

3.4.1 Parameters

In our analysis we will assume (as in the experimental design) that parties are located at 7.5 (a right-wing party, R), 0 (a central party, C) and α (a left-wing party, L), where α is between -7.5 and 0. The reason for only varying the left-wing party's position is that parties' relative positions matter more than their absolute positions. By varying α we can investigate both a situation with polarized parties (α is close to -7.5) and a more centrist, or 'muted' situation (α is close to 0) to study whether this matters for the interaction effect between turnout and party choice. Figure 2 summarizes how parties are distributed in the policy space.



Figure 2: Parties in the Policy Space

Notes. The line indicates the policy space. Party positions are given above the line.

Furthermore, we assume that the voters are distributed on the one-dimensional policy space according to a truncated t-distribution with 0.05 degrees of freedom. This specific

with 20 votes (parties 1 and 4, 2 and 4 or 1, 2 and 3). We also allow a coalition of parties 3 and 4 and only rule out coalitions like 1, 2 and 4.

²⁰ Strøm et al. (2008) report that in 80% of the cases a minimum winning coalition is formed. In the remaining cases one rarely observes super-majorities.

parameterization was chosen to fit the distribution of voter preference taken from the German Longitudinal Election Study 2009 and the Dutch Parliamentary Election Study 2006.²¹

3.4.2 Nash Equilibrium

We assume that there are three parties and solve for symmetric cut-point equilibria, which implies that voters with a position to the left of x_L vote for the left-wing party, voters between x_L and x_R vote for the central party and voters to the right of x_R vote for the right-wing party.

Under *mandatory voting*, the Nash equilibrium is derived as a solution to a set of seven equations reflecting that (i) voters at x_L and at x_R are indifferent between voting for C or L, R, respectively; (ii) the probability of voting for L (R) is the probability of having a position to the left of x_L (to the right of x_R); (iii) the expected utility for voter at position x from voting for $P \in \{L, C, R\}$ is determined by considering all possible election outcomes, computing the resulting payoffs for the voter and weighting them by their respective probabilities. See Appendix A in the Electronic Supplementary Material (*ESM-A*) for details.

The equilibrium cut-points are given in Table A1, in the appendix. The table reveals multiple equilibria. We refine these by solving for the quantal response equilibrium (QRE) letting the error parameter go to infinity along the principal branch of the Multinomial Logit Correspondence (McKelvey and Palfrey 1995). This selects the Nash equilibria we use for our predictions. More details about the QRE for our experiments are presented in Section 3.4.3.

Under *voluntary voting*, we again solve for symmetric cut-point equilibria with cut points x_L and x_R . Note that these cut-points are independent of the costs of voting since such costs only influence whether a voter abstains or not but not for which party she will vote if she turns out (since costs enter utility additively and do not vary across parties). The turnout decision is also described by a cut-point where a voter with position x votes if her voting costs are below a threshold $\bar{c}(x)$. The solution is again derived as a solution to a set of (now eight) equations. The equations in sets (i) and (iii) from the mandatory voting case carry over to the voluntary environment. Those in (ii) need to be corrected for the probability that a voter to the left of x_L (to the right of x_R) turn out to vote.²² Finally, the eighth equation provides an equilibrium

²¹ More information is available from the author, upon request. All our conclusions are robust to assuming a uniform distribution instead (cf. *ESM-E*).

²² Voters may have different turnout rates depending on their position. Therefore, the probability of, for instance, a left-wing vote is not simply the probability that a voter is to the left of x_L , it has to be weighted by the relative turnout rate of a left-wing voter compared to the average turnout rate in the population.

condition for turning out to vote, depicting that (iv) the likelihood of casting a vote is equal to the probability that the realized voting cost is below the expected instrumental benefit from voting. Solving this set of equations leads to unique equilibria for both specifications of left-wing party positions (Table A2 in Appendix A).

Having characterized equilibrium cut-points, we now assess the implications for party polarization. To assess polarization, we use two measures. The first is the vote share of the central party, C. A lower vote share for C signals higher polarization (that is, a higher vote share for the two extreme parties).²³ The second is the Dalton polarization index (e.g., Dalton 2021), which is the vote weighted standard deviation of party positions (cf. *EJM-C*). Figure 3 compares both measures across voluntary and mandatory voting, distinguishing between the cases of an extreme left-wing party and a muted one. While there is little evidence of polarization in the equilibrium for the muted left-wing environment, the figure does show that in the Nash equilibrium for the case with an extreme left-wing party, voluntary voting leads to higher polarization than mandatory voting. This is what we call the Polarization Effect.

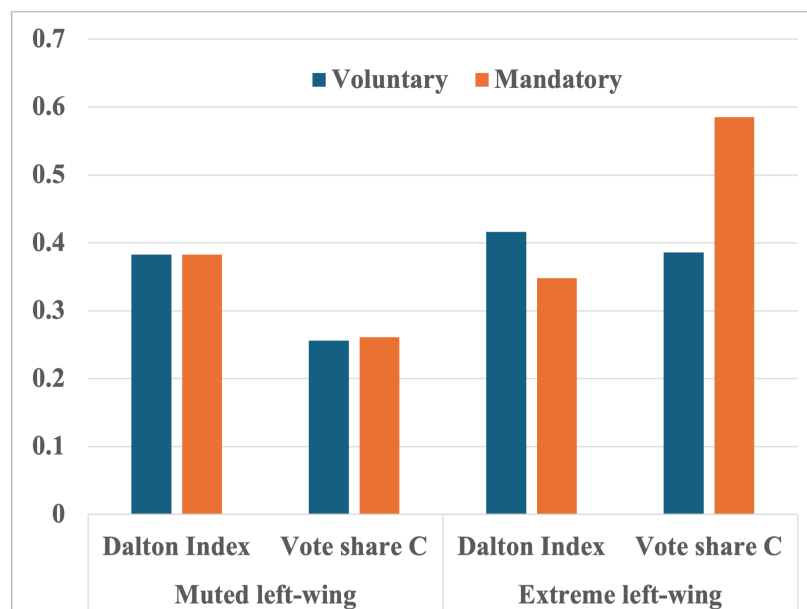


Figure 3: Polarization Effect

Notes. Bars show two measures of polarization in the Nash equilibrium. A higher Dalton index or lower vote share for C show higher polarization.

²³ To isolate polarization due to shifts in party-choice patterns from the effects of turnout differences, we consider for voluntary voting the hypothetical situation where voters choose a party with the probabilities of the equilibrium for the voluntary voting case, but we assume that everybody casts a vote. See *ESM-C* for details.

The intuition underlying the Polarization Effect is that a voter faces a tradeoff between two objectives when choosing a party. On the one hand she wants to give her favorite party (the one located closest to her) a strong position in the coalition formation process by voting sincerely. At the same time, a voter tries to minimize the risk that the party that is farthest away becomes part of the government. When voting is mandatory, it is often worthwhile for a voter with a sincere preference for an extreme party to vote strategically for the central party in order to weaken the position of the party at the other extreme. When voting is voluntary this incentive is weaker (in equilibrium) due to abstention by other voters (see below) and we therefore see less strategic voting by extreme voters. On the other hand, the incentives for strategic voting by supporters of the central party are also different between mandatory and voluntary voting. In *ESM-C* we show that the net effect of the changes in strategic voting in equilibrium is increased support for the extreme parties, that is, increased polarization.²⁴

The Nash equilibrium for the turnout decision is characterized by a function that assigns to each voter position a critical cost for which they are indifferent between abstaining and voting. Figure 4 plots these for the two positions of the left-wing party.

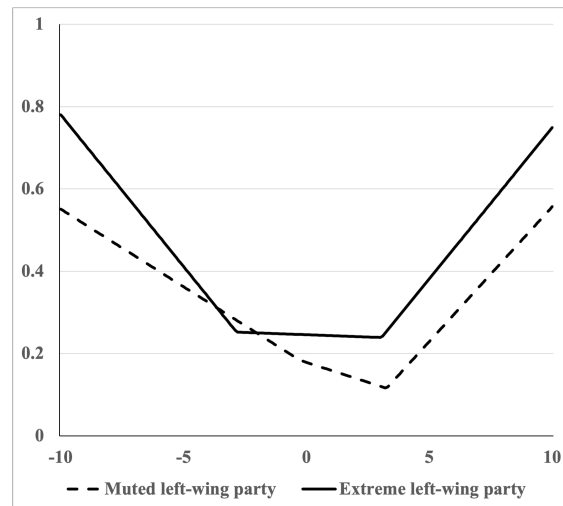


Figure 4: Extremism and Turnout Effects

Notes. The figure shows the predicted Nash cut-points for voting costs, as the voter's position varies along the horizontal axis.

²⁴ In *ESM-C* we show how polarization is affected by differences in the equilibria of the various voting environments that we study. It is important to note that these environments are characterized by parties occupying fixed positions. An observation by an anonymous reviewer highlights another important facet of polarization in PR systems, party fragmentation. Since we maintain a constant three-party framework, changes in voter behavior do not impact fragmentation. We see the issue of polarization arising from party fragmentation within PR systems as a compelling avenue for future research.

Two patterns are obvious in Figure 4. First, for both left-wing-party positions the threshold (and therefore expected turnout) is higher at the extremes than in the middle of the policy space. This reflects what we call the Extremism Effect. The minimum of expected turnout is observed at position 3.0 for the polarized case of an extreme left-wing party and at position 3.2 for the case with a muted left-wing party. Second, for almost all voter position, expected turnout is higher when the left-wing party is extreme than when it is muted. We call this the Turnout Effect.

The Extremism Effect further increases the success rate for extreme parties. The intuition is that extreme voters have more to lose. Their worst-case scenario is a situation where the party on the other side of the policy spectrum is in power. They therefore have a large incentive to participate in the election to reduce the probability of this happening. Centrist voters, on the other hand, have less to lose. For them, it does not matter as much if an extreme party obtains power and therefore they have less of an incentive to incur the costs of voting. As a consequence, turnout is a u-shaped function of the voter's position.

The intuition for the Turnout Effect is straightforward. The higher the polarization, the larger are the differences in utility between the different possible outcomes. These larger incentives make it worthwhile to incur larger voting costs leading to higher turnout rates.

In summary, the equilibrium analysis thus yields three stylized results²⁵:

***Polarization Effect:** When the left-wing party has an extreme position, party choice (conditional on voting) by extreme voters is less strategic and therefore more extreme when voting is voluntary. Central voters also vote less strategically (and therefore less extreme) under voluntary voting. The aggregate effect is an increase in polarization.*

***Extremist Effect:** Extreme voters have higher turnout rates than centrist voters.*

***Turnout Effect:** Turnout rates are higher when parties are more polarized.*

Note again that in the Nash equilibrium, there is no polarization effect when the position of the left-wing party is muted. The extremist and turnout effects are robust to variations in the specific levels of party polarization (i.e. the position of the left-wing party). All three effects

²⁵ We show in *ESM-C* that in equilibrium the polarization and extremist effects contribute more or less equally to an increased polarization of votes cast under the two voting regimes.

are robust to the particular distribution of costs and to using a uniform distribution of voters' positions instead of the t-distribution.

The three comparative static results critically depend on the presence of strategic, instrumental voting behavior. Under naive voting, these relationships would generally not hold (see fn. 7 for a possible exception). In a naive framework, voters make turnout and party choice decisions independently and sincerely, without conditioning their behavior on the expected electoral consequences or on the actions of others. As a result, the mechanisms that generate our comparative statics (reduced strategic moderation when voting is voluntary, higher instrumental incentives for extremists to participate, and greater expected benefits from voting under polarization) are absent. It is, however, possible that other instrumental models would yield similar comparative statics predictions. For example, as we will see below, the Extremist Effect and Turnout Effect are also predicted by QRE equilibria, while these also predict a Polarization Effect when the left-wing party's position is muted.²⁶

3.4.3 Quantal Response Equilibrium

We check the robustness of our predictions using the quantal response equilibrium (QRE) concept (McKelvey and Palfrey 1995, Goeree and Holt 2005, Levine and Palfrey 2007). In particular, we apply 'logit equilibrium'. In this equilibrium, conditional on casting a ballot the probability that a voter votes for party j ($j=1,2,3$) given a position x and costs c is given by the following expression:

$$P_j(x) = \frac{\exp(\lambda * EU(\text{vote for party } j|x,c))}{\sum_k \exp(\lambda * EU(\text{vote for party } k|x,c))} \quad (2)$$

In case that voting is voluntary the probability of casting a ballot is given by:

$$p_{\text{turnout}}(x, c) = \frac{\exp(\lambda * \sum_j P_j(x) * EU(\text{vote for party } j|x,c))}{\exp(\lambda * EU(\text{abstain}|x,c)) + \exp(\lambda * \sum_j P_j(x) * EU(\text{vote for party } j|x,c))} \quad (3)$$

Here, λ is a 'noise parameter' that capturing the responsiveness of choice probabilities to payoff differences. As λ increases, behavior becomes more sensitive to expected payoff differences, and in the limit QRE converges to a Nash equilibrium. When λ is small, choices are close to random; when λ is large, actions with higher expected utility are chosen with high probability.

²⁶ The reason why Nash does not predict the Polarization Effect in the muted case is because there are already very low levels of strategic voting when voting is mandatory, leaving little room for voluntary voting to further reduce it. Specifically, the equilibrium cut-point for left-wing (right-wing) supporters is $X_L = -0.65$ ($X_R = 3.63$), while for sincere voters this is $X_L = -0.75$ ($X_R = 3.75$).

Furthermore, EU denotes the expected utility (as defined in eq. 1) of an action, which is a function of the probabilities with which the other voters vote for the different parties, as well as the voter's policy position and her costs of voting. We assume that the equilibrium is symmetric in the sense that voters with the same policy position and costs of voting have the same probability of choosing the different parties. A logit equilibrium is then found by solving for the fixed point of the system defined by (2). Appendix *ESM-B* provides an overview of the logit equilibria for our game and their derivation.

To derive predictions, we use an out-of-sample estimate of the noise parameter (λ). Using data from a pilot experiment with a similar set-up but with fixed voter positions, we obtain an estimate $\lambda = 3.7$ (for details, see Kamm 2015). Robustness analyses in Appendix *ESM-D* show that our three comparative-static effects are not sensitive to this choice.

The QRE derived and illustrated in Appendix *ESM-B* describe for each possible voter position the probabilities that she will vote for the left-wing, central or right-wing party. Similarly, one can determine the equilibrium turnout probabilities for each voter position and for different positions of the left-wing party. This allows for the derivation of comparative statics predictions. For example, Figure 5 illustrates how these equilibria can be used to derive the Polarization Effect.

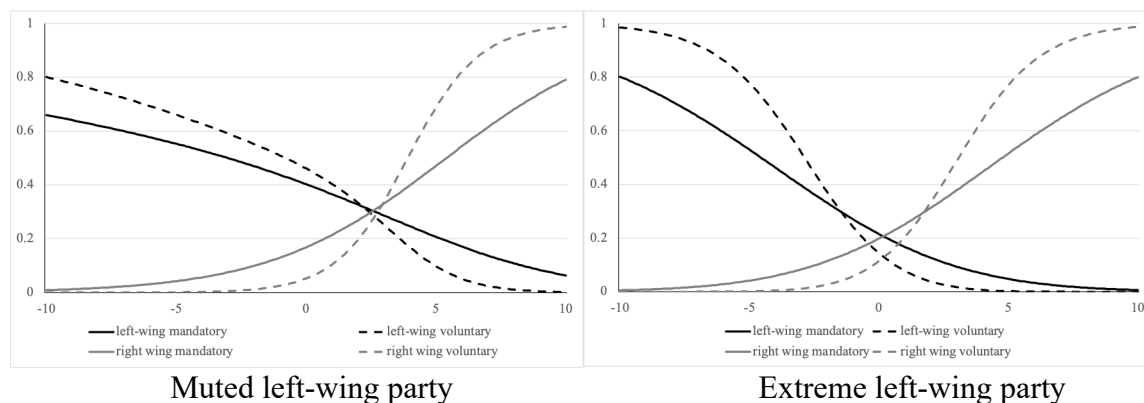


Figure 5: Predicted party choice (voluntary versus mandatory voting)

Notes. The figures compare the predicted probability of voting for each of the extreme parties (conditional on voting) between compulsory and voluntary voting as the voter's position varies along the horizontal axis. The predictions are based on the QRE with $\lambda = 3.7$. The left panel depicts the case for $\alpha = -1.5$ (a muted left-wing party) and the panel on the right depicts the case for $\alpha = -7.0$ (an extreme left-wing party).

Both panels clearly show a higher probability of voting for the extreme parties when voting is voluntary than when it is mandatory. As discussed above, this underlies the Polarization Effect. For the case with an extreme left-wing party (right panel), this was also predicted by the Nash equilibrium. The left panel illustrates that the noisy voting underlying QRE also yields a

Polarization Effect in the muted case. The QRE thus smooths the discontinuity present in the Nash equilibrium and generates a polarization effect even in the muted case.

Next, we will first test the three stylized results with laboratory data. The following section presents our experimental design.

4 Experimental design

4.1 Experimental Protocol

The experiment was conducted at the CREED laboratory at the University of Amsterdam in February 2013 and implemented using php/mysql. Participants were recruited using CREED's subject database. In each of eight sessions, 25 or 30 subjects participated. Most of the 230 subjects in the experiment were undergraduate students of various disciplines.²⁷ Earnings in the experiment are in 'points', which are converted to euros at the end of the experiment at an exchange rate of 100 points = 1€. The experiment lasted on average 100 minutes and the average earnings were €23.90 (including a 7€ show-up fee).

Subjects are shown the instructions on their screen (cf. *ESM-F*). After everyone has read these and the experimenter has privately answered questions, a summary of the instructions is distributed. This summary includes a table that specifies which coalition will be formed for each possible configuration of votes (for an example see *ESM-F*). Then, all subjects have to answer twelve quiz questions that test their understanding of the instructions. After everyone has successfully finished this quiz, the experiment starts. At the end of the session, all subjects answer a short questionnaire and are subsequently paid their earnings in private.

Each session consists of thirty rounds and in each round subjects are in electorates of five where each group is confronted with the task of electing a new government.²⁸ Electorates are rematched in every round. This serves the purpose of avoiding repeated game effects and reduces the influence of noise players. For this re-matching, we use matching groups of ten or fifteen subjects²⁹ (depending on whether a session consisted of 30 or 25 subjects). As a

²⁷ 127 out of 228 (two did not give information on their field of study) majored in economics or business.

²⁸ We decided to frame the task in terms of an election since otherwise the setting would be quite complicated to explain. We think that this framing will not substantially affect behavior, though this could be tested, of course (Levine and Palfrey, 2007 report finding no such framing effects in their turnout experiment). Note that we do not use terms like "left-wing" in the instructions but refer to voters and parties by numbers.

²⁹ Subjects are told that they are randomly re-matched every period, without specifying the matching groups.

consequence, each session generates two or three independent matching group-level observations.

The specific task in each round is presented as follows: in all treatments subjects are informed about their draw of the net voting costs as well as their position in the policy space. To aid comparison, we use the same realizations in all sessions. In the treatments with mandatory voting subjects are asked to decide for which of the three parties (labeled party 1, party 2 and party 3) they would like to vote. In the treatments with voluntary voting they had a fourth option, abstention.³⁰ In all treatments we give the subjects the option to see the complete history in which they took part by clicking on a button.³¹ Hence, they can see what they did in the past for different voting costs, what the distribution of votes was and what the resulting government was. Furthermore, we provide them with a payoff calculator such that they can compute the payoffs they would get from different coalitions, given their parameters in the current round. For an example of what the interface looks like, see *ESM-F*.

After everyone has voted, the computer counts the votes and shows each subject the distribution of votes (and number of abstentions, if applicable), the government that is formed and what policy it implements, and the payoff from the current round as well as the accumulated payoffs from past rounds.

The per round payoffs (which are in terms of points) are determined by:

$$160 - 2*(x^* - x_i)^2 - c_i$$

where x^* is the implemented policy, x_i is the subject's position in the policy space and c_i is the realization of voting costs in the round concerned. The constant 160 ensures that subjects rarely have a negative aggregate payoff from previous rounds, since otherwise (unmeasured) loss aversion could lead to uncontrolled effects.

An important question to address is whether participants understood the experimental task they were confronted with. As mentioned above, participants could only proceed to the experiment after correctly answering twelve questions in a comprehension quiz. These questions covered the more complex issues in the design (see *ESM-F*). We also included two statements in the

³⁰ This option was presented above the three parties such as to visually separate the two types of behavior (voting or abstaining).

³¹ Subjects did not use this option very much. In the first 15 rounds subjects looked at the history 4.7% of the time. For the last 15 rounds this was 2.9%. These fractions did not vary much across treatments.

post-experimental questionnaire about their understanding of the experiment. The first stated “I understood well after the instructions how the experiment works”, to which they responded on a five-point scale ranging from ‘strongly disagree’ to ‘strongly agree’. 74% of the participants responded ‘neutral’ or showed weak or strong agreement. The second question was “When did you fully understand how the experiment works?”, with possible answers (and responses) “1: Immediately after the instructions (35%); 2: After a few rounds (54%); 3: Not until we were almost finished (5%); 4: I still do not really understand (6%)”. We conclude that most of our participants understood the task at hand. To investigate whether our results might hinge on learning in the first few rounds, we will explore whether results are different when dropping these from the analysis.

4.2 Treatments and predictions

To test for the stylized facts outlined in the previous section the experiment employs a full factorial 2x2 design where in the first treatment dimension we vary the position of the left-wing party and in the second dimension whether voting is voluntary or mandatory. Table 1 gives a summary of the treatments.

Table 1: Treatment Summary

	Mandatory voting	Voluntary voting
Muted left-wing party ($\alpha = -1.5$)	CentMand N=6	CentVolu N=5
Extreme left-wing party ($\alpha = -7.0$)	ExtrMand N=5	ExtrVolu N=6

Notes. Cell entries give the treatment acronym used throughout this paper and the number of independent observations (N=# matching groups as discussed in the main text) for each treatment.

We implement two distinct positions for the left-wing party: in our main treatment, denoted by ‘Extreme’, the position is almost symmetric with the right-wing party vis-à-vis the center party ($\alpha = -7.0$) and in the other case, ‘Muted’, it is much less distinguishable from the center ($\alpha = -1.5$). These values are chosen to create sufficient difference in polarization to yield a difference in predicted turnout rates that is large enough to be measured even when subjects’ behavior is noisy.³²

³² For both the Nash equilibrium (Figure 4) and the QRE with $\lambda = 3.7$ (*ESM-B*) the predicted difference in turnout rates is larger than 10%-points for more than half of the voter bliss points.

Having specified the distribution of voters' ideal points and parties' policy positions, the model is completely specified after choosing a distribution for the net voting costs. Like in the theory section, we assume a uniform distribution. Aside from greatly simplifying the equilibrium analysis, this has as the advantage that it is quite easily explained to subjects. As bounds for the uniform distribution, we choose -15 and 200 . While these numbers are meaningless per se, one should note that they indeed allow for subjects to have a net benefit from voting.³³

Applying the equilibrium analysis to our design yields predictions that are parallel to the stylized results of the previous section³⁴:

Prediction 1 (Polarization Effect)

*When the left-wing party takes an extreme position, party choice (conditional on voting) is expected to be more extreme under voluntary voting than under mandatory voting. This can be attributed to a stronger effect of reduced strategic voting by extreme supporters than of reduced strategic voting by supporters of C.*³⁵

Prediction 2 (Extremist Effect)

Voters with more extreme policy positions are expected to have higher turnout rates than centrist voters. Specifically:

a) In ExtrVolu, voters near position 3 are expected to turn out at lower rates than those with more extreme positions.

b) In CentVolu, voters around position 0 are expected to turn out at lower rates than those with more extreme positions.

Prediction 3 (Turnout Effect)

Overall turnout is expected to increase when party positions are more polarized. Accordingly, turnout will be higher in ExtrVolu (where the left-wing party is more extreme) than in CentVolu (where it is muted).

³³ This will be the case for (on average) seven percent of the subjects. It does not seem completely unreasonable to think that such a proportion of the population might have such a high value of 'civic duty' that it overcompensates for the costs of voting.

³⁴ In the theoretical model the equilibrium beliefs about being pivotal in the election are, of course, correct. We make the same assumption in the predictions that follow. In the experiment, we did not measure these beliefs. Deviations from the predictions may then occur, for example, because such beliefs differ across voter positions. We leave it to future research to isolate the role of beliefs about pivotality in the choices of the participants in the experiment.

³⁵ Both extreme (L and R) supporters and C supporters are expected to show less strategic voting in the voluntary treatment. The former leads to increased polarization, while the latter decreases it. Based on the results in ESM-C, we predicted that the net effect is an increase.

Note that under naive voting, none of these comparative statics would arise because turnout and party choice are independent and sincere.

The *Extremist Effect* plays an important role in our theoretical analysis. One might, however, wonder whether alternative mechanisms exist that would lead to the opposite prediction, namely, that centrist voters turn out at higher rates than those at the extremes. One possible explanation is a heightened sense of civic or political responsibility among centrists, who may feel motivated to ensure a strong showing for the central party, thereby strengthening its position in coalition formation. Once again, this would reflect a non-instrumental motivation. Moreover, centrists may be confident that their preferred party will participate in government, which reinforces their incentive to vote. In contrast, supporters of extreme parties may feel discouraged by the expectation that their party may be excluded from coalition negotiations, reducing their motivation to turn out.

5 Results

We will focus on the aggregate behavior in each treatment. We begin by offering a description of the party choice, looking for differences across treatments and comparing these to our prediction 1. Subsequently, we analyze the turnout decision, again going from a description of the data to a comparison across treatments and a test of the predictions (2a and 2b, 3).

5.1 Observed Party Choice

Figure 6 shows the aggregate party choice per treatment. Dots indicate for each position the observed fractions of votes for the different parties (smoothed by using the average fractions for positions ± 0.3 of the value on the horizontal axis). In addition, the figures show the estimated (multinomial) logit curves that fit the data (see *ESM-G* for the underlying estimates). We compare the results across treatments in the next subsection. Here we note three general observations from eyeballing the figures. First, all four figures show aggregate behavior close to cut-point strategies; the slopes are either close to zero or very steep. Comparing these slopes and their location to the Nash cut-points (indicated by the dashed lines) shows that the slopes around the cut-points are less steep and (especially when the left-wing party takes an extreme position) at other voter positions than predicted by Nash. Second, at the same time even at the extremes of the policy space we find that subjects do not always vote sincerely. To accommodate these extreme points, the estimated logit functions have a less steep slope than the observed data. Third, comparing observed behavior to the QRE (see *ESM-B* for a graphical

representation) allows for two conclusions. (i) the equilibrium shows for CentVolu and CentMand a pronounced asymmetry between the extreme left and extreme right positions (where even for the most extreme left-wing voters behavior is not always sincere). This effect is not observed in the data. (ii) in all treatments the observed slope near the cut-point is much steeper than predicted by QRE. Both findings may be attributed to the observation that quantal response does not take into account that sincere voting is a powerful heuristic. Therefore, when voting sincerely coincides with instrumentally optimal behavior, voters behave optimally much more often than predicted. In other words, in those cases the noisy best response is closer to the best response characterizing the Nash equilibrium than predicted in the QRE.

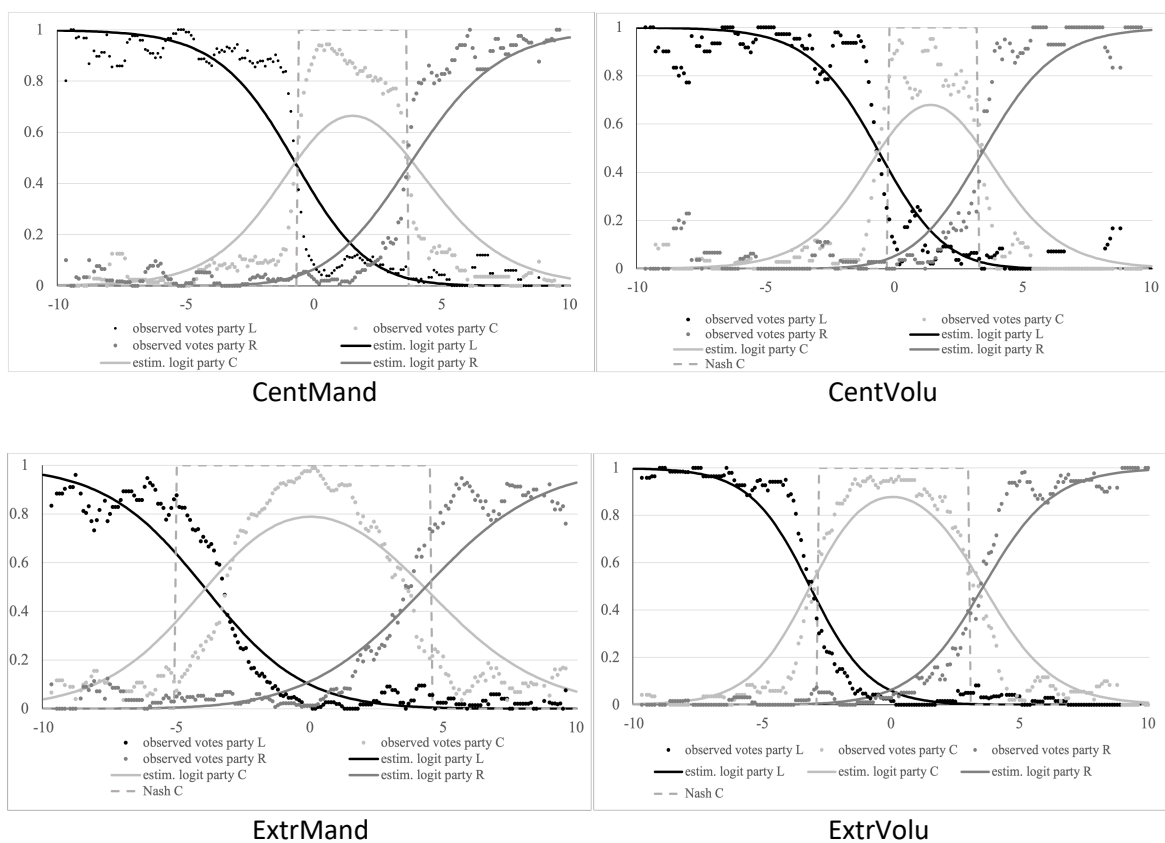


Figure 6: Observed Party choice

Notes. Dots (lines) show the observed (estimated) probability of voting for each of the three parties as the voter's position varies along the horizontal axis. Dashed lines show the Nash equilibrium probabilities of voting for C, which illustrates the Nash cut-points. Data are averaged over ± 0.3 of the value on the x-axis. The data for CentVolu and ExtrVolu are conditional on turning out.

5.2 Comparative Statics

We will first test our hypothesis for the Extreme treatments and subsequently consider what happens when the left-wing party is muted, in the sense that it is positioned very close to the centrist party.

Extreme Left-Wing Party

We start with the Polarization effect, by considering the extent to which voters opt for extreme parties. Figure 7 (left panel) compares the estimated probability functions of voting for the extreme parties under mandatory and voluntary voting. The figure combines the Nash equilibrium cut-points (dotted lines, *ESM-A*) and QRE predictions (dashed lines, from Figure 5) with the estimated logit functions of Figure 6 (solid lines).

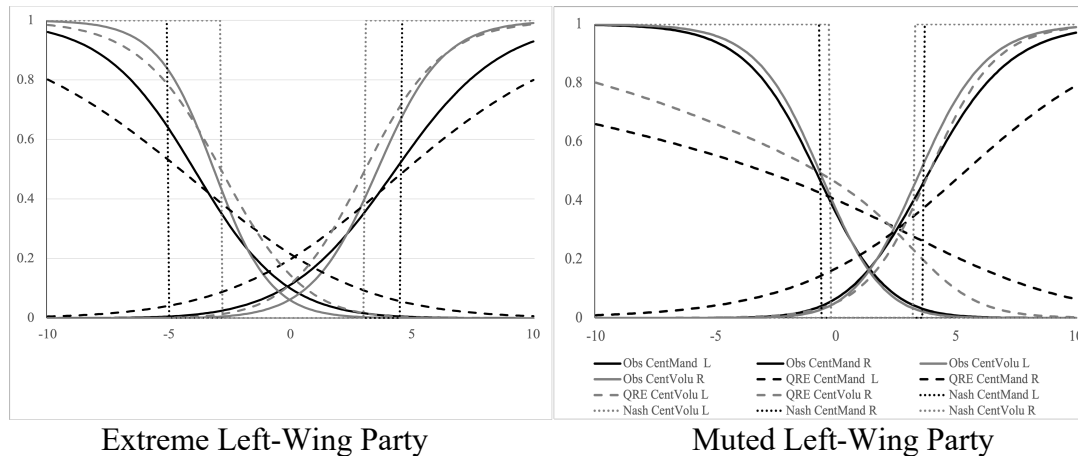


Figure 7: Extremist Voting

Notes. The figure compares the estimated probability of voting for the left- and right-wing party between mandatory (black lines) and voluntary (gray lines) voting, as the voter's position varies along the horizontal axis. Solid lines show the logit functions estimated using observed choices (cf. Figure 6), dotted lines show the Nash equilibria, and dashed lines show the QRE (cf. Figure 5). Lines showing probabilities larger than 0.5 at position -10 ($+10$) refer to party L (R).

Comparing the solid lines to the dotted and dashed lines shows that actual votes are less extreme than the votes predicted by Nash but more extreme than predicted by QRE. The difference between the gray and black solid lines provides a first indication of support for the Polarization Effect when the left-wing party has an extreme position; party choice is more extreme under voluntary voting as predicted (by comparing the dotted or dashed lines).

To formally test Prediction 1, we estimate logit models regressing voting for an extreme party (L or R) on absolute voter position and a dummy representing the voluntary voting treatment. We do so separately for extreme supporters (with a position closest to L or R) and centrist supporters (voters with a position closer to C than to L or R). The results are presented in Table 2 (second and third columns).

Table 2: Logit Results, Voting Extreme

Independent Variables	Marginal Effects			
	Extreme Left-Wing		Muted Left-Wing	
	extreme supporter	centrist supporter	extreme supporter	centrist supporter
Voter position	0.030 (0.005)***	0.131 (0.012)***	0.016 (0.005)***	0.050 (0.015)***
Voluntary	0.091 (0.047)**	-0.004 (0.048)	0.024 (0.031)	0.042 (0.040)

Notes. The table provides the marginal effects of logit estimates of the determinants of voting for an extreme party (L or R). "Voter Position" is the absolute value of the position (in one decimal) on [-10, 10]; "Voluntary" is a dummy variable depicting whether voting is voluntary or mandatory. A voter 'supports' the party closest to her in the policy space. Standard errors given in brackets are clustered at the matching group level (when clustering at the subject level instead, differences are very small, and the results are qualitatively very similar). For the voluntary voting treatments, only subjects who chose to vote for a party are included. *(**; ***) indicates significance at the 10% (5%; 1%) level.

The effect of a voter's position on her party choice is as predicted; voters are more likely to vote for an extreme party, the further their position is from the center (position 0). As was to be expected, this effect is statistically very strong. With the extreme left-wing party, voters with extreme positions vote for an extreme party significantly more often when voting is voluntary than when it is mandatory. The marginal effect of 9.1% points (across bliss points) is large; for example, extreme supporters at a position -3.76 or $+3.76$ vote for the extreme party with a probability of 74.2% under mandatory voting and 87.5% of the time when they voted voluntarily. This is an increase of almost 18%. For centrist supporters the difference between the voluntary and mandatory voting treatments is statistically insignificant. That is, there is no evidence that they vote more (or less) often for an extreme party when voting is voluntary. Across the electorate, voting is then more extreme under voluntary voting, as predicted by the Polarization effect.³⁶

Note that Prediction 1 discusses the role of strategic voting as a mechanism underlying the Polarization effect. Our results in Table 2 for the extreme case confirm this; voting more for extreme parties involves less strategic voting by extreme voters, while no significant effect on strategic voting by C-supporters is observed. This is further confirmed in Table 3 (central panel), which shows the fraction of predicted (Nash and QRE with $\lambda = 3.7$) and observed strategic votes by supporters of the three parties.

A first thing to note is that the extent of strategic voting is more closely aligned with the Nash predictions than with QRE. In terms of comparative statics, for supporters of the extreme parties, we observe significantly less strategic voting in the voluntary case, as predicted by both

³⁶ The results remain very similar if we drop the first three rounds from the analysis (recall from Section 4.1 that almost 90% of the participants indicated that they had understood the instructions after the first few rounds). The marginal effect for extreme voters is then significant at the 10%-level.

Nash and QRE. For supporters of C we observe no difference between mandatory and voluntary voting in strategically voting for the extreme parties, where an increase is predicted by Nash and a slight decrease by QRE. The net effect is that the vote share for C under mandatory voting (54.1%) is higher than in the voluntary case (45.1%). This polarization shift from the center to the extremes is statistically significant ($\chi^2, p < 0.001$).

Table 3: Strategic Voting

		Extreme left-wing party Supporter of:			Muted left-wing party Supporter of:		
		L (0.23)	C (0.58)	R (0.19)	L (0.45)	C (0.36)	R (0.19)
Mandatory	Nash	0.234	0.000	0.125	0.000	0.049	0.000
	QRE	0.389	0.440	0.399	0.464	0.590	0.433
	observed	0.206	0.182	0.201	0.102	0.166	0.103
Voluntary	Nash	0.000	0.186	0.000	0.000	0.218	0.000
	QRE	0.153	0.373	0.157	0.361	0.534	0.207
	observed	0.073	0.184	0.091	0.079	0.210	0.044
voluntary \neq mandatory		0.00***	0.90	0.00***	0.25	0.13	0.04**

Notes. Cells show the fraction of strategic votes, either predicted by Nash, the QRE with $\lambda = 3.7$, or observed in the data. A voter 'supports' the party closest to her in the policy space. The Nash prediction corresponds to the fraction of bliss points among a party's supporters who are predicted (with probability 1) to vote for a different party. An observed vote is strategic if it is for a different party than she supports. In parentheses is the fraction of supporters per party, in the experimental data. The final row gives the p-value of a Mann-Whitney test of the equality of observed strategic voting under mandatory and voluntary voting.

Muted Left-Wing Party

This case of a muted left-wing party is depicted in the right panel of Figure 7. Once again, actual votes are much more extreme than predicted by QRE (with the exception of votes for R when turnout is voluntary), but less extreme than Nash. There appears to be little or no evidence of a Polarization effect in the muted case; this is as predicted by Nash (dotted lines) but contrasts with the QRE (dashed lines).

Figures 6 and 7 suggest that supporters of L and R to a large extent already vote sincerely under mandatory voting in the muted treatment. Indeed, the fourth column of Table 2 shows no significant difference in strategic voting compared to when voting is voluntary. The table (fifth column) also shows that strategic voting by C-supporters (choosing L or R) is not significantly affected by voluntary voting either. These observations are confirmed in the right panel of Table 3, where the only significant effect of voluntary voting is observed for R supporters, who are the smallest group amongst the voters. The net effect of voluntary voting reduces C's vote share from 34.1% under mandatory voting to 30.2% under voluntary voting. This small polarization shift from the center to the extremes is statistically insignificant ($\chi^2, p = 0.149$).

In summary, while our results provide support for the Polarization Effect when the left-wing party is relatively extreme, the effects with a muted left-wing party are much smaller and mostly statistically insignificant. This suggests that the mechanisms underlying the Polarization Effect (changes in strategic voting) play less of a role when the stakes are lower. This effect of the stakes was predicted by Nash, but not by QRE.

5.3 Turnout

Figure 8 shows the (smoothed) turnout rates observed in our experiment together with turnout in the QRE. As predicted by the Turnout Effect (Prediction 3) we observe that turnout rates are consistently higher in the extreme treatment and that this difference is for most positions quite substantial (in the order of magnitude of around ten percentage points). A Wilcoxon rank-sum test comparing average turnout per matching group in the two treatments shows that turnout rates are significantly higher in ExtrVolu than in CentVolu (p-value <0.01).

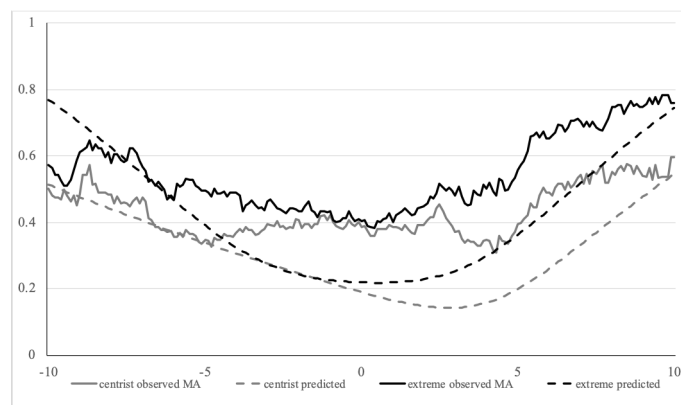


Figure 8: Turnout

Notes. Solid lines show the observed turnout rates in CentVolu and ExtrVolu as the voter's position varies along the x-axis. Data are averaged over ± 1 of the value on the horizontal axis. Dashed lines show the corresponding QRE predictions for $\lambda = 3.7$.

In line with the Extremist Effect (Prediction 2), Figure 8 also shows that extreme voters vote at higher rates than centrist voters, even when with a muted left-wing party. Table 4 provides statistical support for this observation. It shows (separately for ExtrVolu and CentVolu) logit regression results for the decision to vote, with the (absolute) distance between a voter's position and the position with (theoretically) minimal turnout as an independent variable.

The results indicate that the farther away a voter is from the point of minimal turnout, the higher is her probability of voting (p-value <0.01 for both treatments). This is direct support for predictions 2a and 2b. Though strongly significant, the effect is smaller than the QRE predicts. A comparison of the observed levels of turnout with the predicted levels shows that turnout

changes at a much slower rate than predicted when moving along the policy space (Figure 8). The main reason is that centrist voters turn out at much higher rates than predicted. Finally, Table 4 also exhibits (as expected) that the turnout probability is negatively and statistically significantly related to a voter’s voting costs.

Table 4: Logit results

Independent Variables	Extreme left-wing party	Muted left-wing party
Voting costs	-0.004*** (0.000)	-0.004*** (0.000)
Distance	0.030*** (0.004)	0.009*** (0.003)

Notes. Cells give the marginal effects of a logit regression of the decision to vote (the dependent variable is 1, if the subject voted in a given period). ‘Distance’ is the absolute value of the distance between voter’s position and the position with (theoretically) minimal turnout (0.25 for ExtrVolu and 3 for CentVolu). Standard errors given in brackets are clustered at the matching group level. (**, ***) indicates significance at the 10% (5%; 1%) level.

All in all, our laboratory results provide support for both the Extremist Effect and the Turnout Effect. We therefore find experimental evidence in support of all of our stylized (theoretical) results. In the following section, we offer a discussion of the generalizability of these effects.

6 Generalizability

Though we find support for the predicted interaction effects between turnout and party choice in our small laboratory elections, one may wonder how general our conclusions are. In other words, is there evidence of the Polarization Effect, Extremist Effect, and Turnout Effect in large-scale elections outside of the laboratory?

The empirical exercise for the Netherlands and Belgium presented in the introduction provides some evidence of the kind of interaction between turnout and party choice that these effects describe.³⁷ The increased extremism following the switch from mandatory to voluntary voting may be a consequence of the Polarization Effect (conditional on voting voters are more likely to vote for the extreme parties), the Extremist Effect (supporters of extreme parties are more likely to vote), or a combination of the two. The problem with this kind of field data is that one cannot disentangle the two effects because only the aggregate result is measured. Though these aggregate data provide some external validity to our results, they also show the difficulties related to using observational field data for an analysis of distinct mechanisms. In fact, the wish

³⁷ Obviously, more such case studies would strengthen the external validity of our results. Countries rarely switch from compulsory to voluntary voting or *vice versa*, however.

to disentangle such effects is one of the main reasons why we chose to run experiments in the first place.

One can also consider survey data to investigate the validity of the interaction effects. First, we do so for the Extremist Effect. To test this, we use survey data from the Comparative Study of Electoral Systems (CSES), the Eurobarometer and the Dutch Election Study. These are surveys that ask voters about their self-placement on the left-right scale and about their vote intentions and past voting behavior. Based on their self-placement we divide respondents into extreme and centrist voters and compare the average abstention rates across these groups. Table 5 shows the results for each of the three studies.³⁸

Table 5: Empirics on Extremist Effect

Data from the CSES			
	Extreme left-wing voters	Centrist voters	Extreme right-wing voters
Wave I (1996-2001) 37 surveys in 32 countries	.894	.860	.907
Wave II (2001-2006) 39 surveys in 36 countries	.842	.835	.852
Wave III (2006-2011) 45 surveys in 35 countries	.876	.849	.864
Eurobarometer Study (1979-1995); Biannual survey in the EU member states			
	.886	.871	.919
Dutch Election Study ³⁹			
1977	.926	.901	.928
1981	.898	.886	.907
1982	.909	.905	.907
1986	.943	.911	.966
1989	.934	.897	.961
1994	.930	.888	.898
1998	.894	.880	.905
2002	.926	.921	.925

Notes. Average self-reported turnout rates compared between extreme left-wing, centrist and extreme right-wing voters. Entries in bold are significantly different from the centrist turnout rates at the 1% level using a Wilcoxon signed rank test with matching of turnout rates by survey. More details are available from the authors upon request.

³⁸For the Eurobarometer study, we also estimated a linear probability model of turnout on position on the left-right scale and this position squared. Both the negative linear and positive quadratic term are highly significant ($p < 0.001$). For voters at the extreme left (right) this gives an estimated turnout probability of approximately 90% (95%). Estimated turnout is lowest (87%) for voters who position themselves at the center of the left-right scale. These results do not change if we correct for the year of the study.

³⁹ Pooling the data across years, the difference is strongly significant. A Wilcoxon ranksum test shows that the difference in turnout rates of extreme left-wing and extreme right-wing voters on the one side and centrist voters on the other is statistically significant at the 1%-level.

Given that the turnout decisions are self-reported, we expect them to be overstated; but as long as the differences across groups in the propensity of overstating turnout are limited, this will not affect our comparison. The empirical data give strong support for the model prediction that extreme voters vote more often. In each observed year in each study, extreme voters have higher turnout rates than centrist voters. Many of these differences are statistically significant. Note, however, that these differences are (as in our experimental data) smaller than predicted by our theoretical model.

As a third empirical test of the generalizability of our interaction effects, we consider the Turnout Effect (polarization of the parties increases turnout rates). This is a question that has been studied in American politics for quite some time without a clear consensus developing (see Rogowski 2014 for an overview). The question has been much less studied in systems of PR. We therefore conducted an analysis based on Dutch data. Following Dalton (2008) we define polarization as the vote weighted standard deviation of party positions. We conducted the analysis once using the party positions from the Comparative Manifesto Project (Volkens et al. 2010) (which we used to compute the extremism index in the introduction) and once for the Dutch Election Study. For each, we relate the measured polarization to observed turnout in various elections. Figure 9 shows the results.

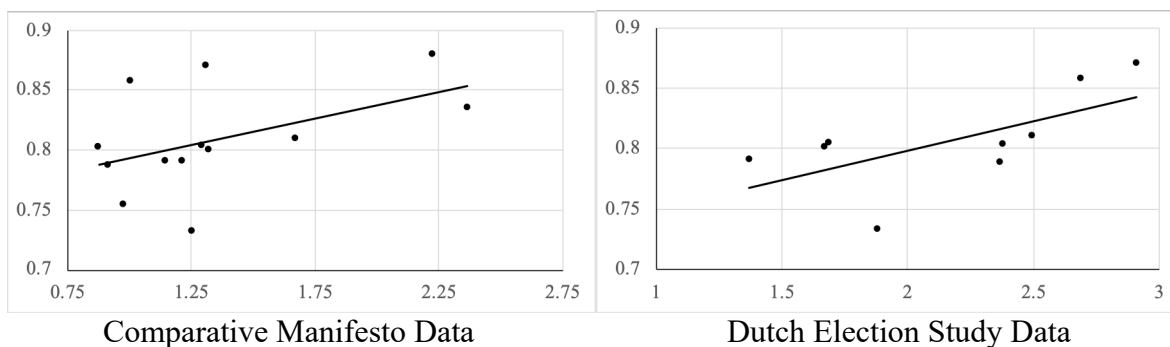


Figure 9: Correlation between polarization and turnout

Notes. The figure shows the relationship between the estimated polarization index and turnout rates in Dutch elections between 1971 and 2010 (Comparative Manifesto Data) and 1981 and 2006 (Dutch Election Study), respectively.

In both cases we observe a statistically significant positive correlation between the polarization of party positions and turnout rates (a correlation of .48 with a one-sided p-value of 0.045 for the Comparative Manifesto Data; and .65 with a one-sided p-value of 0.030 for the Dutch Election Study Data).⁴⁰ This provides some empirical evidence of the Turnout Effect. In summary, the results of this section provide empirical evidence from the field that is in line

⁴⁰ We apply one-sided tests because the Turnout Effect involves a directional prediction.

with each of the three effects that was derived from our theoretical analysis. This strengthens the external validity of our experimental and theoretical results.

7 Conclusions

In this paper we have analyzed the interaction between the turnout decision and party choice in a system of PR. Based on a theoretical analysis applying both Nash equilibrium and QRE (both based on the assumption of instrumental voting), we derived three basic predictions. First, conditional on turning out, voluntary voting makes voters more likely to vote for extreme parties (a ‘Polarization Effect’) when the parties take relatively extreme positions in the policy space. When the parties take less extreme positions, a Polarization Effect is predicted by QRE, but not by Nash. Second, voters with extreme preferences are most likely to vote (an ‘Extremist Effect’). Third, turnout increases with the polarization of the parties (a ‘Turnout Effect’). These effects are typically not predicted by naive, non-instrumental voting models.

Our experimental results provide support for the three predictions when the positions of the left- and right-wing parties are more-or-less symmetric around the center. With a muted left-wing party, we find no support for a Polarization Effect while we do find support for the Extremist and Turnout Effects. The observed turnout rates exhibit the predicted feature that polarization boosts turnout and extreme voters are more likely to vote than centrist voters. This latter difference is not as pronounced as theoretically expected because centrist voters turn out substantially more often than predicted. The generalizability of our experimental and theoretical results is supported by additional empirical evidence from the field. First, a case study of the Netherlands and Belgium shows that when the Netherlands abolished compulsory voting the election outcome in the next elections was more extreme while in Belgium no such effect was observed. Secondly, data from the Comparative Study of Electoral Systems, the Eurobarometer and the Dutch Election Study exhibits the predicted pattern that more extreme voters have higher turnout rates. And thirdly, a case study of the Netherlands showed a positive correlation between the polarization of the party system and turnout rates.

The combination of our theoretical and empirical results leads to interesting conclusions. We clearly find that party choice and turnout interact in our experimental environment. Voluntary voting has significant effects on the extent of strategic voting and if the party bliss points sufficiently diverge, the net result is an increase in voter polarization, compared to when voting is mandatory. Moreover, increased party polarization leads to higher turnout. Turnout is,

however, not uniform across voter preferences. Those who support extreme parties are more likely to cast a vote than supporters around the median voter. We do observe that the difference across these voter types is smaller than theoretically predicted, both in our experimental data and in the observational data that we consider. We attribute this discrepancy to the prevalence of sincere (non-instrumental) voting as a strong heuristic guiding voter behavior. While the observed patterns underscore the importance of instrumental and strategic voting, particularly when parties adopt more extreme positions, our findings also indicate that naive voting continues to play a meaningful role. In sum, even in contexts where strategic incentives are clear, some voters appear to follow simple, sincerity-based decision rules rather than purely instrumental logic.

We believe that our theoretical and experimental results provide an important first step on the way to understanding the interaction effect between turnout and party choice. Our paper provides a basis for more theoretical and empirical work. As we argued in the introduction, this further effort is important since the results we get from the analysis of voting may have implications for a large class of models in the political economy literature. Moreover, if party positions, party choice and turnout are intertwined in the manner we observe, a proper study of party choice or turnout cannot be conducted in isolation. This points to an avenue for future work. This would be to endogenize the party positions and to analyze what the equilibrium positions in this game are. Because of the Extremist Effect, parties may want to position themselves away from the center. It is an open question whether a median voter theorem could hold where all parties converge to the center of the policy space, or whether endogenous turnout yields an equilibrium with polarized parties.

A natural next step in terms of theoretical work would also be to investigate the robustness of our result. One possible avenue to pursue is to investigate alternative coalition formation processes and see whether this influences the existence or strength of the interaction effects. Another possible extension would be to investigate how the distribution of voter preferences influences the interaction effects. The case of preferences being uniformly distributed in the policy space leads to the same conclusions as described here but perhaps electorates with a bimodal preference distribution (which could indicate a polarized electorate) would lead to different conclusions. Nevertheless, this paper provides systematic evidence that the Polarization, Extremist and Turnout Effects are empirically relevant and theoretically coherent.

References

- Abramson, Paul, John Aldrich, André Blais, Matthew Diamond, Abraham Diskin, Indridi Indridason, Daniel Lee, and Renan Levine. 2010. "Comparing Strategic Voting under FPTP and PR." *Comparative Political Studies* 43: 61-90.
- Ansolabehere, Stephen. James M. Snyder, Aaron B. Strauss, and Michael M. Ting. 2005. "Voting Weights and Formateur Advantage in the Formation of Coalition Governments." *American Journal of Political Science* 49: 550-563.
- Austen-Smith, David. and Jeffrey Banks. 1988. "Elections, Coalitions, and Legislative Outcomes". *American Political Science Review* 82: 405-421.
- Bargsted, Matias and Orit Kedar. 2009. "Coalition-Targeted Duvergerian Voting: How Expectations Affect Voter Choice under Proportional Representation." *American Journal of Political Science* 53: 307-323.
- Baron, David P. and Daniel Diermeier. 2001. "Elections, Governments, and Parliaments in Proportional Representation Systems." *Quarterly Journal of Economics* 116: 933-967.
- Baron, David P. and John Ferejohn. 1989. "Bargaining in Legislatures." *American Political Science Review* 83: 1181-1206.
- Black, Duncan. 1958. *The Theory of Committees and Elections*. Cambridge University Press, Cambridge.
- Blackwell, Calvin and Peter Calcagno. 2014. "Party-Crashers or Wallflowers: Costly Voting in Elections with Differing Primary Types." *SSRN working paper*.
- Blais, André. 1991. "The Debate over Electoral Systems." *International Political Science Review* 12: 239-260.
- Blais, André. 2002. "Why Is there So Little Strategic Voting in Canadian Plurality Rule Elections?" *Political Studies* 50: 445-454.
- Blais, André, John Aldrich, Indridi Indridason, and Renan Levine. 2006. "Do Voters Vote for Government Coalitions? Testing Downs' Pessimistic Conclusion." *Party Politics* 12: 691-705.
- Blais, André and Louis Massicotte. 2002. "Electoral Systems." pp. 40-69 in *Comparing Democracies 2. New Challenges in the Study of Elections and Voting*. Lawrence LeDuc et al. London: Sage.
- Brennan, Geoffrey. and Allan Hamlin. 1998. "Expressive voting and electoral equilibrium". *Public Choice* 95: 149-175.

Budge, Ian and Michael J. Laver. 2016. *Party Policy and Government Coalitions*. Springer.

Cho, Seok-Ju. 2014. "Voting Equilibria under Proportional Representation." *American Political Science Review* 108: 281-296.

Cox, Gary. 2018. "Portfolio-Maximizing Strategic Voting in Parliamentary Elections." *The Oxford Handbook of Electoral Systems*. Oxford University Press, Oxford.

Cox, Gary, and Matthew S. Shugart. 1996. "Strategic Voting under Proportional Representation." *Journal of Law, Economics & Organization*. 12: 299-324.

Dalton, Russel J. 2008. "The Quantity and the Quality of Party Systems: Party System Polarization, its Measurement and its Consequences." *Comparative Political Studies* 41: 899–920.

Degan, Arianna, and Antonio Merlo. 2011. "A Structural Model of Turnout and Voting in Multiple Elections". *Journal of the European Economic Association* 9: 209–245.

Diermeier, Daniel. and Antonio Merlo. 2004. "An Empirical Investigation of Coalitional Bargaining Procedures." *Journal of Public Economics* 88: 787-797.

Downs, Anthony. 1957. *An Economic Theory of Democracy*. Harper & Row, New York.

Duch, Raymond M., Jeff May, and David A. Armstrong. 2010. "Coalition-Directed Voting in Multiparty Democracies." *American Political Science Review* 104: 698-719.

Duch, Raymond M., and Jean-Robert Tyran. 2013. "Coalition Context, Voter Heuristics and the Coalition Directed Vote." working paper, Oxford University.

Duverger, Maurice. 1955. *Political Parties*, Wiley, New York.

Feddersen, Timothy, and Wolfgang Pesendorfer. 1996. "The swing voter's curse." *The American economic review* 86: 408-424.

Feddersen, Timothy, Sean Gailmard, and Alvaro Sandroni. 2009. "Moral bias in large elections: Theory and experimental evidence". *American Political Science Review* 103: 175-192.

Gallagher, Michael. 1991. "Proportionality, Disproportionality and Electoral Systems." *Electoral Studies* 10: 33-51.

Goeree, Jacob K., and Charles A. Holt. 2005. "An Explanation of Anomalous Behavior in Models of Political Participation." *American Political Science Review* 99: 201–13.

Greene, S. (2004). "Social identity theory and party identification." *Social Science Quarterly* 85: 136-153.

Großer, Jens, and Arthur Schram. 2010. "Public Opinion Polls, Voter Turnout, and Welfare: An Experimental Study." *American Journal of Political Science* 54: 700-17.

Herrera, Helios, Massimo Morelli, and Thomas Palfrey. 2014. "Turnout and Power Sharing." *The Economic Journal* 124: 131-162.

Herrmann, Michael. 2014. "Polls, Coalitions and Strategic Voting under Proportional Representation." *Journal of Theoretical Politics* 26: 442-467.

Hobolt, Sara B., and Jeffrey A. Karp. 2010. "Voters and Coalition Governments." *Electoral Studies* 29: 299-307.

Indridason, Indrid. 2011. "Proportional Representation, Majoritarian Legislature and Coalitional Voting." *American Journal of Political Science* 55: 954-970.

Irwin, Galen A., and Joop van Holsteyn. 2012. "Strategic Electoral Considerations under Proportional Representation." *Electoral Studies* 31: 184-191.

Kamm, Aaron. 2015. *Political Actors Playing Games: Theory and Experiments*. Rozenberg publishers and Tinbergen Institute, Amsterdam.

Kartal, Melis. 2015. "Laboratory Elections with Endogenous Turnout: Proportional Representation versus Majoritarian Rule." *Experimental Economics* 18: 366-384.

Kawai, Kei, and Yasutira Watanabe. 2013. "Inferring Strategic Voting", *American Economic Review* 103: 624-662.

Kedar, Orit. 2009. *Voting for Policy, not Parties: How Voters Compensate for Power Sharing*. Cambridge University Press, Cambridge.

Kittel, Bernhard, Wolfgang Luhan, and Rebecca Morton. 2014. "Communication and Voting in Multiparty Elections: An Experimental Study." *The Economic Journal* 124: 196-225.

Krishna, Vijay, and John Morgan. 2015. "Majority Rule and Utilitarian Welfare." *AEJ: Micro* 7: 339-375.

Laver, Michael J., and Norman Schofield. 1998. *Multiparty Government: the Politics of Coalition in Europe*. Ann Arbor, University of Michigan Press.

Laver, Michael J., and Kenneth Shepsle. 1990. "Coalitions and Cabinet Government." *American Political Science Review* 84: 873-890.

Laver, Michael J., and Kenneth Shepsle. 1996. *Making and Breaking Governments: Cabinets and Legislatures in Parliamentary Democracies*. Cambridge University Press, Cambridge.

Levine, David K. and Thomas R. Palfrey. 2007. "The Paradox of Voter Participation? A Laboratory Study." *American Political Science Review* 101: 143-158.

McCuen, Brian, and Rebecca Morton. 2010. "Tactical Coalition Voting and Information in the Laboratory." *Electoral Studies* 29: 316-328.

McKelvey, Richard, and Thomas R. Palfrey. 1995. "Quantal Response Equilibria for Normal Form Games." *Games and Economic Behavior* 10: 6-38.

Meffert, Michael F., and Thomas Gschwend. 2010. "Strategic Coalition Voting: Evidence from Austria." *Electoral Studies* 29: 339-349.

Miller, Peter, and Ruth Dassonneville. 2016. "High Turnout in the Low Countries: Partisan Effects of the Abolition of Compulsory Voting in the Netherlands." *Electoral Studies* 44: 132-143.

Niou, Emerson. 2001. "Strategic Voting under Plurality and Runoff Rules." *Journal of Theoretical Politics* 13: 209-227.

Palfrey, Thomas R. 2009. "Laboratory experiments in political economy". *Annual Review of Political Science* 12: 379-388.

Palfrey, Thomas R., and Howard Rosenthal. 1983. "A Strategic Calculus of Voting." *Public Choice* 41: 7-53.

Riambau, Guillem. 2016. "Do Citizens Vote for Parties, Policies or the Expected Winner in Proportional Representation? Evidence from Four Different Countries Using a Multiple-Type Model." *Party Politics* 24: 549-562.

Riker, William, and Peter Ordeshook. 1968. "A Theory of the Calculus of Voting." *American Political Science Review* 62: 25-42.

Rogowski, Jon C. 2014. "Electoral Choice, Ideological Conflict, and Political Participation." *American Journal of Political Science* 58: 479-494.

Schram, Arthur. 1992. "Testing Economic Theories of Voter Behavior Using Micro-Data." *Applied Economics* 24: 419-428.

Schram, Arthur, and Joep Sonnemans. 1996a. "Why People Vote: Experimental Evidence." *Journal of Economic Psychology* 17: 417-442.

Schram, Arthur, and Joep Sonnemans. 1996b. "Voter Turnout as a Participation Game: An Experimental Investigation." *International Journal of Game Theory* 25: 385-406.

Spenkuch, Jörg L. 2018. "Expressive vs. Strategic Voting: An Empirical Assessment." *Journal of Public Economics* 165:73-81.

Strøm, Kaare, Wolfgang C. Müller, and Torbjörn Bergman. 2008. *Cabinets and Coalition Bargaining: The Democratic Life Cycle in Western Europe*. Oxford University Press, Oxford.

Thurner, Paul W., and Angelika Eymann. 2000. "Policy-Specific Alienation and Indifference in the Calculus of Voting: A Simultaneous Model of Party Choice and Abstention." *Public Choice* 102: 51-77.

Tyran, Jean-Robert. 2004. "Voting when money and morals conflict: an experimental test of expressive voting". *Journal of public economics* 88: 1645-1664.

Volken, Andrea, Onawa P. Lacewell, Sven Regel, Hennike Schultze, and Annika Werner. 2010. *The Manifesto Data Collection. Manifesto Project (MRG/CMP/MARPOR)*. Berlin: Wissenschaftszentrum Berlin für Sozialforschung (WZB).

Weschle, Simon. 2014. "Two Types of Economic Voting: How Economic Conditions Jointly Affect Vote Choice and Turnout." *Electoral Studies* 34: 39-53.

West, E. A., & Iyengar, S. (2022). Partisanship as a social identity: Implications for polarization. *Political Behavior* 44:, 807-838.