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Why do individuals vote for minor parties with no realistic chance of winning?

A game theory approach

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Abstract

This Work Project explores voting behaviour, focusing on why voters support parties they know will not win, by applying a game theory framework complemented with a survey analysis. By combining game-theoretic analysis, which illustrates the trade-offs voters face under varying scenarios, with survey results and analysis, exploring real voter motivations, this research examines how partisanship, electoral systems and voter expectations shape decision-making. The study delves into strategic and ideological voting patterns, considering the influence of protest voting and the role of uncertainty in voter choices.

Keywords: Game Theory; Voting Behaviour; Minor Parties; Sincere Voting; Ideologies; Strategic Voting; Protest Voting; Partisanship.

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1. Introduction

Voting is the foundation of democratic systems, embodying the principles of representation and accountability. However, supporting parties with little chance of winning reveals a more complex balance between individual expression and collective outcomes.

This Work Project examines the motivations and factors influencing voter support for minor parties with no realistic chance of winning, addressing the research question: “Why do individuals vote for minor parties with no realistic chance of winning? A game theory approach.".

To address this question, the study employs a game theory framework to explore decision-making under varying scenarios, complemented by the analysis of survey data. This approach will consider the roles of external factors such as partisanship and electoral systems, as well as the role of expectations, uncertainty, and mixed strategies in shaping voter behaviour. This research contributes to the understanding of voter behaviour by integrating game theory to analyse the strategic dimensions of voting for minor parties.

The Work Project opens with a review of relevant literature to establish the theoretical foundation. This is followed by a detailed methodology section, integrating game theory frameworks and survey analysis to examine voter behaviour. Scenario-based analyses are then employed to explore key patterns and strategies. Finally, the study presents findings from the survey and discusses their implications for understanding electoral behaviour.

2. Literature Review

In 1957, Anthony Downs studied voting behaviour and developed the Rational Choice Theory (RCT), stating that individuals do a cost-benefit analysis and choose the candidate or party they believe will most directly benefit them. Moreover, this process presumes that voters, on top of their utility, also consider the probability of their vote influencing the elections, by considering

the probability of winning (Downs 1957). Some authors have criticised this theory, arguing that it oversimplifies human behaviour and fails to account for factors such as social, ideological and emotional influences (Green and Shapiro 1994).

Additionally, a critical perspective on traditional models of voting behaviour contends that voting behaviour is deeply shaped by group identities, social affiliations, and retrospective evaluations. Voters frequently vote in ways that may not strictly correspond to their policy beliefs or personal preferences. Individuals do not always act as informed and rational decision-makers, as many end up being swayed by social allegiances, historical loyalties, and collective identities. As a result, these influences may lead to behavioural patterns that deviate significantly from the idealised rational choice models (Achen and Bartels 2016). This perspective on voting behaviour as identity-driven is reinforced by theories of partisanship. Lupu suggests that stronger party distinctions deepen partisan loyalties (Lupu 2015). He also states that this might happen because, if the parties are more differentiated, then it is easier to distinguish them and form a party attachment. Another view pointed out by Lupu falls upon the idea that if parties are closer, then the benefit of supporting one over the other is smaller than when the parties are well differentiated and far from each other. Both perspectives suggest that as the gap between political parties grows, citizens tend to become more partisan (Lupu 2015). Furthermore, party preferences may be more pronounced in a system with fewer parties and higher polarization than in a system with multiple parties and lower polarization (Dalton 2008). Furthermore, Green, Palmquist, and Schickler argue that partisanship operates as a social identity that extends beyond simple policy preferences, where the individual's vote is also a symbol of belonging. Building on these insights, political identity has increasingly intersected with other social and cultural identities, heightening the emotional significance of voting (Green, Palmquist and Schickler 2002).

A further significant aspect that could influence voter behaviour is the electoral system, which defines the process of casting votes and allocating seats (Blais and Massicotte 1996). Different types of electoral systems lead to distinct forms of strategic voting (Blais et al. 2001). Focusing on plurality and proportional representation, we should try to understand if strategic voting happens more in one than another, or if the regime has no influence. As an illustration, proportional representation (PR) makes it possible for small parties to gain seats enables wider participation and influences voter expectations and decision patterns, but plurality systems tend to restrict smaller parties (Gschwend and Stoiber 2014).

In PR, parliamentary seats are allocated in alignment with each party's share of the popular vote, allowing smaller parties to secure representation that accurately aligns with their voter support. In contrast, in plurality systems, or first-past-the-post (FPTP), candidates win by receiving the most votes in each district, even without an absolute majority. This second approach often discourages smaller parties (Blais and Massicotte 1996).

Confirming the importance of the electoral system in individual behaviour, Fujiwara and Eggers found that the two candidates with more votes tend to get even more votes under plurality than under proportional elections, which favours multipartyism (Fujiwara 2011) (Eggers 2015).

Focusing on the support for minor parties, for many voters, supporting anti-establishment parties is less about ideologies and more about expressing discontent with the political status quo (Van Der Brug, Fennema, and Tillie 2000). This combination of populist attitudes and a sense of political misalignment leads voters to express their dissatisfaction through alternative political choices, and using their votes as a protest vote. On the other hand, voter discontent with existing parties often manifests in withdrawing traditional party support or switching to non-mainstream options. Additionally, in some cases protest voting is a reaction to perceived failures in currently established parties (Van Hauwaert and Van Kessel 2018; Dassonneville, Blais, and Dejaeghere 2015)

Protest voting and strategic voting differ in both intent and impact. Strategic voting is a key concept in electoral behaviour, describing the phenomenon where voters select a candidate not solely based on personal preference but to influence the election outcome by supporting a viable contender (Abramson et al. 1992; Blais et al. 2001). This type of voting occurs when individuals think that their preferred candidate has little or no chance of winning and thus opt for a candidate with a stronger likelihood of winning to ensure their vote has an impact (Alvarez and Nagler 2000; Karp et al. 2002). According to Duverger's (1954) "psychological effect", some voters who have a minor party as their preferred party end up switching to a party with higher chances of winning because they believe that supporting a marginal party may be equivalent to wasting their vote (Duverger 1954). Abramson et al. (1992) referred to this phenomenon as sophisticated voting, which can be described as voting for a candidate with higher chances of winning, even if it is not the preferred party (Abramson et al. 1992).

Sincere voting is often viewed as a more authentic expression of political belief, where voters prioritise ideological or personal alignment over pragmatism. Depending on how they balance the significance of expressing genuine choice against the desire for electoral influence, voters may cast strategic or sincere ballots (Alvarez and Nagler 2000). Moreover, a higher propensity for strategic voting arises when the preference intensity for the first choice over the second is lower, while the preference intensity for the second choice over the third is higher (Blais and Massicotte 1996).

To better understand strategic voting in multiparty systems, Alvarez and Nagler created a utility-based model that explains how voters take into account both their individual preferences and how their vote would affect the outcome. In multiparty contexts, such as Britain and the Netherlands, voters engage in strategic considerations similar to those found in two-party systems, weighing their genuine preferences against the vote's actual impact (Alvarez and Nagler 2000). Karp and Vowles examined New Zealand's electoral system and found that many

voters split their votes between the party list and electorate contests. On the party list, voters end up casting sincere votes, reflecting their true party preferences, sincere voting. However, in the electorate vote, they often vote strategically to support a more viable local candidate.

Their findings suggest that even within PR systems, strategic voting persists when voters perceive certain candidates or parties as less competitive, illustrating a complex balance between expressing sincere preferences and maximising electoral impact (Karp et al. 2002).

3. Methodology

In this study, I will start by employing game theory to analyse different scenarios where voters consider supporting a party with minimal chances of winning, and thus need to balance their personal preferences with the importance they give to having an impact on the election results. The game theory analysis will be divided into three sections. First, I will create a general scenario with a two-player game framework that attributes costs to their different choices. These costs will be generic at the start and will be deducted from a general level of utility, depending on their decisions. Additionally, I will define two possible types of voters, type 1 and type 2. Then, this framework will be implemented in various scenarios where the types of voters will change. These include scenarios where voters are ideologically driven, which means they are sincere voters, strategically motivated, or a combination of both. In the second section, I will relax the assumption that coordination between voters is necessary for Party B to win. This section will analyse cases involving mixed strategies to address situations where unpredictability plays a role in voter behaviour. Finally, the third section will focus on addressing the problem of incomplete information, examining voting behaviour when voters lack full knowledge of the opponent's type.

To further explore the motivations and behaviour of voters, particularly the factors affecting minor parties' support, I designed and conducted a survey, which serves as a basis for the analysis. The survey was designed to identify which factors have an influence on the probability

of voting for a minor party and to explore how individuals might behave in situations where their preferred party has little to no chance of winning. Later, I will explore concepts such as protest voting, the importance of ideologies and sincere versus strategic voting, by analysing its results and graphs, which will be in the appendix.

Although real-world elections involve numerous voters, a two-player framework offers a simplified yet effective way to capture the essential dynamics of voter behaviour. By focusing on the interaction between two representative voters, particularly in the context of a marginal party, with the behaviour of the mass of other voters taken as given, we can highlight the trade-offs and strategies that are likely to arise in real-world scenarios.

4. Analysis

4.1 Foundation for the Analytical Framework

To begin the analysis, it is essential to identify each voter's best response, i.e., what each voter will choose considering the other player's decision. This will help us understand if some individuals need to consider the decisions of other voters, or if they are indifferent to the other voter's choice. In the latter case, we are in the presence of a dominant strategy which is the perfect approach for understanding why some people maintain their convictions of voting for a specific party regardless of other players' moves. For the former case, Nash equilibrium can help to comprehend how and why certain voting patterns become stable, even when they are not aligned with the preferences.

4.2 Section 1 – Strategic Coordination for Party B's Victory

4.2.1 General Scenario

Consider a general scenario where two players, Voter 1 and Voter 2, support the same minor political party, Party A, which cannot win the election. Two other parties, Party B and Party C, are disputing the first place in the election. Both voters share similar ideologies and would both

prefer B to win over C. We assume here that Party B wins only if both voters vote for it, otherwise, Party C wins. Thus voters face a coordination problem in their choice of whether to vote strategically or not.

Furthermore, in this context, voting decisions involve two types of general costs: c_d, the cost of deviating from the voter's ideological preference (Party A), and c_l, the cost incurred if Party C wins. The cost c_l represents the loss of seeing the only viable alternative (Party B) defeated, leaving the least desirable party (Party C) victorious.

Moreover, two types of voters are considered in this game. First, type 1 voters are driven by ideological loyalty ($c_d > c_l$). The personal sacrifice of voting against their preferred party (Party A) outweighs the risk of Party C winning. On the other hand, type 2 voters are motivated by the strategic influence of their vote ($c_l > c_d$). Preventing Party C from winning is more important to them, even if it requires deviating from their ideological preference.

Additionally, it is important to note that the cost of deviating for type 1 voters will be represented as c_d^{high}, while for type 2 voters, it will be represented as c_d^{low}. These costs are compared to the cost of allowing Party C's victory, c_l. For type 1 voters, $c_d^{high} > cl$, indicating a higher cost of deviation. Conversely, for type 2 voters, $c_d^{low} < cl$.

In this game, the payoffs represent the utility derived by each voter based on the strategies of both. They measure the overall satisfaction or benefit a voter gains from a particular outcome, considering both ideological and strategic factors. The costs are deducted from a baseline utility to reflect the trade-offs voters face when balancing ideological loyalty against strategic considerations. The highest possible utility, U, is received by a voter who votes for their preferred party, Party A, and Party B wins.

The game matrix Table 1 represents the payoffs where no type of voter is specified, considering each voter's preferences and the costs involved in their decisions.

Voter 1\ Voter 2	Party A	Party B
Party A	$(U - c_l, U - c_l)$	$(U - c_l, U - c_d - c_l)$
Party B	$(U - c_d - c_l, U - c_l)$	$(U - c_d, U - c_d)$

Table 1: General payoff matrix

The best responses and the Nash Equilibrium are determined by the relative importance each voter attributes to the cost of deviating, c_d, and the cost of allowing Party C's victory, c_l.

By looking at this general scenario, it is possible to say that (Party A, Party A) is a Nash Equilibrium, independently of voter types, because any deviation makes Party C win. It is now necessary to determine whether there are more Nash Equilibria or if (Party A, Party A) is the only one. It is also clear that (Party A, Party B) and (Party B, Party A) can be ruled out, leaving (Party B, Party B) as the only other possibility to consider. When Voter 1 chooses Party B, Voter 2 must decide between Party A, achieving a utility of $U - c_l$, or Party B, attaining a utility of $U - c_d$. In this case, the choice will depend on the voter type.

4.2.2 Scenario 1 – Both voters are loyal

These players care deeply about their ideologies and maintain a keen sense of loyalty to their preferred party. For them, deviating is more costly than losing, meaning they are type 1 voters, thus $c_d = c_d^{high} > c_l$. When both voters end up following their ideologies, Party A, the payoff will be $U - c_1$ for both voters On the other hand, when they decide to vote for Party B simultaneously, the outcome is $U - c_d^{high}$ for both voters.

Voter 1\ Voter 2	Party A	Party B
Party A	$(\underline{U - c_l}, \underline{U - c_l})$	$(\underline{U - c_l}, U - c_d^{high} - c_l)$
Party B	$(U - c_d^{high} - c_l, \underline{U - c_l})$	$(U - c_d^{high}, U - c_d^{high})$

Table 2: Payoff matrix for type 1 voters

When Voter 1 chooses Party A, Voter 2's best response, will also be Party A, and if Voter 1 votes for Party B, Voter 2's best response will still be Party A. The same logic applies to Voter 2. This means that voting for Party A is the best response for both players in every situation.

Therefore, voting for Party A is a dominant strategy for both players. Ultimately, (Party A, Party A) is the only Nash equilibrium in this game indicating that players will always end up choosing to vote sincerely, i.e., vote for the party with no chances of winning, Party A.

4.2.3 Scenario 2 – Both voters are strategic

Now, these voters maximise their utility by voting for a party which has a chance of winning. Consequently, they are strategic (type 2) voters.

Voter 1\ Voter 2	Party A	Party B
Party A	$(\underline{U - c_l}, \underline{U - c_l})$	$(U - c_l, U - c_d^{low} - c_l)$
Party B	$(U - c_d^{low} - c_l, U - c_l)$	$(\underline{U - c_d^{low}}, \underline{U - c_d^{low}})$

Table 3: Payoff matrix for type 2 voters

For these players, having an impact and a meaningful vote means more than their ideologies, meaning that the cost of deviating to help Part B win is lower than the cost of losing, $c_d = c_d^{low} < c_l$.

When Voter 1 chooses Party A, Voter 2's best response is to vote for Party A as well, because $U - c_l$ is higher than $U - c_d^{low} - c_l$. On the other hand, when Voter 1 chooses Party B, Voter 2's best response is Party B, since $U - c_l$ is lower than $U - c_d^{low}$. The same reasoning holds for Voter 2. In these scenarios, there are no dominant strategies, given that the strategy of one player depends on the strategy of the other.

Looking at these payoffs and players' best responses, two Nash Equilibria can be identified: (Party A, Party A) and (Party B, Party B) resulting in payoffs of $(U - c_l, U - c_l)$ and $(U - c_d^{low}, U - c_d^{low})$, respectively. It is evident that the second Nash Equilibrium, (Party B, Party B), offers a higher utility for both players, as $c_d^{low} < c_l$. Therefore, only (Party B, Party B) is Pareto efficient, as it achieves the highest possible payoff for both players, while (Party A, Party A) is not Pareto efficient because transitioning to (Party B, Party B) would improve the outcomes for both players without making either worse off. In this case, despite the evident

Pareto efficiency of (Party B, Party B), this equilibrium can only be achieved through the coordination of players' choices. Both players need to anticipate that the other will choose this option, otherwise, they will end up with a suboptimal equilibrium (Party A, Party A)

This coordination problem highlights the complexities arising from the presence of multiple Nash Equilibria. In cases of strategic uncertainty and imperfect information, it is crucial to understand when this uncertainty makes voters indifferent between their options. When such indifference arises, voters rationally randomise their votes, balancing ideological and strategic considerations.

To find a mixed strategy Nash Equilibrium, we assign probabilities to each voter's choices. Starting with Voter 1, the probability that Voter 1 votes for Party A is p, and for Party B is 1-p. Moving on to Voter 2, the probability that Voter 2 votes for Party A is q, and for Party B is 1-q. In this case, instead of having an absolute utility, the Expected Utility will be used. For Voter 1, the expected utility of voting for Party A is $E[u_a] = q*(U - c_l) + (1-q)* (U - c_l) = U - c_l$, and for Party B is $E[u_b] = q* (U – c_d^{low} - c_l) + (1-q)*(U - c_d^{low}) = U – q*c_l - c_d^{low}$. The same probabilities apply to B since they are both type 2 voters. Voter 1 will prefer to vote for Party A if $E[u_a] > E[u_b]$, which will happen when $q > 1 – (c_d^{low}/ c_l)$. When the cost of deviating in comparison to the cost of losing is higher, q will have to be higher than a smaller number, meaning that the probability of Voter 1 voting for Party A increases. Voters will be indifferent between voting for Party A and Party B when $E[u_a] = E[u_b]$, $U - c_l^{high} = U – q*c_l - c_d^{low}$, or, $q = 1 – (c_d^{low}/ c_l)$. This probability will depend on the proportion of these costs. The higher the cost of deviating in comparison to the cost of allowing Party C's victory, the lower the probability of Voter 2 voting for Party A. As explained before, c_d^{low} will always be lower than c_l, thus c_d^{low}/ c_l will always be less than 1, meaning that q will always be higher than 0. This implies that as the ratio of c_d^{low} to c_l increases, the required value of q decreases for Voter 1 to continue supporting Party A.

Furthermore, if c_d^{low} is significantly smaller than c_I, the value of q will approach 1. As the gap between these costs narrows, the likelihood of Voter 2 voting for Party A must increase for Voter 1 to maintain their support for Party A.

4.2.4 Scenario 3 – Voters of different types

We now consider how this framework behaves when it is common knowledge that voters give different degrees of importance to ideologies versus having an impactful vote. Assume that voter 1 is strategic, and that voter 2 is ideological.

Voter 1\ Voter 2	Party A	Party B
Party A	$(\underline{U - c_I}\ ,\ \underline{U - c_I})$	$(U - c_I\ ,\ U - c_d^{high} - c_I)$
Party B	$(U - c_d^{low} - c_I\ ,\ \underline{U - c_I})$	$(\underline{U - c_d^{low}},\ U - c_d^{high})$

Table 4: Payoff matrix for voters of different types

Voting for Party A is a dominant strategy for Voter 2. Therefore, Voter 1's best response is also to vote for Party A, as they cannot avoid Party C's victory. Thus, the only possible Nash Equilibrium is (Party A, Party A).

4.3 Section 2 - Party B wins with a single vote

In this section, we assume that one vote is sufficient to secure Party B's victory and will show how this changes the outcome. Voters are aware of this condition and incorporate it into their decision-making process. All other assumptions from the first section remain applicable to this analysis. The following table represents the election results under this new assumption.

Voter 1\ Voter 2	Party A	Party B
Party A	Party C wins	Party B wins
Party B	Party B wins	Party B wins

Table 5: Election results matrix

4.3.1 Nash equilibria under complete information

Now, the only way to have the Nash Equilibrium, (Party A, Party A) is if both voters are type 1. When both voters are type 2, two new Nash Equilibria arise:

Voter 1\ Voter 2	Party A	Party B
Party A	$(U - c_l , U - c_l)$	$(\underline{U}, \underline{U - c_d^{low}})$
Party B	$(\underline{U - c_d^{low}}, \underline{U})$	$(U - c_d^{low} , U - c_d^{low})$

Table 6: Payoff matrix mixed strategies

In this scenario, there are no dominant strategies, therefore their choice depends on what the other voter chooses. If Voter 1 chooses to vote for Party A, then Voter 2 will choose to vote for Party B to prevent Party C's victory. On the other hand, when Voter 1 votes for Party B, Voter 2 does not need to vote for Party B, thus votes for Party A. There is also a mixed-strategy Nash equilibrium. Voter 1's expected utility of voting on Party A will be $q*(U - c_l)+ (1 - q)*U$, which is $U – q*c_l$, and the expected utility of voting on Party B will be $q*(U - c_d^{low}) + (1 – q)*(U - c_d^{low})$, which is $(U - c_d^{low})$. Thus, Voter 1 will prefer to vote for Party A if $q < (c_d^{low}/c_l)$. The same applies to Voter 2 but with the probability being represented by a p instead of a q. Lastly, Voter 1 will be indifferent between the two parties when $U – q*c_l = U - c_d^{low}$, which is $q = (c_d^{low}/ c_l)$, and only in this situation will randomize its choice. Thus the equilibrium strategies are $p = q = (c_d^{low}/ c_l)$. This comes as no surprise, since the higher the cost of deviating, the fewer incentives Voter 2 will have to deviate, increasing the probability of voting for Party A.

4.4 Bayesian Model: Uncertainty about voter type

In the real world, the types of the voters might not be known. The Bayesian model allows for the incorporation of prior beliefs about voter types and their strategies and provides a meaningful framework to deal with incomplete information. By applying this framework, it becomes possible to analyse how expectations about other voters' behaviour influence individual decision-making. The probability of Voter 1 being a type 1 voter is α and the probability of being a type 2 is 1 - α. The same applies to Voter 2.

4.4.1 Bayesian Nash equilibria under incomplete information: Section 1

This model will first be applied to the analysis in the first section, which operates under the assumption that coordination is essential for Party B's victory.

Voting for Party A is a dominant strategy for ideological type voters, type 1. However, the vote of the strategic type, type 2, depends on what the other voter would do.

Assuming the other type 2 voter votes for Party B, Voter 1 prefers to vote for Party B if $\alpha(U - c_d^{low} - c_l) + (1 - \alpha)*(U - c_d^{low}) \geq \alpha(U - c_l) + (1 - \alpha)*(U - c_l)$ or $1 - (c_d^{low}/c_l) \geq \alpha$ (payoffs from tables 7 to 10). The Bayesian-Nash Equilibrium (BNE) will be ((Party A, Party B), (Party A, Party B)) if $\alpha \leq 1 - (c_d^{low}/c_l)$. This suggests that when the cost of deviating (c_d^{low}) is relatively low compared to the cost of losing (c_l), both type 2 voters are more inclined to vote strategically for Party B.

Now, assuming the other type 2 voter chooses to vote for Party A, Voter 1 of type 2 prefers to vote for Party A if $\alpha(U - c_d^{low} - c_l) + (1 - \alpha)* (U - c_d^{low} - c_l) \leq \alpha(U - c_l) + (1 - \alpha)*(U - c_l)$ or $c_d^{low} \geq 0$. This means that when type 2 Voter 2 votes for Party A, Voter 1 will always prefer to vote for Party A as well. The BNE will be ((Party A, Party A), (Party A, Party A)) for all values of α. In this case, if one type 2 voter chooses Party A, the other type 2 voter will always prefer Party A as well due to the cost of deviating (c_d^{low}), and since their deviation will not change who wins. This illustrates that even when both voters are type 2, thus preferring Party B's victory, they can fail to coordinate.

4.4.2 Bayesian Nash equilibria under incomplete information: Section 2

In this section where Party B only needs one vote to win, Party A remains a dominant strategy for type 1 voters. However, as in the previous section, type 2 voters' behaviour depends on the other voter's choice.

Considering the other voter is type 2 and votes for Party B, Voter 1 prefers to vote for Party B if $\alpha(U - c_d^{low}) + (1 - \alpha)*(U - c_d^{low}) \geq \alpha(U - c_l) + (1 - \alpha)*(U)$ or $\alpha \geq (c_d^{low}/c_l)$ (payoffs from tables

11 to 14). The Bayesian-Nash Equilibrium (BNE) will be ((Party A, Party B), (Party A, Party B)) if $\alpha \geq (c_d^{low}/c_l)$. When the ratio (c_d^{low}/c_l) is higher, the probability of type 1 voters has to be higher for Voter 2 to vote for Party B.

Additionally, if the other type 2 voter chooses to vote for Party A, Voter 1 will prefer Party A if $\alpha(U - c_l) + (1 - \alpha)^* (U - c_l) \geq \alpha(U - c_d^{low}) + (1 - \alpha)^*(U - c_d^{low})$ or $c_d^{low} \geq c_l$. As we know, c_d^{low} will never be equal to or higher than c_l. This was expected since Voter 1, will always prefer to vote for Party B if Voter 2 votes for Party A because he wants Party B to win and the cost of allowing to lose the election is higher than the cost of deviating to Party B.

When type 2 Voter 2 votes for Party A, Voter 1 will always prefer to vote for Party B and make the difference. The BNE will be ((Party A, Party B), (Party A, Party B)) for all α. This illustrates that when coordination is unnecessary, voters have higher incentives to deviate.

4.5 Scenarios Analysis and Relevance

The initial framework examines how individuals with varying beliefs and priorities behave when voting for their preferred party, assuming that coordination is required for Party B to secure victory. In the scenario with both voters type 1, the cost of deviating from A is too high to justify voting for Party B. Thus, the Nash Equilibrium is (Party A, Party A). This loyalty shows a strong sense of political identity and maintaining it provides greater utility than influencing the election results. Moving to the second scenario where both voters are type 2, the opposite behaviour occurs, having both voters prioritising an impact on election results, thus preventing Party C's victory. This scenario illustrates how, in some cases, voters are willing to sacrifice ideological preferences, ending up deviating from a minor party. Without coordination, they may end up with the least preferred outcome for both voters. This creates strategic uncertainty, where each voter must predict the other's choice to avoid the undesirable result of Party C's victory. By applying a mixed strategies framework, it was possible to define the probabilities, as a function of the ratio between the two costs, under which voters will decide

to randomise between parties, which will happen when $q = 1 - (c_d^{low}/ c_l)$. Relaxing the assumption to allow Party B to win with just one vote, changes this probability to $q = (c_d^{low}/ c_l)$. As it is possible to conclude, these probabilities are the reverse. In the second case, voters will prefer to be free riders, i.e., to vote for A while the other voter deviates and makes Party B victorious.

The concepts of sincere, and strategic voting find practical relevance in these two scenarios. type 1 voters always prioritize voting sincerely, whereas type 2 voters can favour strategic voting as a means to amplify their influence on the outcome, but may not do it in the end.

The Bayesian model extended this analysis by introducing incomplete information, reflecting real-world uncertainty about voter types. Under the assumption that Party B required both voters to coordinate, the model showed that strategic voters were more likely to deviate and support Party B when the probability of encountering an ideological voter (α) was low relative to $1 – (c_d^{low}/c_l)$. However, coordination failures occurred when one strategic voter chose Party A, forcing both voters into the less-preferred Nash Equilibrium of (Party A, Party A). When the assumption was relaxed to allow Party B to win with a single vote, the Bayesian model demonstrated that free-riding became the dominant behaviour.

4.6 Partisanship Influence

Individuals' behaviour is often shaped by their social environment, including the groups they identify with and the affiliations they maintain. By the conclusions made by several authors, it is possible to conclude that partisanship for smaller parties increases the cost of deviating and decreases the cost of losing. Partisan individuals are more likely to stick to the party with which they are affiliated instead of deviating. Considering that, as Lupu and Dalton (Lupu 2015, Dalton 2008) concluded, the strength of partisanship is shaped by the degree of polarization of the electoral system and the number of parties in it, the higher the degree of polarization, the higher the strength of partisanship, and the higher the number of parties in the system, the lower

is the strength of partisanship. This strength can be reflected in our scenarios primarily through its impact on the mixed-strategy equilibria and Bayesian game outcomes.

The presence of partisanship forces will not change the Pure Nash Equilibria found in the first three scenarios, however, in mixed-strategy scenarios, partisanship influences the probabilities assigned to each voter's strategies. Stronger partisanship increases the cost of deviating (c_d) while decreasing the cost of losing (c_l), making it more likely that voters will prefer Party A, which will shift the probabilities of p and q in favour of Party A. Lower probabilities of the other voters will be needed for voters to vote on Party A.

In the Bayesian games, higher partisanship expands the range of probabilities favouring ideological voting (Party A), as the relative costs of deviating and losing change. This results in stronger stability for equilibria involving Party A, as even strategic voters may lean toward Party A when partisanship is sufficiently strong.

Wrapping it all up, partisanship, for ideologies-driven voters, is expected to provide an additional utility that compensates for the lack of practical outcomes. This will come into conflict when individuals aspire to act practically and strategically, increasing their cost of deviating, which, without partisanship, was lower.

4.7 Electoral Systems Influence

Up to this point, my analysis has neglected the specific electoral systems within each scenario. When it comes to influencing voting behaviour, in PR systems, individuals who identify with minor party ideologies may feel encouraged to support it. These voters have less incentive to deviate since they know there is a chance, even when small, that their vote is represented. On the other hand, in FPTP systems, individuals know that minor parties have no representation, which can lead them to perceive their vote as a useless vote. This perception may reduce the cost of deviating for voters. Naturally, strategic voting will be more common in FPTP systems than in PR ones. As seen in the previous scenarios, but now considering the electoral system, a

voter who prefers Party A, and would like to prevent Party C from winning, if it is in an FPTP system, is way more likely to vote for Party B than a voter in a PR systems, which, by switching to Party B, will lead to a reduction in Party A's representation, increasing the cost of deviating. In mixed strategies, this might influence voter behaviour by changing the cost of deviating and losing. In PR systems, where c_l may be lower, the equilibrium probabilities (p and q) will favour ideological choices increasing the likelihood of voting for minor parties.

In summary, it is possible to predict that FPTP systems discourage support for minor parties, leading to a higher chance of individuals voting strategically, while on PR systems, both sincere and protest voting will be encouraged, allowing for greater support for minor parties.

4.8 Protest Voting

Until now, the focus of this analysis has been on understanding why individuals who identify with a certain party still vote for it even knowing said party has no chances of winning. However, there exists another category of individuals who vote for minor parties without necessarily aligning with those parties ideologically. This fact often arises from a combination of economic discontent and anti-establishment sentiment, because of this, several voters end up seeing voting for these parties as an opportunity to express dissatisfaction with the current political options.

Now analysing the implications of this type of voting in the decision-making process, these voters will be less focused on the results, contrasting with the idea of strategic voting. In this case, the willingness to vote for a minor party will be likely to increase since voter are determined to express their discontent. These individuals will prioritise expressive voting, in this case, the expressive stands for wanting to express dissatisfaction and not their ideologies, over being practical, by supporting a party with more chances of winning. In fact, in most of the cases, protest voting arises from discontent toward these major parties.

Considering the previous scenarios analysed before, now instead of voting ideologically versus strategically, it can be regarded as protest voters versus strategic voters. While strategic voters would prefer to choose Party B, which has some chance of winning, protest-driven voters would prefer to vote for A, to show discontent. To some extent, ideologically driven voters may seem to have the same impact as protest-driven voters, however, the desire to vote in protest may further amplify this effect. Additionally, introducing protest voting to this framework might increase the uncertainty as it introduces variability in voter behaviour that is not tied to traditional strategic calculations. Lastly, the game matrix with this type of voter would look similar to the ones with ideological types. While ideological voters prioritize expressing their ideologies, protest voters prioritize expressing dissatisfaction, but both express it by voting for Party A. However, may seem unexpected, as protest voters, unlike ideologically driven voters, may not face consistent costs in their decision-making since their voting behaviour tends to be reactive to external circumstances.

Bringing it all together, it is important to acknowledge that not all votes for minor parties stem from ideological alignment. Some votes may choose these parties as a form of protest to make a point rather than out of genuine identification with their policies or values.

4.9 Survey analysis

To explore the motivations and behaviour of voters with special emphasis on the factors affecting minor parties' support, a survey was conducted, which will serve as support for some of the results and conclusions drawn throughout the previous analysis. It is possible to explore concepts such as protest voting, ideologies and sincere versus strategic voting. This survey received 204 answers, with 43% from male participants and 57% from female participants, spanning different age groups and education levels. It is important to note that the survey relied on a convenience sampling method, involving individuals who chose to participate voluntarily rather than being randomly selected. Firstly, it was possible to study if voters are consistent in

voting, by always voting for the same party or not (Figure 1). Only 25% of the participants said that they usually vote for the same party, and 73% of these would still vote for their preferred party even knowing it had no chance of winning (Figure 2). When comparing these values with the other group of participants, it is possible to see that, for participants who do not usually vote for the same party, only 68%, less 5% than before, would still vote for their preferred party even knowing it had no chances of winning, and this percentage is even lower for participants whose vote depends on the type of the election, reaching a value of 56% (Figure 2). This difference comes as no surprise since it would be expected that voters who do not usually vote for the same party would also be more willing to deviate from their preferred party if this one has no chance of winning.

Additionally, to understand if this difference implies more strategic behaviour for individuals who do not usually vote for the same party, the relationship between this variable and the vote on a party to avoid another to win was studied. It is possible to observe that, for individuals who usually vote for the same party, 88% of participants said that they never voted for a party which was not their preferred one to avoid another party winning and only 12% have done so (Figure 3). However, the first value is considerably lower for individuals who do not usually vote on the same party and for individuals who say that their vote depends on the election, reaching 55% and 60%, respectively. Furthermore, 38% of the participants who do not usually vote for the same party said that they have voted for a party which is not their preferred one to avoid another one to win. It is then expected that individuals who usually vote for the same party show less strategic behaviour.

Another factor truly valuable to be studied is the main factor which influences individuals' vote. From our study, in which participants had to pick three out of seven listed factors, the top three were, a) specific policy proposals, chosen by 91% of the participants, followed by b) ideology of the party, which received 87%, and then the c) candidates with 82% (Figure 4). This question

was made about voting on parties in general, however, it is also important to understand the main motivations that lead individuals to vote for minor parties. On this topic, 65% of participants answered that they would vote for minor parties as an expression of their true opinion, which entails an ideological vote, followed by a percentage of 24% of participants saying that they would vote for a minor party to increase the party's visibility, and the third most voted choice, with 9 percentual points, was to signal dissatisfaction with the larger parties, which represents the percentage of protest voting (Figure 5).

Moreover, in the last section of the survey, the perception of electoral impact and strategic considerations were studied. The majority of participants, 96%, believe to have some kind of impact on the election results (Figure 6). From these results, it is now important to see if the feeling of having an impact on the elections changes the propensity to vote for minor parties or not. It is possible to observe that the participants who believe to have a great deal of impact are the ones who have the higher percentage of never voting for a different party to prevent another from winning (Figure 7). This could be due to the desire to have influence in the party they are voting for since they believe that their vote has a great impact.

Furthermore, when asked if they agree with the following statement "It's better to vote for a party that shares some of my views and has a chance of winning than a party with no chance"?, 13% strongly agreed with it, 34% agreed, 16% were neutral, 30% disagreed, and only 7% strongly disagree with the statement (Figure 8). However, when confronted with the question of which party would they vote for if they knew their preferred party had no chance of winning, 67% of the participants answered that they would continue to vote for the same (Figure 9). The value obtained in the last question, 67%, is higher than the value obtained when asked what they think about voting on another party than on their preferred one, which only got 37% on the disagree side, which may reveal uncertainty.

Lastly, when asked if they had ever voted for a party other than their favourite to prevent another party from winning, 56% of participants reported they had never done so, while 37% admitted to having done it (Figure 10). As this question reflects past behaviour, 37% will be the percentage considered of type 2 voters, while the remaining, 63%, will be considered the percentage of ideologically-driven voters.

Now that the percentage of type 2 voters is known, the section where the Bayesian model is studied can be solved with these values, using α equal to 63%.

Starting with the case where a type 2 voter votes for Party B, Voter 1 prefers to vote for Party B if $1 - (c_d^{low}/c_l) \geq 0.63$. The Bayesian-Nash Equilibrium (BNE) will be ((Party B, Party A), (Party B, Party A)) if $0.63 \leq 1 - (c_d^{low}/c_l)$. This means that the ratio of (c_d^{low}/c_l) has to be equal to or lower than 0.37. In the second case, type 2 Voter chooses to vote for Party A, thus Voter 1 prefers to vote for Party A if $0.63(U - c_d^{low} - c_l) + (0.37)^* (U - c_d^{low} - c_l) \leq 0.63(U - c_l) + (0.37)^*(U - c_l)$ or $c_d^{low} \geq 0$. This means that When Type 2 Voter 2 votes for Party A, Voter 1 will always prefer to vote for Party A as well. The BNE will always be ((Party A, Party A), (Party A, Party A)). When Party B only needs one vote to win, these dynamics will shift slightly. In the case where the voter is type 2 and votes for Party B, Voter 1 prefers to vote for Party B if $0.63(U - c_d^{low}) + (1 - 0.63)^*(U - c_d^{low}) \geq 0.63(U - c_l) + (1 - 0.63)^*(U)$ or $0.63 \geq (c_d^{low}/c_l)$. The Bayesian-Nash Equilibrium (BNE) will be ((Party A, Party B), (Party A, Party B)) if $0.63 \geq (c_d^{low}/c_l)$. For this to hold, the ratio (c_d^{low}/c_l) has to be equal to or lower than 0.63.

Finally, if the other type 2 voter chooses to vote for Party A, Voter 1 will prefer Party A if $\alpha(U - c_l) + (1 - 0.63)^* (U - c_l) \geq \alpha(U - c_d^{low}) + (1 - 0.63)^*(U - c_d^{low})$ or $c_d^{low} \geq c_l$. The value of α has no impact in this case.

5 Conclusion and Final Remarks

The purpose of this thesis was to investigate the reasons behind voters supporting parties they know have minimal chances of winning. The study intended to understand how voters balance practical reasons with ideological allegiance by combining game-theoretic models with survey analysis. Additionally, the study aimed to understand how elements such as partisanship and electoral systems shape voting decisions.

In the initial scenarios of this analysis, where Party B required both voter's support to win, it was possible to conclude that coordination plays a critical role. For ideologically driven voters, type 1, voting for Party A is a dominant strategy. On the other hand, for strategic voters, type 2, this leads to two Nash Equilibria. Mixed strategies helped identify a third equilibrium by introducing probabilistic decision-making. This relationship was expressed as $q = 1 - (c_d^{low}/c_l)$. Higher ratios of (c_d^{low}/c_l) will lead to lower q, which means that Voter 1 needs a lower q, the probability of Voter 2 voting for Party A, to vote for Party A. Furthermore, altering the assumption so that a single vote was sufficient for Party B to win significantly changed the outcomes. The relationship is now expressed as $q = (c_d^{low}/c_l)$, showing that when voters don't need to coordinate, the higher the cost of deviating the higher the probability of voting for that Party.

The Bayesian model extended this analysis to real-world scenarios with incomplete information, allowing for variability in voter types. Under the assumption that Party B required coordination to win, the analysis revealed that strategic voters are more likely to deviate and support Party B when the cost of deviation is low relative to the cost of losing, as captured by the condition $\alpha \leq 1 - (c_d^{low}/c_l)$. However, when one strategic voter chooses Party A, coordination fails, and both voters default to supporting Party A.

When the assumption was relaxed so that Party B needed only one vote to win, the free-riding behaviour shifted the balance, increasing the probability of strategic voting as captured by the ratio $\alpha \geq (c_d^{low}/c_l)$.

The survey reinforced these findings, showing that individuals who believe their vote can influence an election are more inclined to vote sincerely. Proportional representation (PR) systems tend to enhance the perception of having an impactful vote. This suggests that individuals in PR systems, because they perceive their vote as impactful, are more likely to vote for their preferred party, regardless of its size. Furthermore, many voters support minor parties not out of ideological alignment but as a form of protest against the political establishment. However, the survey highlighted that ideological allegiance remains the primary driver for most minor party supporters. Lastly, strong partisan attachments increase the cost of deviating from one's preferred party, reducing the likelihood of strategic voting. This aligns with the theoretical models, where partisanship was shown to shift the balance of probabilities in favour of sincere voting, particularly in mixed-strategy scenarios.

In sum, this study highlights the complex interplay of ideological conviction, strategic considerations, and protest motivations that drive voters to support minor parties. The need for cooperation often results in coordination failures, resulting in sincere voting even when strategic deviating would be preferable. Contrarily, the sense of free-riding encourages strategic voters to rely on others to secure outcomes while maintaining their ideological preferences. Proportional representation systems foster sincere and protest voting by enhancing the perceived influence of minor parties. Finally, partisanship strengthens ideological loyalty, increasing the cost of deviating.

These dynamics underscore the persistence of minor party support in democracies, reflecting the enduring tension between individual expression and collective outcomes.

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7 Appendix:

Table 7: Payoff matrix for Bayesian Model with both voters type 1

		Ideological (α)	
	Voter 1\ Voter 2	Party A	Party B
Ideological (α)	Party A	$(U - c_l , U - c_l)$	$(U - c_l , U - c_d^{high} - c_l)$
	Party B	$(U - c_d^{high} - c_l , U - c_l)$	$(U - c_d^{high} , U - c_d^{high})$

Table 8: Payoff matrix for Bayesian Model with voters of different types

		Ideological (α)	
	Voter 1\ Voter 2	Party A	Party B
Strategic (1 - α)	Party A	$(U - c_l , U - c_l)$	$(U - c_l , U - c_d^{high} - c_l)$
	Party B	$(U - c_d^{low} - c_l , U - c_l)$	$(U - c_d^{low} , U - c_d^{high})$

Table 9: Payoff matrix for Bayesian Model with voters of different types

		Strategic (1-α)	
	Voter 1\ Voter 2	Party A	Party B
Ideological (α)	Party A	$(U - c_l , U - c_l)$	$(U - c_l , U - c_d^{low} - c_l)$
	Party B	$(U - c_l - c_d^{high} , U - c_l)$	$(U - c_d^{high} , U - c_d^{low})$

Table 10: Payoff matrix for Bayesian Model with both voters type 2

		Strategic (1-α)	
	Voter 1\ Voter 2	Party A	Party B
Strategic (1 - α)	Party A	$(U - c_l , U - c_l)$	$(U - c_l , U - c_d^{low} - c_l)$
	Party B	$(U - c_d^{low} - c_l , U - c_l)$	$(U - c_d^{low} , U - c_d^{low})$

Click here to return to text

Table 11: Payoff matrix for Bayesian Model with both voters type 1 under new assumption

		Ideological (α)	
	Voter 1\ Voter 2	Party A	Party B
Ideological (α)	Party A	$(U - c_l , U - c_l)$	$(U, U - c_d^{high})$
	Party B	$(U - c_d^{high} , U)$	$(U - c_d^{high} , U - c_d^{high})$

Table 12: Payoff matrix for Bayesian Model with voters of different types under new assumption

		Ideological (α)	
	Voter 1\ Voter 2	Party A	Party B
Strategic (1 - α)	Party A	$(U - c_l , U - c_l)$	$(U, U - c_d^{high})$
	Party B	$(U - c_d^{low} , U)$	$(U - c_d^{low} , U - c_d^{high})$

Table 13: Payoff matrix for Bayesian Model with voters of different types under new assumption

		Strategic (1-α)	
	Voter 1\ Voter 2	Party A	Party B
Ideological (α)	Party A	$(U - c_l , U - c_l)$	$(U , U - c_d^{low})$
	Party B	$(U- c_d^{high}, U)$	$(U - c_d^{high}, U - c_d^{low})$

Table 14: Payoff matrix for Bayesian Model with both voters type 2 under new assumption

		Strategic (1-α)	
	Voter 1\ Voter 2	Party A	Party B
Strategic (1 - α)	Party A	$(U - c_l , U - c_l)$	$(U, U - c_d^{low})$
	Party B	$(U - c_d^{low} , U)$	$(U - c_d^{low} , U - c_d^{low})$

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Survey Questions:

Section 1: Demographic Data

Question 1.1: How old are you?

- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- +74

Question 1.2: What is your gender?

- Female
- Male
- Other / Prefer not to say

Question 1.3: What is your level of education?

- Basic
- Secondary
- Bachelor's degree
- Master's or Doctorate

Section 2: Electoral Behaviour

Question 2.1: How often do you participate in elections (national or local)?

- Always
- Almost Always
- Sometimes
- Rarely
- Never

Question 2.2: Do you usually vote for the same party?

- Yes
- No
- It depends on the type of the election

Section 3: Voting Motivation

Question 3.1: What are the main factors that influence your vote? (select 3)

- Party ideology
- Party loyalty
- Candidates
- Specific policy proposals
- Alignment with social groups (e.g. unions, religion)
- Protest against larger parties
- Other (please specify):

Question 3.2: If you knew your preferred party had no chance of winning, who would you vote for?

- I would continue voting for the same party
- I would vote for a larger party with similar ideas
- I would vote blank/null
- I would not vote

Question 3.3: Do you usually vote for a party that you think has a good chance of winning?

- Yes
- No

Question 3.4: When you choose to vote for a party that is unlikely to win, what is your main motivation?

- To express my true opinion
- To increase the party's visibility
- To signal dissatisfaction with the larger parties
- Other (please specify):

Section 4: Your Thoughts on Elections and Voting

Question 4.1: In elections, do you feel that your vote has an impact on the final results?

- A great deal of impact
- Some impact
- Little impact
- No impact

Question 4.2: To what extent do you agree with the following statement: "It's better to vote for a party that shares some of my views and has a chance of winning than a party with no chance"?

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Question 4.3: Have you ever voted for a party that was not your preferred choice just to prevent another party from winning?

- Yes, frequently
- Yes, a few times
- No, never
- I don't know

Question 4.4: How do you interpret the concept of "strategic voting"? (Choose all that apply)

- Voting for a party that has a chance of winning, even if it's not my favourite
- Voting to prevent a party I dislike from winning
- Voting to give more power to my preferred party
- I don't believe in strategic voting

Table of Figures:

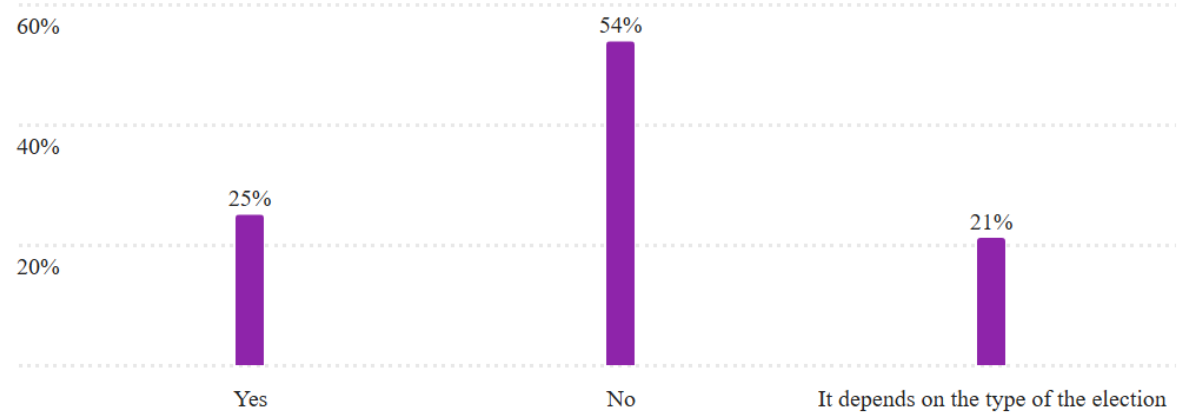

Figure 1: Frequency of Voter Loyalty

Question: “Do you usually vote for the same party?”. Click here to return to text

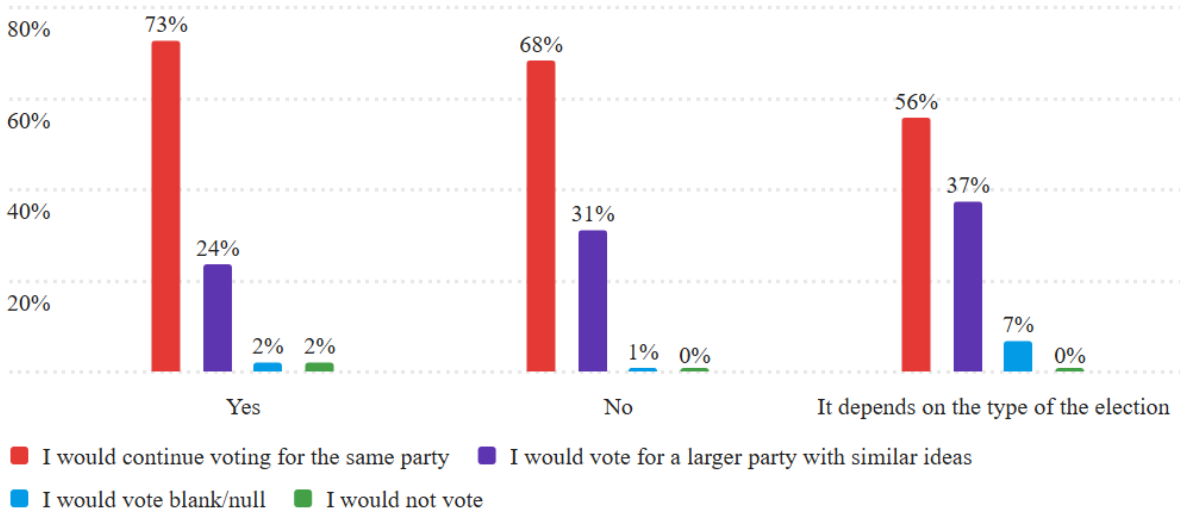

Figure 2: Possible Voter Behaviour Based on Party Loyalty and Perceived Winning Probability

This figure explores the relationship between the question “Do you usually vote for the same party?”, which has the answers “Yes”, “No” and “It depends on the type of the election” and the question “If you knew your preferred party had no chance of winning, who would you vote for?”. Click here to return to text

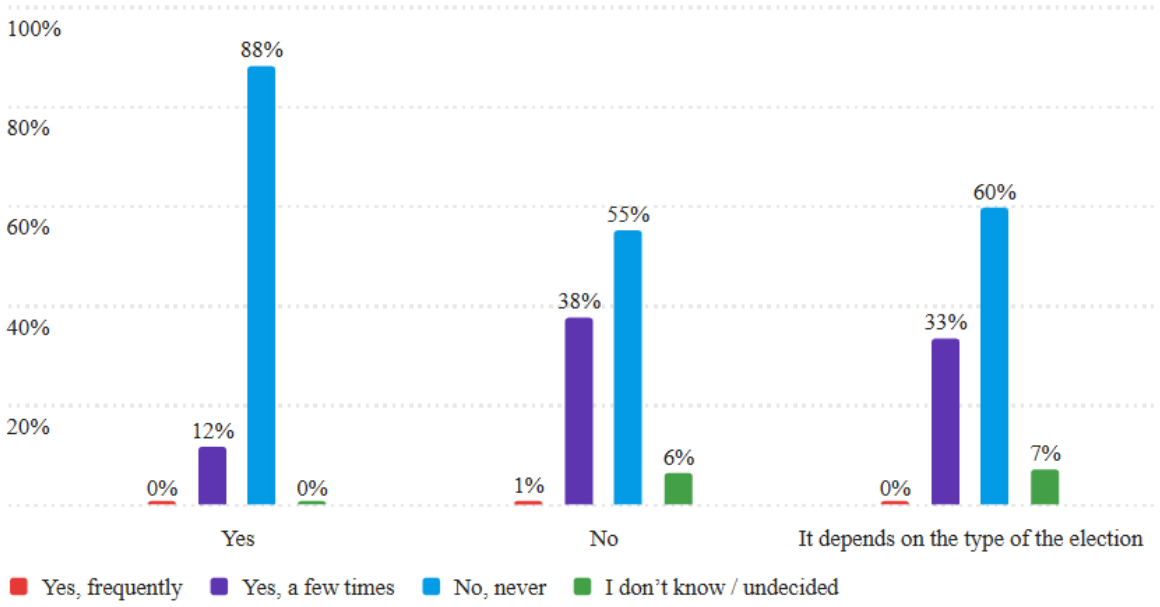

Figure 3: Impact of Party Loyalty in Past Strategic Voting Choices

This figure explores the relationship between the question "Do you usually vote for the same party?", which has the possible answers "Yes", "No" and "It depends on the type of the election" and the question "Have you ever voted for a party that was not your preferred choice just to prevent another party from winning?". Click here to return to text

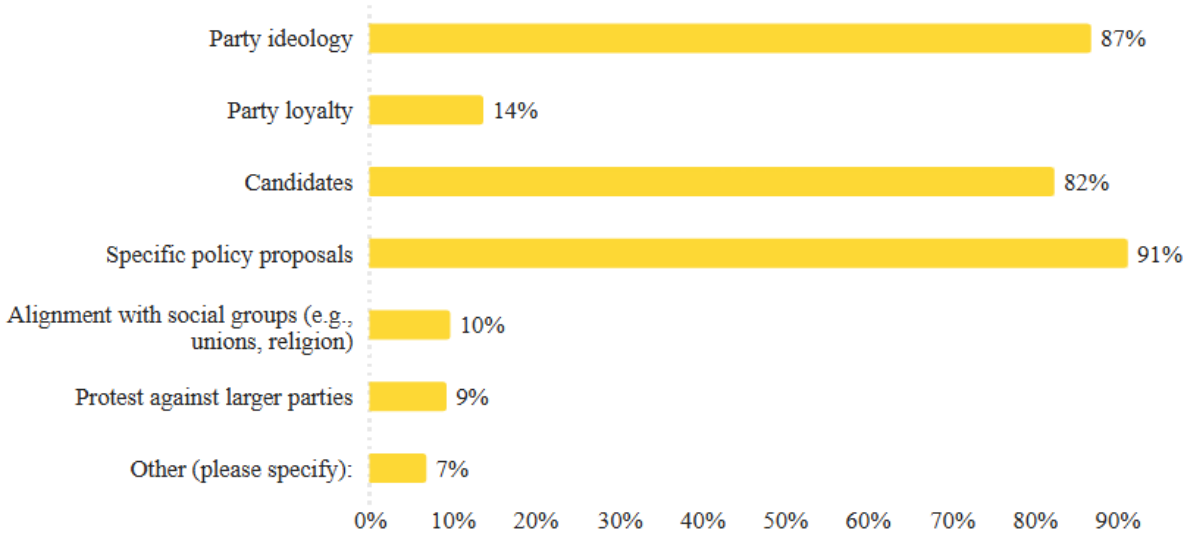

Figure 4: Main Factors that Influence Voting Decision

Question: "What are the main factors that influence your vote? (select 3)".

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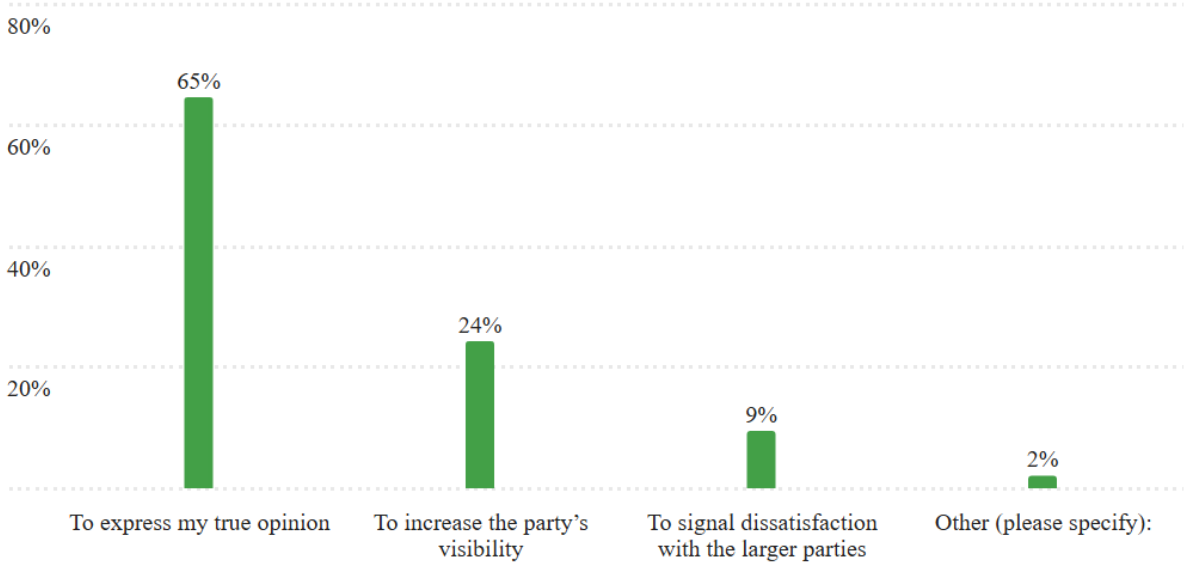

Figure 5: Main Motivations to Vote for a Minor Party Unlikely to Win

Question: "When you choose to vote for a party that is unlikely to win, what is your main motivation?" Click here to return to text

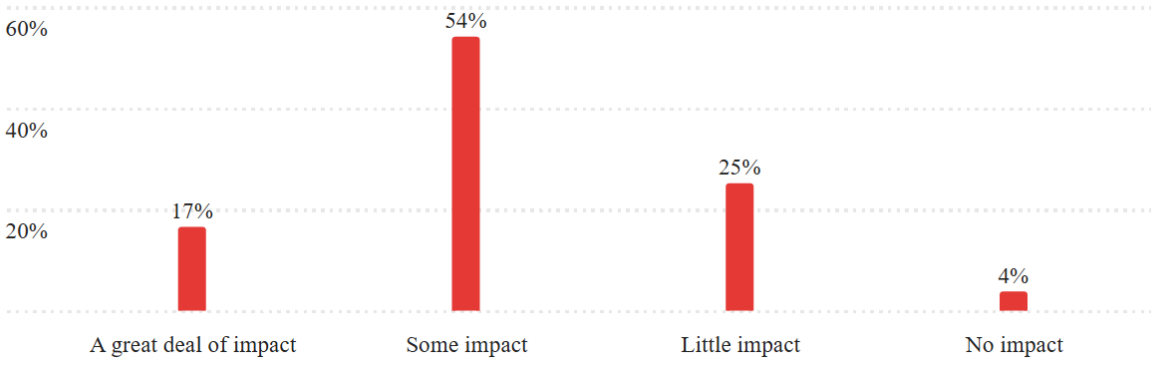

Figure 6: Perceived Impact on Election Results

Question: "In elections, do you feel that your vote has an impact on the final results?"

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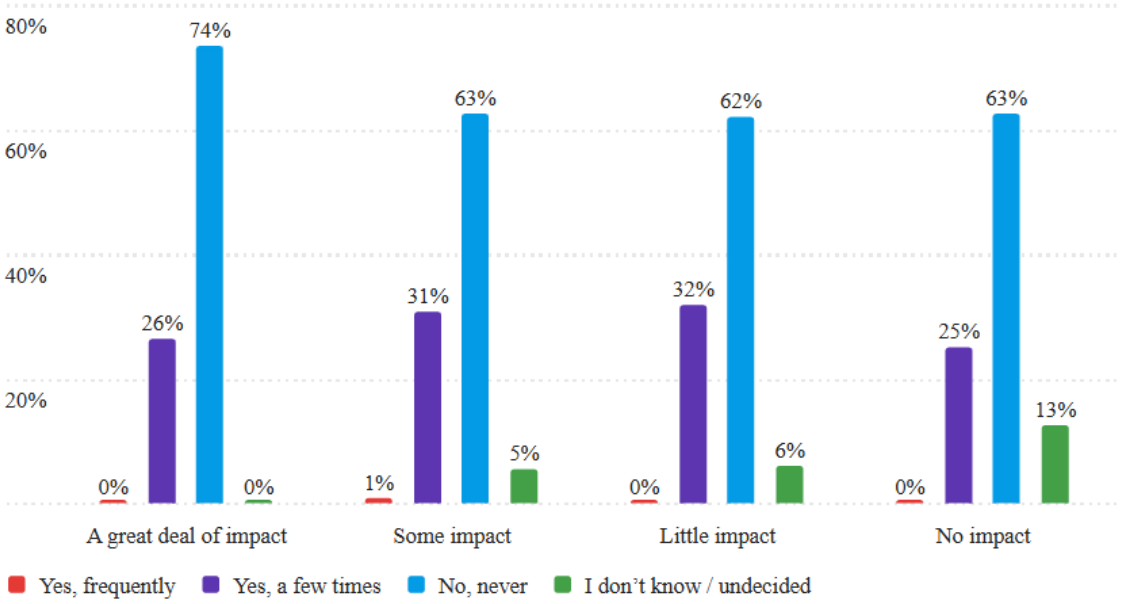

Figure 7: Perceived Impact of Vote on Election Outcomes and Its Influence on Strategic Voting

This figure explores the relationship between the question "In elections, do you feel that your vote has an impact on the final results" and the question "Have you ever voted for a party that was not your preferred choice just to prevent another party from winning?".

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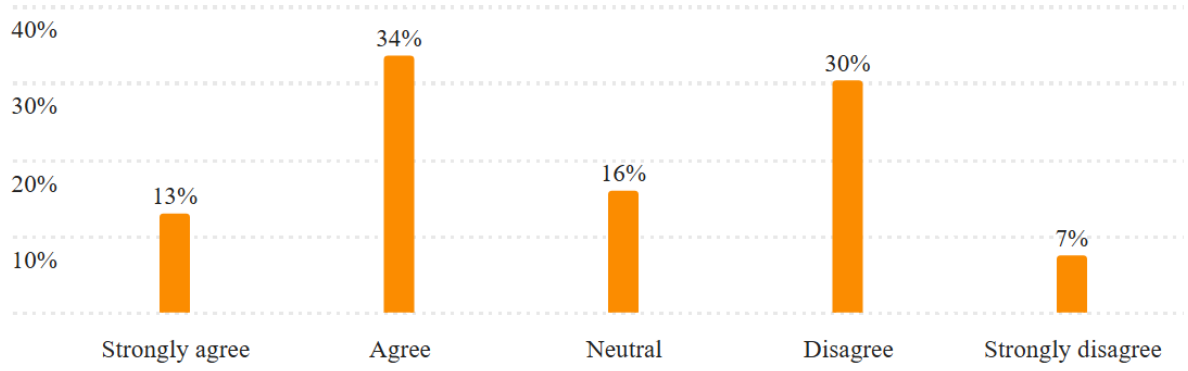

Figure 8: Attitudes Toward Deviation from Preferred Party

Question: To what extent do you agree with the following statement: "It's better to vote for a party that shares some of my views and has a chance of winning than a party with no chance?". Click here to return to text

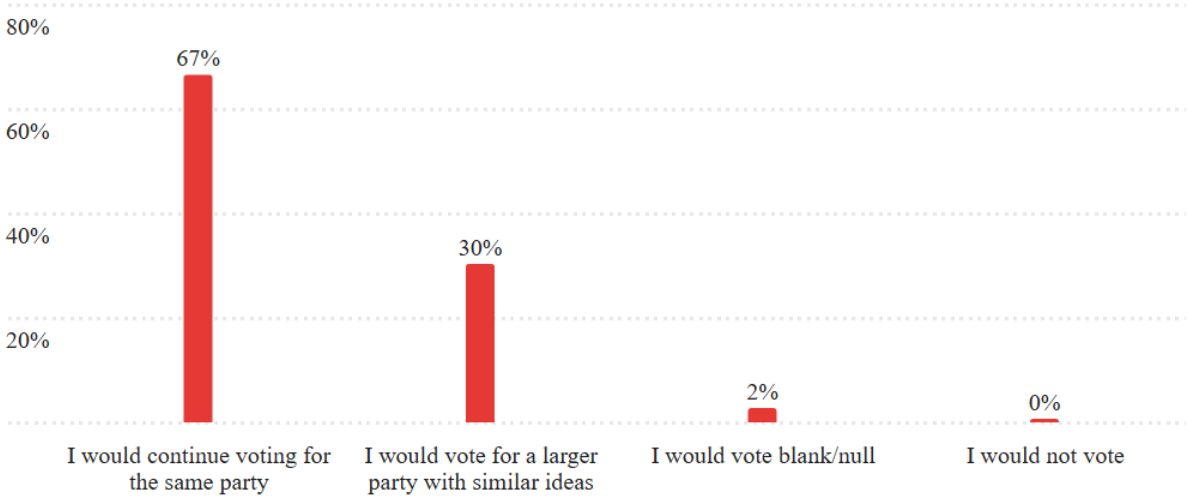

Figure 9: Voter Behaviour When Preferred Party is Unlikely to Win

Question: "If you knew your preferred party had no chance of winning, who would you vote for?". Click here to return to text

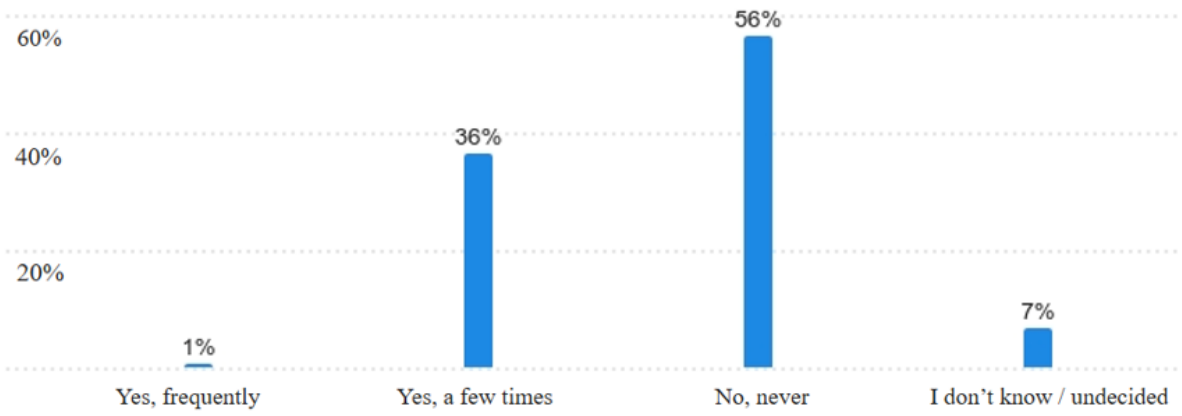

Figure 10: Past Strategic Voting Behaviour

Question: Have you ever voted for a party that was not your preferred choice just to prevent another party from winning**?"** Click here to return to text