Who votes more strategically?[1]

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Abstract

Strategic voting is an important explanation for aggregate political phenomena, but we know little about how strategic voting varies across types of voters. Are richer voters more strategic than poorer voters? Does strategic behavior vary with age, education, gender or political leaning? The answers may be important for assessing how well an electoral system represents different preferences in society. We introduce a new approach to measuring and comparing strategic voting across voters that can be broadly applied given appropriate survey data. In recent British elections, we find that older voters vote more strategically than younger voters and that richer voters vote more strategically than poorer voters, even as strategic behavior varies little across education level. The differences in strategic voting by age and income are smaller than observed differences in turnout by age and income, but they tend to exacerbate these better-known inequalities in political participation.

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Introduction

Strategic voting is fundamental to our understanding of the relationship between electoral systems and aggregate political outcomes. Most notably, Duverger (1954) postulated that plurality systems tend to have two main parties partly because strategic voters abandon less popular candidates. This observation has since been formalized, generalized, and extended to other electoral systems (e.g. Cox, 1997). Meanwhile, a large empirical literature has studied election surveys and aggregate election results to assess the proportion of voters who vote strategically.[2] The answers have varied widely, partly because of disagreements about how strategic voting should be defined and measured. In general, however, the evidence indicates that strategic voting is sufficiently prevalent to help explain aggregate results not just in plurality elections in the U.K. (e.g. Fisher, 2004), Canada (Black, 1978), and the U.S. (Abramson et al., 1992; Hall and Snyder Jr, 2015) but also in elections held under proportional or mixed rules.[3]

In this paper we address a different question from most previous research: rather than asking to what extent voters are strategic in general, we seek to understand *inequalities in strategic voting behavior across types of voters*. Does strategic voting behavior vary systematically with voter characteristics such as age, education, income, gender or political leaning? Inequalities in strategic voting matter because voters who are less strategic will on average be less successful at electing their preferred candidates;[4] across many close elections, this difference in strategic behavior could affect how well different groups of voters are represented. (To take a prominent example, the results of the U.S. presidential elections of both 2000 and 2016 might have been reversed if left-leaning voters had voted more strategically or right-leaning voters had voted less strategically.) If there are inequalities in strategic voting, they could be addressed by improving the public's understanding of the electoral system, by raising the quality and visibility of polling information (Hall and Snyder Jr, 2015), or by adopting an electoral system that less commonly

[2] See e.g. Heath et al. (1991); Niemi, Whitten and Franklin (1992); Evans and Heath (1993); Heath and Evans (1994); Alvarez and Nagler (2000); Evans (2002); Alvarez, Boehmke and Nagler (2006); Fieldhouse, Shryne and Pickles (2007); Kawai and Watanabe (2013); Artabe and Gardeazabal (2014); Herrmann, Munzert and Selb (2015); Fisher and Myatt (2017).

[3] Strategic voting under proportional representation is examined in e.g. Sartori (1968), Abramson et al. (2010) and Artabe and Gardeazabal (2014). Strategic voting in mixed electoral systems is examined in Karp et al. (2002); Gschwend (2007); Spenkuch (2018).

[4] This statement assumes a fixed set of candidates; the implications of heterogeneity in strategic voting are more subtle in equilibrium.

rewards strategic behavior.

Despite the clear normative and policy value of understanding how strategic voting behavior varies across types of voters, there has been relatively little research on the topic. A few existing studies have compared strategic voting across groups of voters, but generally only as a secondary concern (e.g. Black 1978; Abramson et al. 1992; Niemi, Whitten and Franklin 1992; Merolla and Stephenson 2007, though see Evans 1994; Fisher 2001).[5] In fact, there remains little agreement on how to measure strategic voting in the first place, with cutting-edge work in the field continuing to focus on measurement issues (e.g. Kawai and Watanabe, 2013; Herrmann, Munzert and Selb, 2015; Fisher and Myatt, 2017). This may explain why much less is known about inequalities in strategic voting than about inequalities in turnout (e.g. Verba, Schlozman and Brady, 1995; Gallego, 2014; Kasara and Suryanarayan, 2015), even though failing to vote strategically can be just as much a waste of a ballot as failing to vote at all.

We introduce and implement a generalizable and theoretically grounded way to study inequalities in strategic voting that more effectively addresses key methodological challenges. The basis of our approach is a new scalar measure of the incentive to cast a strategic vote for a candidate other than one's favorite. This measure, which we call τ, can be calculated for any voter given a proxy for the voter's cardinal preferences over candidates or parties and a model of counterfactual election outcomes. τ plays two roles in our analysis. First, it identifies voters for whom an insincere vote would produce a better expected election outcome than a sincere vote. (Previous research lacked such a measure, relying instead on proxies that less precisely identify these voters.) Given survey data indicating how each voter voted, this allows us to estimate our basic measure of "strategic-ness", called *strategic responsiveness*, which in the three-candidate case measures how much more likely one is to vote for one's second choice when such a vote is beneficial than otherwise. (Unlike previous measures of strategic behavior, strategic responsiveness considers what voters do both when an insincere vote is called for and when it is not.) Second, τ acts as a control variable in our comparisons of strategic responsiveness across groups: it helps ensure that our conclusions reflect differences in voters' behavior rather than in their preferences or circumstances. (More so than previous attempts to measure and control for tac-

[5] Loewen, Hinton and Sheffer (2015) examine "non-political, non-sociological" individual differences in strategic decision-making in the lab.

tical incentives, our measure of tactical incentives is grounded in a coherent theory of voting behavior, as explained in the next section.) With the methods we introduce in this paper, researchers can calculate τ and apply our method for comparing strategic voting behavior using data from any electoral survey that reports respondent vote choices and preferences.[6]

We apply this approach to data from the British Election Study for the 2005, 2010, and 2015 UK general elections. We find widespread strategic behavior overall, with around half of all voters casting the correct strategic vote when the incentive to vote insincerely is largest. We then look for differences in strategic responsiveness across five politically salient social characteristics: education, income, gender, age, and general left-right political orientation. In contrast to several previous studies (Black, 1978; Niemi, Whitten and Franklin, 1992; Fisher, 2001; Merolla and Stephenson, 2007), we do not find substantial differences in strategic voting by education. We do, however, find that younger voters vote less strategically than older voters and that low-income voters on average vote less strategically than higher-income voters, though the differences by income vary across election years. We also find some evidence that voters on the left vote slightly more strategically than those on the right, and that women vote slightly more strategically than men, though these differences are small and more sensitive to model specifications. Notably, the observed differences in strategic voting by age and income tend to exacerbate known inequalities in political participation,[7] although the scale of the voting differences we observe is substantially smaller than the corresponding turnout differences. We show that differences in strategic responsiveness by age and income are not easily explained by measurement error or differences in voters' accuracy of beliefs; there is some evidence, however, that older voters vote more strategically because they approach voting more pragmatically than younger voters do.

We emphasize that our focus in this paper is on whether voters *vote* strategically (and how this varies across voters), not whether voters *think* strategically. Others may ask to what extent voters engage in valid strategic reasoning, e.g. whether they have beliefs about the likelihood

[6] It is most straightforward to apply our methods to other plurality systems, but the general approach applies more broadly. The measurement of preferences is more challenging in systems where coalition government is the norm, as discussed in footnote 16.

[7] For age, see e.g., Smets and van Ham (2013); Wolfinger and Rosenstone (1980); Swaddle and Heath (1989); Denver and Johns (2012); for income, see e.g., Verba, Schlozman and Brady (1995); Lijphart (1997); Swaddle and Heath (1989); Smets and van Ham (2013); Denver and Johns (2012).

that their vote is pivotal in various ways, whether they vote in a way that is consistent with their beliefs about pivotality, whether they refer to this process of strategic thinking when they explain their vote. By contrast, we ask to what extent voters vote in a way that advances their interests (given the objective strategic incentives they face) whatever the thought process that leads to their vote: after all, the effect of a given vote is the same whether the voter thought strategically based on good information about likely outcomes, thought strategically based on *bad* information about likely outcomes, used a simple heuristic, or was simply instructed how to vote by her friends. Our approach may reveal less about voters' thought processes, but we believe it says more about possible differences in voters' ability to obtain desired outcomes in elections.

In brief, this paper makes four main contributions. First, it focuses attention on a mostly overlooked but normatively relevant question: who votes more strategically? Second, it offers a new measure of voting behavior (strategic responsiveness) that provides a better basis for comparison. Third, it defines and shows how to estimate a new, theoretically grounded measure of tactical incentives that is used both to measure and to compare strategic responsiveness across groups. Fourth, it applies these innovations to provide new evidence about inequalities in strategic voting in the British electorate. It remains to be seen whether the inequalities we find are specific to the setting we study, but the approach we introduce can be used to investigate the generalizability of our results.

A new approach to measuring and comparing strategic voting

To determine whether some voters vote more strategically than others, we must first clarify what it means to vote strategically, decide how "strategic-ness" should be measured, and develop a feasible strategy for measuring and comparing strategic voting across voters. We address each of these issues in turn before summarizing our approach.

Notation and terminology

A representative voter decides how to vote in a plurality election involving K candidates. Denote by $\mathbf{p}(j) = \{p_1(j), p_2(j), \ldots, p_K(j)\}$ the probability that each candidate is elected conditional on

the voter voting for candidate j. ($\mathbf{p}(j)$ differs from $\mathbf{p}(k)$ to the extent that a single vote may decide the outcome. We discuss the interpretation and estimation of these probabilities below.) Denote by u_j the Von Neumann-Morgenstern (VNM) utility the voter receives as a result of candidate j being elected, which might reflect the perceived effect of electing that candidate on policy outcomes (including through government formation) or the voter's satisfaction with being represented by that candidate in policy debates. We will refer to u_j as outcome-based utility because it depends on which candidate is elected but not on which candidate the voter votes for. Denote by $\mathbf{u} = \{u_1, u_2, \ldots, u_K\}$ the vector of these utilities, one for each candidate; label the candidates such that $u_1 > u_j \; \forall \; j > 1$, i.e. such that candidate 1 is the voter's favorite. Note that $\mathbf{p}(j) \cdot \mathbf{u}$ is the voter's expected outcome-based utility given a vote for candidate j.

We can now define key terms that we use throughout the paper:

Definition A *sincere vote* is a vote for candidate 1; an *insincere vote* is a vote for another candidate.

Definition Among insincere votes, the *best insincere vote* is the one that maximizes expected outcome-based utility, i.e. it is a vote for a candidate $j > 1$ such that $\mathbf{p}(j) \cdot \mathbf{u} \geq \mathbf{p}(k) \cdot \mathbf{u}$ for all $k > 1$.

We focus on the *best* insincere vote because it helps us distinguish strategic voting from protest voting and other types of insincere behavior.

Definition The *tactical voting incentive*, τ, is the difference in expected outcome-based utility between the best insincere vote and a sincere vote:

$$\tau \equiv \max_{j>1} \mathbf{p}(j) \cdot \mathbf{u} - \mathbf{p}(1) \cdot \mathbf{u}. \tag{1}$$

Thus τ measures the maximum expected benefit (or minimum expected cost) of an insincere vote.

Definition *Purely strategic voting* means casting the best insincere vote when $\tau > 0$ and otherwise casting a sincere vote.

Departures from purely strategic voting

Voters may deviate from purely strategic voting for several reasons. They may be expressive, in the sense that they value voting according to their true preferences (Hamlin and Jennings, 2011). They may care about future policy outcomes and believe that their vote affects those outcomes directly or by affecting future elections (Franklin, Niemi and Whitten, 1994; Piketty, 2000; Castanheira, 2003). Or they may make a mistake due to poor information or incorrect reasoning.

To simply formalize these ideas, suppose a representative voter receives benefit $b \geq 0$ from voting for candidate 1 (which captures the expressive benefits and perceived policy benefits of a sincere vote);[8] suppose also that ε measures the voter's misperception of τ, so that if the true tactical incentive is τ the voter perceives a benefit of $\tau - \varepsilon$. Then the voter casts a best insincere vote when $\tau > b + \varepsilon$ and otherwise votes sincerely, and $b + \varepsilon$ captures the degree to which she overvalues a sincere vote relative to the best insincere vote due to expressiveness, perceived effects of the vote on policy, and misperceptions.

We hypothesize that no voter is either purely strategic or completely unresponsive to strategic incentives: in terms of the simple model just introduced, no voter approaches every voting decision with $b + \varepsilon = 0$ or $|b + \varepsilon| = \infty$.[9] Voters may differ in how closely their behavior approximates the pure strategic ideal of $b + \varepsilon = 0$, however, and it is this variation that we seek to understand.

Strategic responsiveness

As noted above, a purely strategic voter is one who casts a best insincere vote when $\tau > 0$ and otherwise votes sincerely. Let y_i be 1 if voter i casts a best insincere vote and 0 otherwise, and let τ_i be the tactical incentive faced by voter i. We propose *strategic responsiveness* (SR) as a measure of how closely the voting behavior of a voter or collection of voters approximates pure

[8] Spenkuch (2018) calls this a "sincerity bias".

[9] In support of the idea that every voter acts strategically when pushed hard enough, consider the Kevin Costner movie *Swing Vote* (2008), in which two U.S. presidential candidates tie for first in New Mexico (with the Electoral College in the balance) and the protagonist, whose vote was not registered in the initial count, has the chance to cast a new ballot. The question never arises whether he will vote for one of the frontrunners, even though there are six candidates shown on the ballot in an early scene.

strategic voting:

$$\text{SR} \equiv E[y_i \mid \tau_i > 0] - E[y_i \mid \tau_i \leq 0].$$

In words, SR is the difference in the proportion of best insincere votes when such a vote maximizes the voter's expected outcome-based utility and when it does not.[10] If we view $\tau_i > 0$ as "treatment" and $\tau_i \leq 0$ as "control", then SR is the effect of treatment on the probability of casting the best insincere vote; our objective is to measure heterogeneity in this treatment effect across types of voters. SR is at a maximum of 1 for purely strategic voters, at a minimum of -1 for voters who vote insincerely when they should vote sincerely and vice versa, and zero for voters whose probability of a best insincere vote is unrelated to the tactical incentive τ_i.

Strategic responsiveness innovates on previous measures of strategic behavior in three respects. First, it rewards insincere voting only among the subset of voters for whom an insincere vote is actually optimal (subject to measurement error in τ_i), i.e. those with $\tau_i > 0$. (By contrast, many previous approaches measure insincere voting among voters for whom an insincere vote *may be* optimal, for example because their favorite candidate finishes third or lower, e.g. Blais and Nadeau (1996); Fisher (2001); Alvarez, Boehmke and Nagler (2006); Merolla and Stephenson (2007).) Second, by focusing on the proportion casting the best insincere vote rather than the proportion casting any insincere vote, our measure tends to limit the role of protest voting and other insincere behavior in settings with more than three candidates. (When there are only three candidates, a vote for one's second choice is always the best insincere vote.) Third, it punishes voters who cast a best insincere vote when a sincere vote is actually optimal, i.e. when $\tau_i < 0$; these votes may be due to misperception or the desire to send a message, and therefore represent departures from purely strategic voting as we define it.[11]

Comparing strategic responsiveness

To compare strategic responsiveness across two types of voters, we suggest the diff-in-diff-like regression

$$E[y_i] = \beta_1 W_i + \beta_2 I\{\tau_i > 0\} + \beta_3 W_i \times I\{\tau_i > 0\} + g(\tau_i), \tag{2}$$

[10] We include those for whom $\tau = 0$ in the second group, but this is arbitrary and inconsequential.

[11] They could also be correct insincere votes that we misclassify due to measurement error in τ_i, e.g. because of discrepancies between the voter's VNM utilities and the proxies we observe.

where y_i indicates whether voter i casts a best insincere vote, W_i indicates voter i's type (e.g. male vs. female),[12] $I\{\tau_i > 0\}$ indicates whether the voter benefits from an insincere vote, and $g(\tau_i)$ is a flexible function of τ_i. Omitting $g(\tau_i)$, β_3 measures the raw difference in SR across levels of W_i. Including $g(\tau_i)$, β_3 measures the difference in SR controlling for τ, which addresses concerns that the intensity of treatment (i.e. the magnitude of τ) might differ across types of voters conditional on the sign of τ.

The simple conceptual model above justifies this control strategy: to isolate differences in $b + \varepsilon$ across groups, we want to compare voting behavior conditional on τ, which is the only possible confounding variable in that model. By contrast, most previous literature controls additively for various proxy measures that might be correlated with τ.[13] A key advantage of our approach is that, because τ is a scalar, we can use less parametric functional forms and present results more transparently; also, unlike many of the standard measures of preference intensity and competitiveness, τ is easily extended to elections with any number of candidates.

Of course, for τ to make sense as a control variable we must believe that the scale of the utility measure used to compute τ is roughly comparable across groups being compared. (Note, however, that scale comparability is not necessary for the sign of τ to correctly indicate whether the voter benefits from a tactical vote or not.) This scale comparability assumption is difficult if not impossible to test, though a similar assumption is made by all previous studies that use party or candidate ratings as control variables (e.g. Fisher, 2001; Merolla and Stephenson, 2007; Fisher and Myatt, 2017) and Fisher (2001) shows that measures of party preference intensity constructed from such ratings (which we will use below when measuring τ) are a strong predictor of vote choice.[14] As it happens, the results of this paper do not depend on whether we control

[12] In cases where one wants to divide the electorate into three types (e.g. low, middle, and high income), the regression includes two interactions, one comparing the middle type to the lowest type and the other comparing the highest type to the lowest type.

[13] Previous control variables include the margin between the top two candidates (e.g. Niemi, Whitten and Franklin, 1992), the distance between the voter's preferred candidate and the leaders (e.g. Niemi, Whitten and Franklin, 1992; Evans, 1994), and the size of the preference "gaps" between the voter's first- and second-favorite and second- and third-favorite candidates (e.g. Fisher, 2001). Fisher (2001) also controls for a variable (referred to in Fisher and Myatt (2017) as Λ) that encodes the voter's preference order and voting context separate from preference intensity. Appendix A.2 relates Λ to τ.

[14] In favor of this assumption, survey questions that elicit candidate/party/leader ratings typically associate numerical responses with anchoring phrases (e.g. 0 means "strongly dislike" in the CSES and BES), which may encourage different voters to use the scale in a similar way. Testing the assumption would require measuring how ratings correspond to other observable measures of preference and comparing this correspondence across groups.

for τ (and thus do not depend on scale comparability), but in general we advocate controlling for τ as the best way to address potential differences in strategic contexts across groups of voters being compared.

Measuring tactical incentives

Measuring and comparing strategic responsiveness requires measuring τ, which in turn requires (for each voter) measures of (1) the voter's VNM utility from electing each candidate and (2) the probability of each candidate being elected as a function of the voter's vote.

For (1), we suggest using voters' numerical ratings of candidates, parties, and/or party leaders such as are commonly included on voter surveys such as the Comparative Study of Election Systems (CSES).[15] Research in health economics has shown that the numerical ratings patients assign to hypothetical health states (e.g. mild back pain, loss of a limb) are imperfect but suitable proxies for VNM utility measures elicited using "standard gamble" methods (e.g. Dolan and Sutton, 1997; Drummond et al., 2015; Brazier et al., 2016), which suggests that numerical ratings could also capture VNM utilities over candidates or parties. In many surveys voters are asked to rate parties and party leaders, and in some they are asked to rate candidates; in this paper we focus on party ratings and show similar results using leader ratings (Appendix C). A key question is whether giving a high rating to a party means the same thing as wanting to *elect* a candidate from that party. One reason it might not is that voters may consider how electing an MP from each party is likely to affect government formation or policymaking (e.g. Bargsted and Kedar, 2009; Duch, May and Armstrong, 2010), which could in turn create a difference between preferences over candidates/parties in the abstract and preferences about who gets elected; thus a voter who most prefers the Greens in the abstract might prefer to see a Labour MP elected in her constituency, believing that an extra Labour MP diminishes the chance of a Conservative government (and raises the chance of a preferred Labour government) more than an extra Green MP.[16] To the extent that true VNM utilities do not map linearly

[15] One could also consider relative issue position (Alvarez and Nagler, 2000), issue ownership on salient positions (Bélanger and Meguid, 2008), or other factors.

[16] In our view, coalition-directed strategic voting and similar phenomena enter at the preference formation stage (where voters determine their utility from electing each candidate $\mathbf{u}$ given their raw preferences over candidates/parties $\tilde{\mathbf{u}}$ and beliefs about likely aggregate election outcomes), while the strategic voting on which we focus occurs at the vote choice phase (where voters decide on a vote given $\mathbf{u}$ and beliefs about constituency-

onto the proxies being used (for whatever reason), there will be measurement error in τ and possibly bias in SR. Given our goal of comparing strategic responsiveness across types of voters, we arrive at fundamentally incorrect conclusions only if this measurement error affects different types of voters differently;[17] we assess differential measurement error below.

For (2), we suggest extracting election probabilities from a model of counterfactual elections that matches observed results on average but reflects the objective (un)predictability of elections as reflected in forecasting errors. Following Fisher and Myatt (2017) (see also Myatt and Fisher, 2002), we model the vote shares of each candidate in an election using a Dirichlet distribution with parameter vector $s\mathbf{v} \equiv \{sv_1, sv_2, \ldots, sv_K\}$, where $\mathbf{v}$ is the vector of expected vote shares and s is a precision parameter. Like Fisher and Myatt (2017), we set $\mathbf{v}$ equal to the vector of vote shares that is actually observed in each constituency.[18] We then use a maximum likelihood procedure to choose the value of the precision parameter s that makes constituency-level forecasts as unsurprising as possible, given that $\mathbf{v}$ is the observed result. We thus calibrate the precision of the model to match the uncertainty facing the most well-informed observers in advance of elections (arising from e.g. sampling variation in polls, scientific error in modeling vote choice and turnout, unexpected events that occur between the forecast and the election); we take this to be the best estimate of the true underlying variability of election outcomes.[19]

Given this model of counterfactual election outcomes, we next extract the probabilities required to estimate τ. In Appendix A we show that τ can be estimated as a function of pivot probabilities – the probability of each pair of candidates tying for first place – and utilities only, ignoring events in which any candidate wins by more than one vote. Fisher and Myatt (2017) derived an analytical expression for these probabilities in three-candidate elections (with

level election outcomes). Ideally we would have both sets of utility measures for each voter ($\mathbf{u}$ and $\tilde{\mathbf{u}}$), which would allow us to separately assess both aspects of strategic voter behavior.

[17] If measurement error causes the same bias in SR for all types of voters, differences in SR across types of voters will be unbiased; if measurement error attenuates SR by the same factor for all types of voters, differences in SR across types of voters will be similarly attenuated but correct in sign.

[18] Thus we assess the extent to which different types of voters best-respond to a noisy version of other voters' actual votes. In Appendix C we reproduce the analysis with $\mathbf{v}$ set equal to the forecasted vote shares, yielding almost undistinguishable results.

[19] In the theoretical literature on voting, this uncertainty would encompass both idiosyncratic uncertainty (which becomes inconsequential in large electorates) and aggregate uncertainty (which does not). See e.g. Good and Mayer (1975); Myatt (2007). In Appendix C we show the core results at lower precision levels, yielding broadly similar results.

Dirichlet beliefs).[20] To accommodate more than three candidates, we first make an independence assumption: letting $x_1, x_2, \ldots, x_K$ denote a vector of realized vote shares, we assume that (for any indexing of the candidates)

$$\Pr(x_1 = x_2 = y, x_3 < y, \ldots, x_K < y) \approx \Pr(x_1 = x_2 = y) \prod_{i=3}^{K} \Pr(x_i < y \mid x_1 = x_2 = y).$$

(In words, we assume that the probability of candidates 1 and 2 tying for first at a vote share y is the same as the probability of candidates 1 and 2 each receiving vote share y times the (conditional) probability of candidate 3 receiving less than y times the (conditional) probability of candidate 4 receiving less than y, etc.) Using the aggregate property of the Dirichlet distribution (Frigyik, Kapila and Gupta, 2010), and letting $\mathrm{Dir}(\mathbf{x}; s\mathbf{v})$ denote the Dirichlet density with parameters $s\mathbf{v}$ evaluated at $\mathbf{x} = \{x_1, x_2, \ldots, x_K\}$, the probability of a tie for first between candidates 1 and 2 (given n voters) is then approximately

$$\frac{1}{n} \int_{\frac{1}{K}}^{\frac{1}{2}} \mathrm{Dir}\big(y, y, 1-2y; sv_1, sv_2, s(1-v_1-v_2)\big) \prod_{i=3}^{K} \int_0^y \mathrm{Beta}\big(\frac{z}{1-2y}; sv_i, s\sum_{j=3}^{K} v_j - sv_i\big) dz\, dy, \quad (3)$$

which can be computed by numerical integration. Appendix A explains this derivation further, shows that the resulting estimates match simulation-based estimates at much lower computational cost, and relates tie probabilities to election probabilities.

To be clear, we do not assume that the model of election results we use to compute τ reflects the beliefs of the typical voter, nor that voters are capable of reproducing our calculations to compute τ; rather, τ is meant to capture the voter's objective strategic situation, which is closer to how it would be perceived by an expert forecaster who knows the voter's preferences. This reflects our overall aim, which is to measure the extent to which different types of voters cast the best insincere vote when they *objectively* should and vote sincerely otherwise. Given this aim, discrepancies between voters' perceptions and the objective reality (as we model it) are one reason why voters may depart from the strategic ideal (via ε in the model above). Other researchers may seek instead to measure the extent to which voters' vote choices are consistent with voters' own subjective beliefs about the strategic implications of their vote; this

[20] Other notable approaches to this problem include Hoffman (1982) and Palfrey (1989).

would require a different model of beliefs and a different interpretation of resulting differences in strategic responsiveness, but could otherwise closely reflect our method. Still other researchers may seek to predict voter behavior, in which case the best approach may be considerably different from our own: past vote choice and simple heuristics such as "vote for your favorite viable party" may be better predictors of voting behavior than τ.

Summary of our approach

Given a measure of a voter's VNM utility from each possible election outcome and a measure of the probability of each election outcome as a function of the voter's vote, one can estimate the maximum expected benefit of an insincere vote (relative to a sincere vote) for the voter. We call this τ. A purely strategic voter casts an insincere vote if τ is positive and a sincere vote otherwise. Voters may not be purely strategic for various reasons.

To measure how closely voters approximate purely strategic voting, we take the difference between the probability of the best insincere vote when $\tau > 0$ and when $\tau \leq 0$. We call this measure *strategic responsiveness* (SR). To measure τ, we use observed results and election forecasts to build a counterfactual model of election results and combine these with the voter's numerical ratings of parties, leaders, and/or candidates. To address the possibility that different groups of voters face different types of voting situations, we suggest using τ as a single, flexible, scalar control variable that arises from a theoretically coherent model of vote choice. The effectiveness of τ as a control variable relies on the assumption that different voters use the utility scale similarly, but others have made a similar assumption and the alternative of ignoring preference intensity is unappealing.

Tactical incentives in the British electorate

We apply our framework to data from the internet panels of the British Election Study (BES) for the 2005, 2010, and 2015 general elections.[21] In this section we describe how we estimate tactical incentives in the British case, including illustrative examples, and briefly characterize

[21] See Clarke et al. (2006), Sanders and Whiteley (2014), and Fieldhouse et al. (2017) for the 2005, 2010 and 2015 BES data, respectively.

the distribution of tactical incentives in the data.

Voter preferences

As proxies for utility scores, we use voters' ratings of the parties competing in their constituency. Specifically, BES respondents are asked, "On a scale that runs from 0 to 10, where 0 means strongly dislike and 10 means strongly like, how do you feel about the [e.g. Labour] Party?"[22] The BES's post-election wave asks voters to rate the major parties immediately after the election (with the large majority of ratings being given during the three days following the election); in 2005 and 2010 the BES post-election wave did not ask about smaller parties, so we obtain these ratings for all years from the pre-election wave of the panel, which takes place around six weeks before the election.[23]

In cases where a voter gives two or more parties the same top rating on the 0-10 scale, we identify the voter's preferred candidate/party using questions in which the voter is asked whether they feel closer to any particular party. If the tie is between parties A and B but the voter indicates she feels closest to party C, we exclude the voter from analysis on the basis that her preferences are inconsistent. We also exclude voters who provide like-dislike scores for fewer than three parties and those who respond that they did not vote, do not know how they voted, or refuse to report how they voted.[24] This leaves a sample of 24,923 respondents, with the number per survey being 4,778 (2005 BES) 11,539 (2010 BES), and 8,606 (2015 BES).[25]

Probability of ties for first

As noted above, our model of counterfactual election outcomes is a Dirichlet distribution centered on the actual election outcome, with the variance parameter tuned to maximize the likelihood of forecasts of constituency vote shares.[26] Calibration on the 2005, 2010, and 2015

[22] In the Appendix we report similar results based on ratings of party leaders.

[23] In Appendix C we show that results for 2015 are similar using only post-election ratings or leader ratings.

[24] Appendix C shows that our main findings are robust to extreme assumptions about how strategic responsiveness might vary between excluded and included respondents.

[25] The total number of respondents is 5,910 (2005), 13,356 (2010) and 19,986 (2015); only about half of 2015 respondents (randomly chosen) were asked the party like-dislike question, which is why our estimation sample is smaller in 2015 than in 2010.

[26] For the 2010 and 2015 elections, we use final pre-election constituency vote share estimates published by `www.electionforecast.co.uk` (Hanretty, Lauderdale and Vivyan, 2016) on the basis of polls and past elections results. For the 2005 election, we use the final pre-election poll published by ICM to calculate the national swing

UK elections produced a level of precision corresponding to $s = 85$. At this level of precision, the standard deviation of support for a party with mean support of 0.3 is .05; the standard deviation of support for a party with mean support of .10 is .032. The results of our analysis are nearly indistinguishable if we instead center the distribution on the forecasted outcomes (as shown in Appendix C); this is because forecasts are rarely incorrect about which parties are competitive in a given constituency, even if they sometimes fail to identify the eventual winner. The results are also similar (as shown in Appendix C) if we assume higher levels of aggregate uncertainty by setting s to 20 (which roughly doubles the variance of the party vote shares) or to 12 (which is the level of uncertainty Fisher and Myatt (2017) ascribe to British voters in recent elections).

Figure 1 shows two election results (the Oxford West & Abingdon constituency and the Colne Valley constituency in 2010, left top and left bottom) along with the probability of each possible tie for first calculated by our method.[27] In Oxford, the Conservative candidate very narrowly defeated the Liberal Democrat, with Labour in a distant third and UKIP and the Greens further back. Our procedure estimates the probability of a tie for first between the two leading candidates as about 8 in 100,000, with all other tie probabilities indistinguishable from zero at this scale.[28]

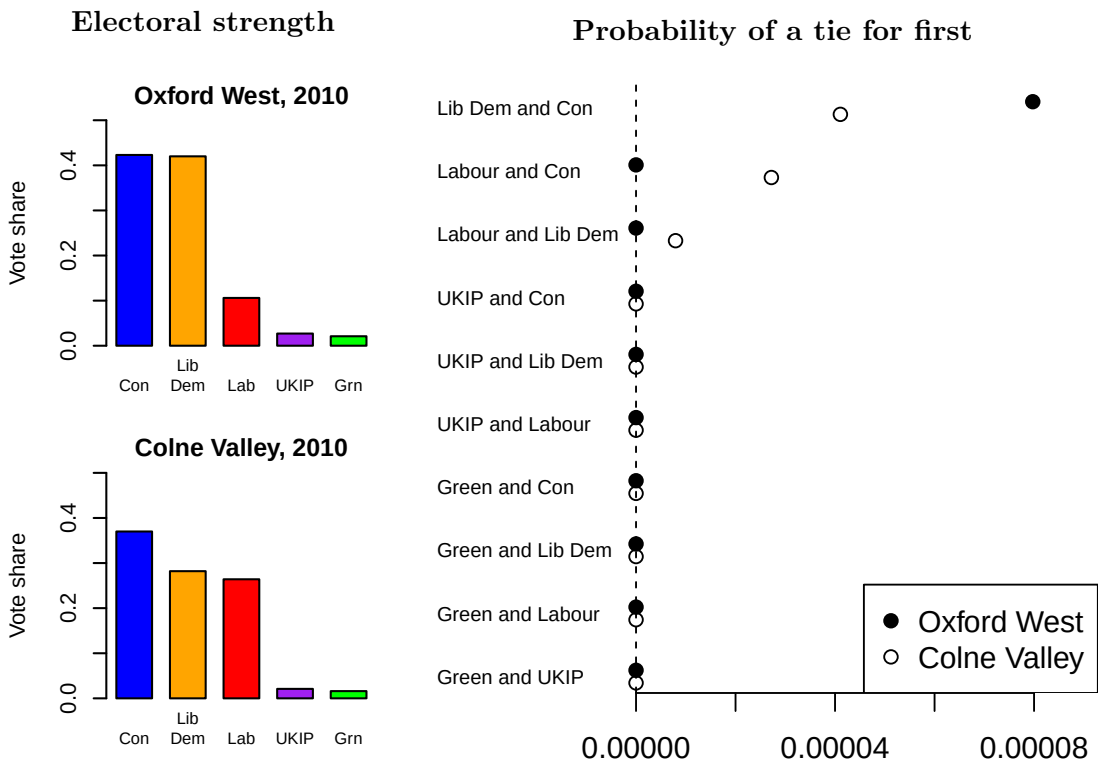
The order of finish in Colne Valley was the same, but the Conservative candidate won with a larger margin and Labour finished narrowly behind the Liberal Democrat. The probability of a tie for first between the Conservative and the Liberal Democrat is about half as large in Colne Valley as in Oxford West, reflecting the larger margin; the probability of a tie for first involving the Labour candidate and the Conservative is only slightly lower, followed by the Labour-Liberal Democrat pair, with all of the others effectively zero.

for each party compared to 2001 and add these estimated changes to the 2001 constituency vote shares.

[27] We assume in all cases that the electorate size is 50,000, which is roughly typical of the elections we study.

[28] Readers may wonder whether voters would realistically distinguish a pivot probability of 8/100,000 from zero when deciding how to vote. As noted above, this paper examines whether voters behave as if they were maximizing expected outcome-based utility, but it takes no position on how they arrive at their decisions.

Figure 1: Electoral strength and pivot probabilities: two examples



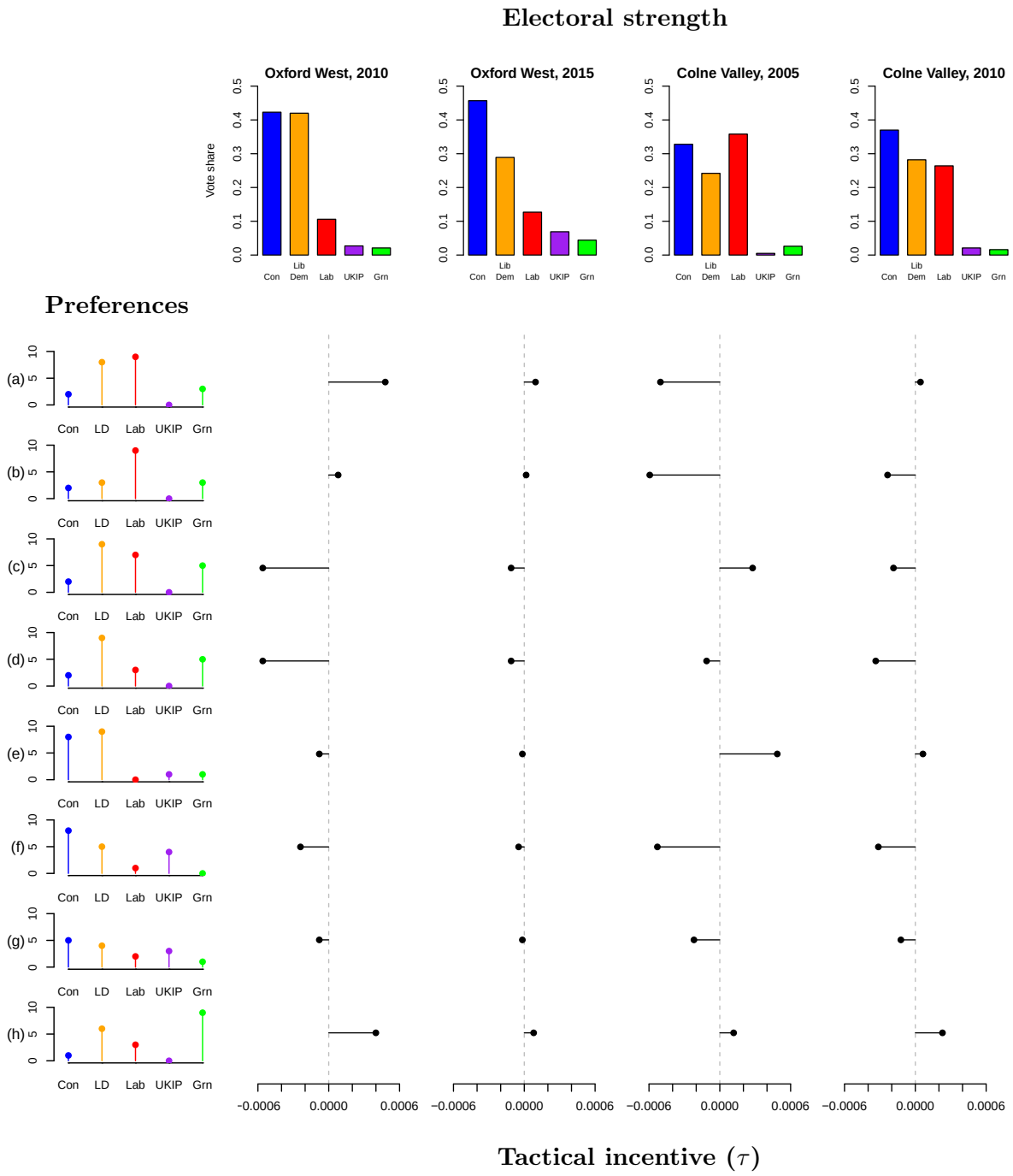
NOTE: We use a Dirichlet distribution to model counterfactual election outcomes based on observed results. The right panel shows the estimated probability of a tie for first between each pair of parties based on the 2010 election results (shown in the left panel) in Oxford West & Abingdon (solid circles) and Colne Valley (open circles).

Tactical incentives: examples and distribution

In Figure 2 we provide examples to illustrate how the tactical incentive τ relates to voter preferences and the electoral context. Along the left side of the figure we depict eight sets of preferences, labeled (a)-(h), where in each diagram the height of the dot corresponds to the rating the voter assigns to the party on the 0-10 like-dislike scale. Along the top of the figure we characterize the electoral strength of the five parties in four contests: the Oxford West & Abingdon constituency in 2010 and 2015, and the Colne Valley constituency in 2005 and 2010 (note that we plotted tie probabilities for the first and fourth of these contests in Figure 1 above). In the center of the figure we plot the tactical incentive τ for each combination of preferences and electoral contests, for a total of thirty-two examples.

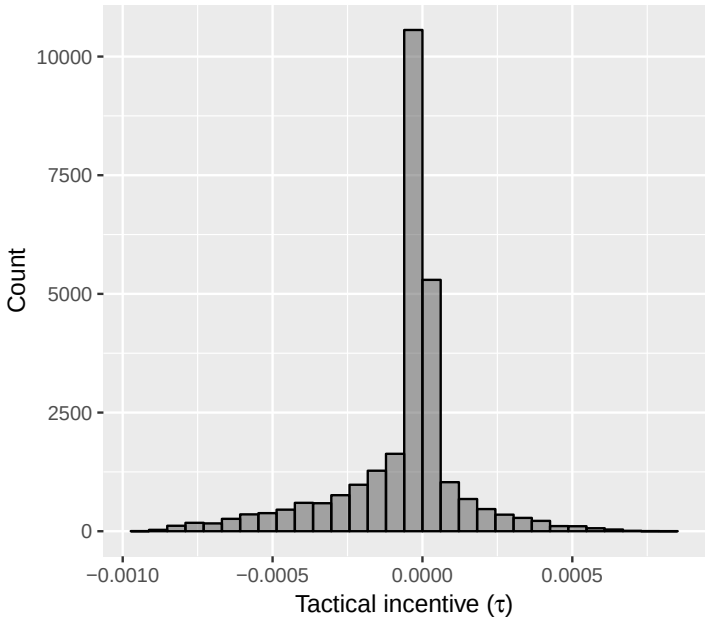
We can summarize the lessons of Figure 1 as follows. When only two candidates could realistically tie for first, as in the Oxford elections shown here, tactical incentives are relatively simple: the sign depends on whether the voter's preferred candidate is a frontrunner, while the magnitude depends on both the strength of the voter's preference between the frontrunners and how close the election is between them. When three candidates are competitive, as in the Colne Valley elections, some things remain straightforward: a voter who prefers the leader will have a negative tactical incentive, while a voter who prefers a hopeless candidate (and has preferences among the frontrunners) will have a positive tactical incentive; in both cases the magnitude depends on preference intensity and the chance of a tie. But other subtleties arise: a voter whose most preferred candidate is running second or third may or may not benefit from an insincere vote, depending on the voter's preferences and the candidates' relative electoral strength. For example, consider the Colne Valley election in 2010, in which Labour finished third. A Labour supporter who rates the Liberal Democrats almost as highly as Labour (preference profile (a), first row) would benefit from an insincere vote for the Liberal Democrat, while a Labour supporter who rates the Liberal Democrats almost as low as the Conservatives (preference profile (b), second row) would do better with a sincere vote for Labour. A similar reversal takes place in the same election between preference profiles (d) and (e): a voter whose favorite candidate is running second is better off with a sincere vote when she strongly prefers her favorite to the frontrunner (preference profile (d), fourth row), but when she is nearly

Figure 2: Tactical incentives for different preferences in different elections



NOTE: Each column of dots shows the tactical incentive (τ) for a different hypothetical voter given electoral results indicated by the bar chart at the top of the column. The party preferences of these hypothetical voters are indicated by the diagrams along the left. For example, the third dot from the top in the left-most column shows that τ is roughly -0.0006 for a voter in Oxford West & Abingdon in 2010 who assigns ratings of 2, 9, 7, 0, and 5 to the Conservatives, Liberal Democrats, Labour, UKIP, and Greens.

Figure 3: Distribution of tactical incentives in the BES sample



NOTE: The histogram shows the distribution of tactical incentives (τ) in our BES sample. About one-third of respondents have $\tau > 0$, indicating that a tactical vote would maximize their (short-term) outcome-based utility.

indifferent between the two frontrunners and strongly opposed to the third-place candidate, she is best off with an insincere vote (preference profile (e), fifth row).[29]

Figure 3 shows a histogram of tactical incentives in the BES sample. The distribution is clearly unimodal, with the mode being slightly below zero (indicating that a sincere vote is slightly more beneficial than a tactical vote). This makes sense if most voters' favorite party is a local frontrunner and most elections are not decided by narrow margins. Approximately 1/3 of all respondents have a positive tactical incentive. The largest observed value of τ is around .0008; thus no voter can expect their rating of the winner to increase by more than .0008 points on the 0-10 like-dislike scale from voting strategically.[30]

[29]The possibility of a benefiting from an insincere vote in this circumstance was shown by Kselman and Niou (2010) and proven for Dirichlet beliefs by Fisher and Myatt (2017).

[30]Recalling that the probability of a tie between the Conservative and the Liberal Democrat in Oxford West was around .00008, note that a voter in that constituency who rates the Greens and Lib Dems 10 (and indicates she identifies with the Greens) and rates the Conservatives 0 would have a τ around .0008.

Table 1: Raw strategic responsiveness in 2005, 2010 and 2015 BES samples

	$\tau \leq 0$	$\tau > 0$
Number of observations	16857	8066
Number casting best insincere vote	586	3124
Proportion casting best insincere vote	0.035	0.387
Strategic responsiveness	$0.387 - 0.035 = 0.353$	

Measuring and comparing strategic behavior in the British electorate

Aggregate strategic responsiveness

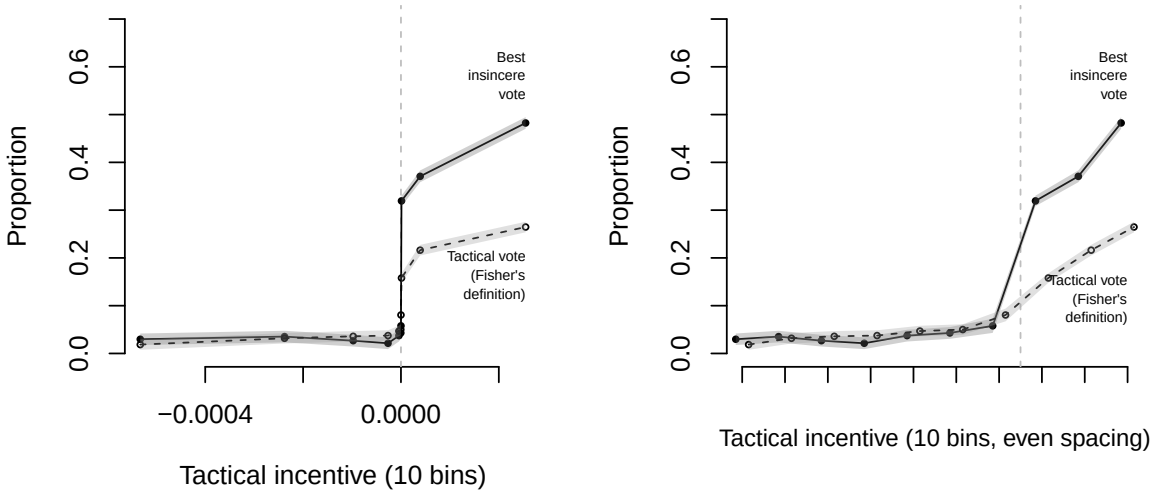
Before using our measure of τ to investigate heterogeneity in strategic responsiveness across types of British voters, we first briefly examine voting behavior in the entire sample as a function of τ both to validate the measure and to establish links to previous studies of tactical voting in the British electorate.

Table 1 describes strategic voting behavior for the whole British electorate over the three elections we study. The probability of casting a best insincere vote is low when $\tau \leq 0$: of the nearly 17,000 BES respondents who faced $\tau \leq 0$, 3.5% (586) do so. In contrast, the probability of casting a best insincere vote jumps substantially when τ is positive: of the roughly 8,000 BES respondents who faced $\tau > 0$, 38.7% (3,124) do so. Aggregate strategic responsiveness – the difference between these two rates – is thus around .35.

Figure 4 shows how aggregate voting behavior depends on the tactical incentive τ for the entire BES sample. We focus first on the left panel. The solid line shows the probability of a best insincere vote as a function of τ. To estimate this function, we first construct ten nearly equal-sized bins of τ: we start with bins that contain the deciles of τ and then move the smallest (in absolute value) bin boundary to zero, such that no bin has observations with positive and negative τ. The figure shows the proportion of best insincere votes in each of these bins with 95% confidence intervals shown in the shaded area.[31] In the left panel of Figure 4, the dots are located along the horizontal axis at the mean value of τ within the corresponding bin. Because

[31] More specifically, we regress an indicator for whether the voter casts a best insincere vote on the set of bin indicators (with no intercept); the dots show the point estimates from these regressions and the shaded area connects the 95% confidence intervals for those point estimates.

Figure 4: Voting behavior as a function of τ: aggregate



NOTE: Each diagram shows two measures of strategic voting behavior as a function of τ. The solid line shows the proportion casting the best (i.e. the expected utility maximizing) insincere vote; the dashed line shows the tactical voting rate as measured by Fisher (2004), which is essentially the proportion who say their vote was a tactical vote. The left and right diagrams show the same information on a different horizontal scale, as explained in the text.

the bins are so close together near $\tau = 0$, in the right panel we show the same function where the bin means are equally spaced along the horizontal axis. The rate of best insincere voting clearly increases monotonically as τ becomes more positive.

The voting patterns in Table 1 and Figure 4 are broadly consistent with Kiewiet (2013) and Fisher and Myatt (2017), who each conclude (on the basis of disparate approaches) that roughly one-third of British voters strategically desert their preferred party when it is not locally viable. Note, however, that around half of voters in the highest decile of τ are willing to abandon a preferred candidate. The monotonic relationship between τ and the rate of insincere voting (given $\tau > 0$) suggests that any attempt to classify voters as strategic or sincere inevitably conflates voters' strategic orientation with the type of decisions they typically face.[32]

To further link our analysis to previous literature, the dashed line in Figure 4 shows the proportion of tactical votes according to Fisher (2004)'s definition, which essentially requires that the voter claimed that the vote was tactical and did not report preferences that contradict that claim. Measured in this way, the overall proportion is substantially lower but

[32]Thus Kawai and Watanabe (2013) express the proportion of strategic voters as a function of the electoral margin (p. 653).

the function has a similar monotonic shape.[33] Thus not only voters' reported votes but their reported explanations for their votes are responsive to τ, which offers validation of τ as a measure of tactical voting incentives. Further validation appears in Table B.2 in the Appendix, which shows that voting behavior is more responsive to τ among voters who have a greater sense of vote efficacy, who correctly anticipate the local winner, and (especially) who explicitly endorse a more strategic approach to voting.

Strategic responsiveness and social characteristics

We now assess whether voters with different social characteristics differ in their strategic responsiveness. We focus on heterogeneity by education, age, income, gender and ideological leaning. We choose these variables primarily because each is plausibly associated with – or in the case of ideological leaning, actively describes – preferences over political outcomes. The link between income and preferences over economic policies is well established (e.g. McCarty, Poole and Rosenthal, 2006; Gelman, 2008), but education and age are related to key emerging political cleavages in the US and UK, with more educated and younger voters tending to hold more socially liberal, cosmopolitan views (Ford and Goodwin, 2014; Inglehart and Norris, 2017). Regarding gender, past research also shows that men and women differ in their average preferences over gender roles and gender equality policies (Campbell, Childs and Lovenduski, 2009). Thus, substantial differences in strategic responsiveness by any of these characteristics would be a cause for concern on normative grounds, as it would suggest that types of voters who differ in their political preferences also differ in their ability to secure preferred electoral outcomes.

Of the five characteristics chosen, age and education have received attention in existing studies of heterogeneity in strategic behavior across voters. Neither Evans (1994) or Fisher (2001) find evidence that age is associated with tactical voting rates. Evans (1994) also finds no evidence that education is associated with tactical voting rates, but Fisher (2001) shows

[33] Best insincere votes when $\tau > 0$ are sometimes not coded as tactical according to Fisher's definition because the voter offers no explanation for the vote (as happens in 5% to 12% of cases, depending on the year), an ambiguous explanation (e.g. "I dread a Tory government" or "I disliked the alternative more"), or an explanation that contradicts the like/dislike scores (e.g. "I thought it was the best party"). Appendix C presents the core analysis using Fisher's definition.

Table 2: Raw strategic responsiveness by social characteristics

	Pr(best insincere vote)		Raw
	$\tau \leq 0$	$\tau > 0$	SR
Level 2 education or lower	0.03	0.38	0.35
Level 3 education	0.04	0.37	0.33
Level 4+ (uni. degree) education	0.04	0.41	0.37
Age below 30	0.03	0.32	0.28
Age 30 to 59	0.04	0.39	0.36
Age 60 plus	0.03	0.41	0.38
Low income	0.03	0.37	0.33
Med income	0.03	0.37	0.34
High income	0.04	0.43	0.40
Male	0.04	0.38	0.34
Female	0.03	0.40	0.36
Con. preferrer	0.03	0.37	0.34
Lab. preferrer	0.04	0.41	0.37

a positive relationship between education and tactical voting among voters voters who might benefit from voting tactically. Black (1978) and Merolla and Stephenson (2007) also find that measures of strategic incentives better explain voting behavior among more educated voters.

Table 2 shows how raw strategic responsiveness (SR) varies by social characteristic, again pooling the 2005, 2010 and 2015 BES samples. Rows 1-3 of the table indicate that, when we divide the sample into three groups according to educational attainment,[34] raw strategic responsiveness varies only moderately across these groups (SR = .35, SR = .33, SR = .37, respectively). Rows 4-6 of the table instead divide the sample by age and suggest quite substantial differences in strategic responsiveness, with voters aged below 30 notably less responsive (SR = .28) than voters aged between 30 and 59 (SR = .36) and 60 or above (SR = .38). Rows 7-9 divide the sample by income tercile and also reveal notable differences in strategic responsiveness, with high-income voters (those in the top income tercile in the sample) more responsive than their low- and medium-income counterparts (.40 vs. .33 and 0.34). The remaining rows show slightly higher strategic responsiveness among women than men (.36 vs. .34) and among voters who assign a higher like/dislike score to Labour than to the Conservatives (.37 vs. .34).

As noted above, a difference in strategic responsiveness between two groups of voters could

[34]The middle group ("Level 3 education") includes those who achieved A-level qualifications or equivalent; these qualifications would typically be completed at age 18. The lower group ("Level 2 or lower") has no qualifications or a qualification below this level (e.g. GCSE, typically completed at age 16), while the higher group ("Level 4+") received at least a university degree or equivalent.

arise because the two groups approach similar voting decisions differently or because the two groups face different types of voting decisions. We therefore compare strategic responsiveness across voter groups using the regression specification given above in equation 2, which controls for τ values.

To flexibly control for τ, we include dummy variables for the ten nearly equal-sized bins of τ we used for Figure 4 above, thus allowing the baseline propensity to vote tactically to vary across bins of τ.[35] We also include an indicator for each election year and, in models that control for bins of τ, we interact these bins with the election year indicators to allow baseline responsiveness to τ to vary across years.

Figure 5 shows our estimates of and 95% confidence intervals for β_3 from regressions like expression 2, both with and without controls for τ (solid and open circles, respectively). (Thus the open circles depict the differences in SR reported in Table 2.) The main takeaway is that the estimated differences in SR do not change much when we control for τ, which suggests the distribution of τ is fairly similar across these subsets (conditional on the sign of τ). The figure also shows that the larger differences in SR we reported in Table 2 are highly statistically significant; the Lab-vs-Con preferrer difference is also significant in both specifications and other differences are insignificant or marginally significant.

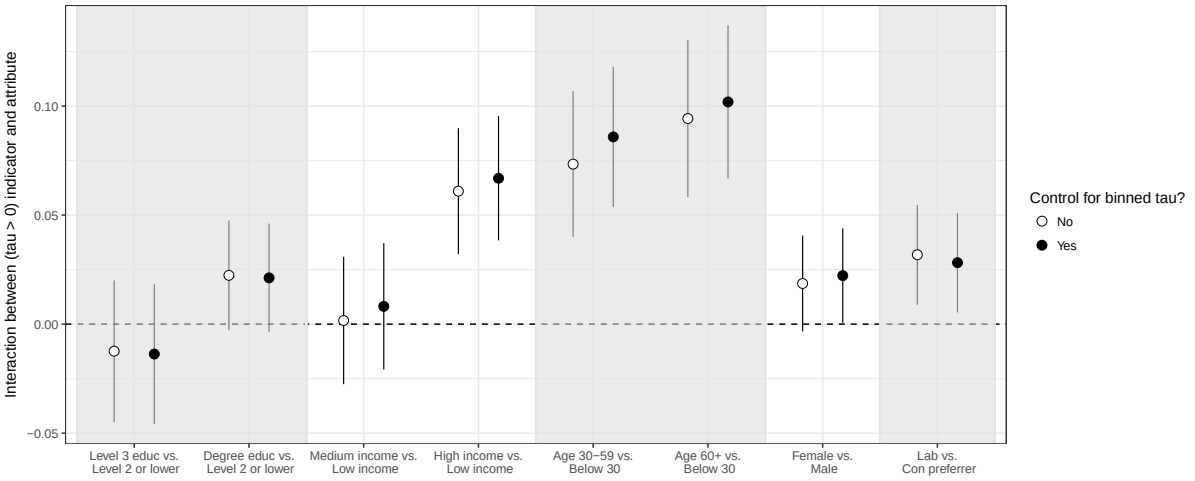
Figure 6 provides another view of the heterogeneity we detect in strategic behavior. Here we depict the rate of best insincere voting as a function of τ separately by social characteristic. In the cases where our regression analysis shows a significant difference in SR (especially age and income), the curvature of the function varies noticeably across groups.

How stable are these results when we break down our data by election year? Figure 7 shows the estimated interactions between group membership and $I\{\tau_i > 0\}$ when we estimate equation 2 separately by election year (2005, 2010, and 2015) and in all years pooled together, each time controlling for bins of τ.[36] Each point estimate in this figure comes from a separate regression. The pooled estimates (filled black dots) correspond to the estimates in Figure 5 that control for bins of τ. For age group, gender and ideological leaning, the point estimates of the

[35] Because of the way the bins of τ are designed, the $\beta_2 I\{\tau_i > 0\}$ term drops out of the regression where such bins are included.

[36] The election-year indicators and their interactions with τ bins are present in the pooled model but drop out in the year-specific models.

Figure 5: Heterogeneity in responsiveness to tactical incentive by social characteristics



NOTE: Each dot shows the estimated difference in strategic responsiveness between two groups of voters (β_3 in equation 2), with 95% confidence intervals shown by vertical lines. The closed (open) circles come from regressions with (without) controls for bins of τ.

interaction coefficients appear to be reasonably stable across election years. The interactions involving education and income levels vary more across years.

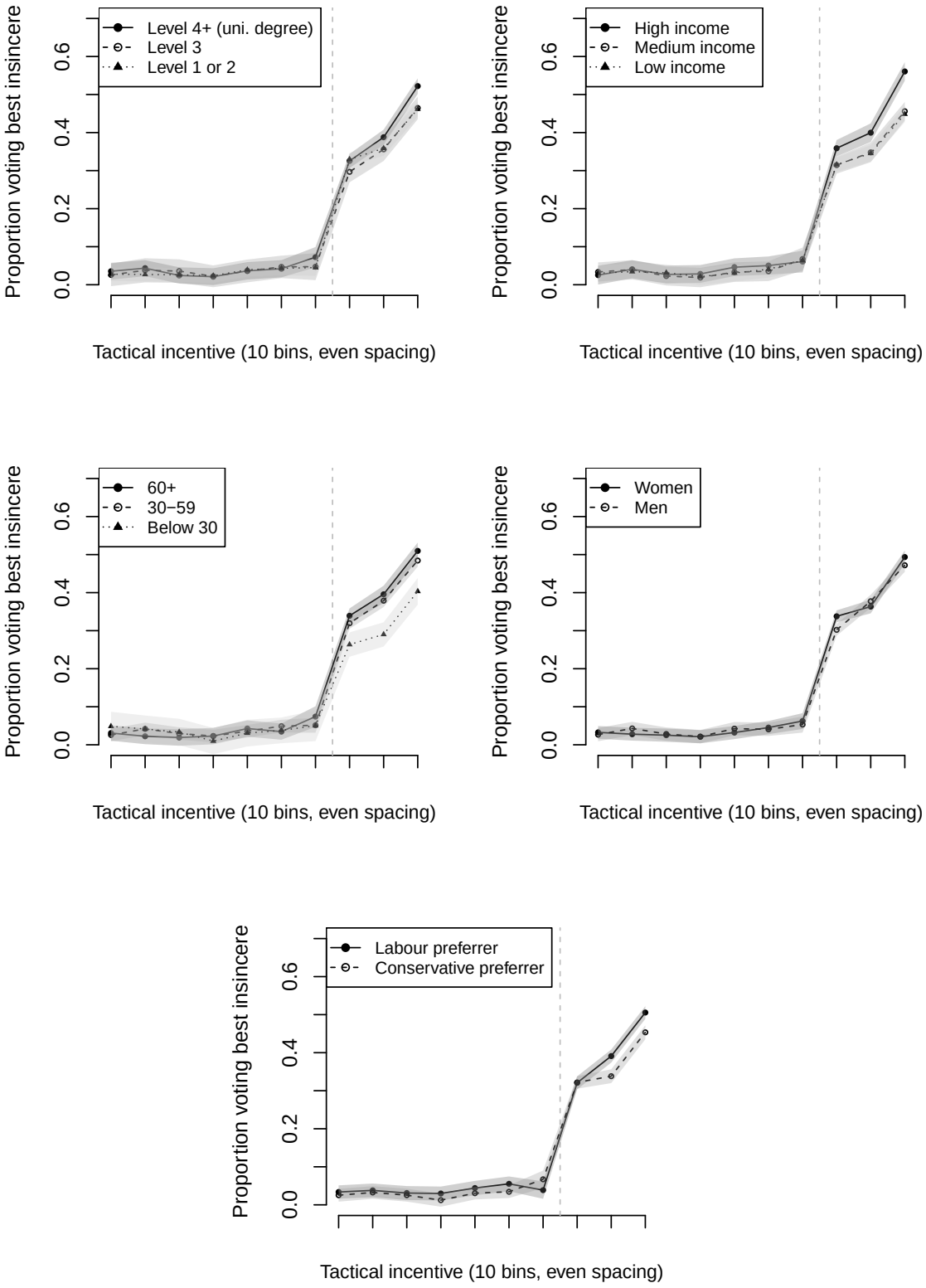
Putting magnitudes in context

To help put these results in context, we can compare the extent to which different types of voters in recent British elections are predicted to waste their vote due to departures from purely strategic voting (our focus) and due to failing to vote at all (i.e. abstention). Assuming that $\Pr(\tau_i > 0)$ is about 1/3 for all types of voters[37] and that (consistent with Table 2) the probability of an insincere vote (best or otherwise) when $\tau_i < 0$ is about the same for all types of voters, the difference in the proportion of votes wasted due to departures from purely strategic voting for two groups of voters is approximately 1/3 the difference in SR between the two groups of voters.[38] Based on Table 2, then, the difference in the wasted vote rate for young and old

[37]The observed proportion in our data is .34 for the youngest group vs. .31 for the older group and .33 for the poorest group vs. .32 for the richest group.

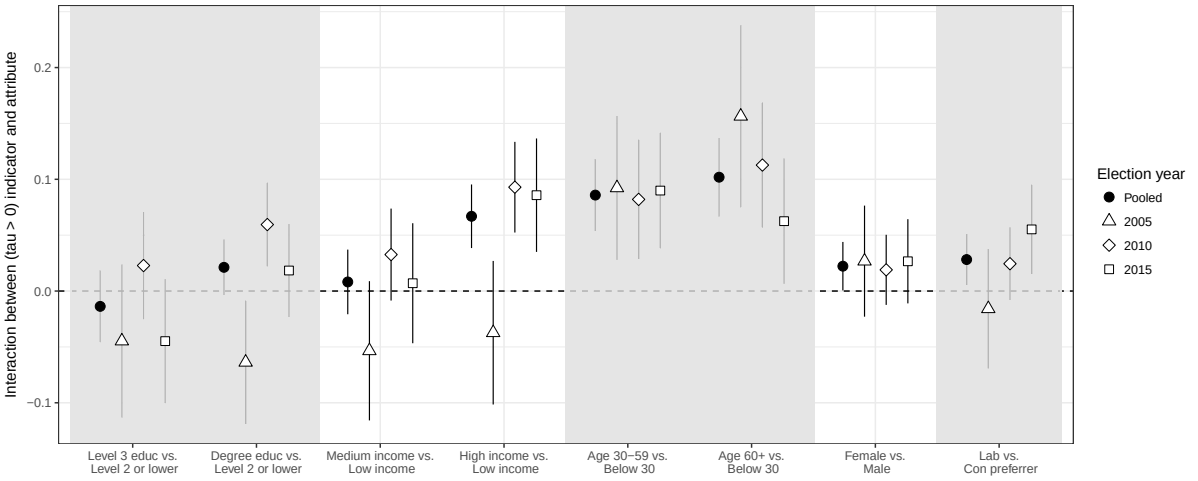
[38]To see this, note that the probability of a wasted vote is $\Pr(\tau_i < 0)\Pr(\text{insincere vote} \mid \tau_i < 0) + \Pr(\tau_i > 0)\,(1 - \Pr(\text{best insincere vote} \mid \tau_i < 0))$; assuming $\Pr(\text{insincere vote} \mid \tau_i < 0)$ is the same for e.g. young and old voters and $\Pr(\tau_i > 0) = \frac{1}{3}$ for young and old voters, the difference in the probability of a wasted vote between young and old voters is $\frac{1}{3}\left(\Pr(\text{best insincere vote} \mid \tau_i < 0, \text{old}) - \Pr(\text{best insincere vote} \mid \tau_i < 0, \text{young})\right)$, which becomes $\frac{1}{3}\left(\text{SR}_{\text{old}} - \text{SR}_{\text{young}}\right)$ under the assumption that $\Pr(\text{best insincere vote} \mid \tau_i < 0)$ is the same for young and old voters.

Figure 6: Strategic response functions by social characteristic



NOTE: Each diagram shows, as a function of τ and with subsetting by social characteristic, the proportion of respondents casting a "best insincere" vote, i.e. the insincere vote that yields the maximum expected outcome-based utility among insincere votes. Appendix Figure C.8 shows the same relationships when the outcome is "any insincere vote".

Figure 7: Heterogeneity in responsiveness to tactical incentive across election years



NOTE: Each point shows the estimated difference in strategic responsiveness between two groups of voters (β_3 in equation 2), with 95% confidence intervals shown by vertical lines. The solid circles show estimates for all years together; others show estimates for a single election year.

voters is about $\frac{1}{3}(.38 - .28) \approx .033$ and for poor and rich voters is about $\frac{1}{3}(.40 - .33) \approx .023$. By comparison, analysis of validated turnout in the face-to-face 2015 BES indicates a difference in abstention rates between young and old voters of around .34 (c.f. Prosser et al., 2018), i.e. around 10 times larger, and between poor and rich voters of around .14, i.e. around 7 times larger. In terms of wasted votes, then, the differences we observe in strategic behavior are much smaller than the corresponding differences in turnout; still, a policy proposal capable of reducing the turnout gap across age groups by 10% or across income groups by 15% would undoubtedly deserve attention.

What explains heterogeneity in strategic responsiveness?

As noted above, differences in measurement error across types of voters could produce apparent differences in strategic responsiveness: if the party ratings we use are an especially noisy proxy of preferences for one group of voters, then we will have less precise measures of their τ, leading us to conclude that they are less responsive to strategic incentives than they actually are. Could differences in strategic responsiveness that we have documented, most notably by age and income group, simply reflect differential measurement error?

In Appendix C we study various plausible ways in which differential measurement error might arise and show that none of these appear to explain the differences in strategic responsiveness by age and income that we find in our main analysis. These estimated differences remain similar when we measure preferences based on either party leader ratings or post-election party ratings rather than (as in the main analysis) a mix of post- and pre-election party ratings. This stability indicates that the age and income results cannot easily be explained by differential measurement error that arises due to either one type of voter caring less about party leaders (rather than the party as a whole) than another or one type of voter having preferences that are more consistent over time than another. Neither do we find evidence that the observed age and income results are driven by differential measurement error that arises due to one type of voter caring more about local candidates (rather than the party as a whole) than another: when we examine the proportion of each type of voter who explains their vote choice in terms of local candidates, the types more likely to do so – and thus for whom party-based preference measures are likely to be noisiest – are those we find to be more strategic (i.e. older and richer voters). Finally, we re-estimate our main analysis allowing strategic responsiveness to vary by preferred party and by strength of party identification, both of which are plausibly associated with differential measurement error in the mapping of true preferences to party ratings (e.g. because respondents with stronger party ID tend to overstate the utility they receive from their preferred party winning).[39] The differences in SR by age and income persist.[40]

What then explains the differences in strategic responsiveness that we have observed? The simple model of voting behavior introduced above suggests that voters deviate from purely strategic voting for two main types of reason: first, because they obtain additional benefit from casting a sincere vote (a larger b parameter), due either to their expressiveness or their desire to affect future elections or policy outcomes; or second, because they misperceive the strategic incentive (a larger ε value) due to information or reasoning errors. Which of these reasons explains observed differences in strategic responsiveness by, for example, age and income

[39] We control for the main effect of either party supported or the strength of party identification as well as the interaction of these variables with the $\tau_i > 0$ indicator.

[40] In Appendix B we also show that observed differences in strategic responsiveness by age and income are robust when we allow strategic responsiveness to vary by both simultaneously or by others of the five social characteristics we study.

groups? Appendix B reports some initial evidence relating to this question, which we summarize here.

First, to test whether our main findings reflect differences in the degree to which voters care about casting a sincere vote versus short-term outcome-based utility, we use two 2015 BES items asking respondents to consciously weigh up these considerations: to the extent that respondents agree with the statement "People who vote for small parties are throwing away their vote" and disagree with the statement "People should vote for the party they like the most, even if it's not likely to win" we measure them as having a more strategic disposition (oriented more toward short-term outcome-based utility than to expressive or long-term considerations). We show in Appendix B that respondents with stronger strategic disposition judged by this measure are substantially more strategically responsive. We also show that, once we allow strategic responsiveness to vary by strategic disposition, differences by age (but not by income) are substantially attenuated. This suggests that older voters are more strategically responsive in part because they are consciously more instrumental in their vote decisions. In the terminology of our simple model, younger voters may have a larger b parameter than older voters, whether because they enjoy expressing themselves or because they care more about the effect of their vote on future elections.

Second, we test whether observed differences in strategic responsiveness arise due to differences in voters' accuracy of perceptions. We find that voters who correctly predict the local winner and who have been contacted by parties during the campaign are more strategically responsive. Controlling for these and other proxies for voters' information level[41] does not, however, affect the differences in responsiveness that we find by age and income. We also find that voters who believe that their vote is more likely to affect the outcome are more strategically responsive (perhaps because this inflates perceived τ); controlling for subjective vote efficacy does not, however, substantially alter our main results concerning age and income. Thus, we uncover little evidence that differences in strategic responsiveness by age and income arise because older or higher income voters are better informed or perceive strategic incentives differently to younger or lower income voters.

[41] We also check general political knowledge and measures of campaign intensity in the respondent's constituency.

Discussion and conclusion

In their article "In Praise of Manipulation", Dowding and Van Hees (2008) argue that strategic voting is not as normatively problematic as many democratic theorists think. They recognize that it may be worrying if some voters have the "information and understanding" necessary to vote strategically while others do not (p. 4), but they downplay that concern by arguing that democracy benefits when voters seek the information and understanding that would make them better strategic voters (p. 10).

Whereas Dowding and Van Hees discuss inequalities in strategic voting as a hypothetical problem, their sanguine view may be more difficult to sustain once we take into account the findings of this paper, which shed new light on the empirical extent of such inequalities. In particular, we find that richer and older voters (who already participate in elections at a higher rate in the UK and elsewhere) appear to be further advantaged when it comes to strategic voting. While we agree with Dowding and Van Hees's view that it is good for democracy if "the inherent possibilities of strategic voting encourage voters to learn more about their democracy and the views of their fellows" (p. 10), this benefit must be weighed against the possibility that voters with systematically fewer resources to invest in studying polling data are underrepresented as a result. In the case of age, inequalities in strategic behavior may also have more to do with voters' time horizons than with their "information and understanding", which further complicates Dowding and Van Hees's case: if younger voters are more likely than older voters to "waste" their vote on a certain party because they care more about who is in power several elections in the future, then inequalities in strategic voting will not disappear even if younger voters seek out better information and understanding (whatever other benefits this search may have for democracy). In this scenario, the only way to make younger voters more effective at determining the outcome of current elections is to make them less effective at determining the outcome of future elections. In light of these observations, we conclude that the case for "praising" or even tolerating inequalities in strategic voting becomes weaker, and the argument for adopting electoral systems that are less likely to reward strategic voting becomes stronger.

We see two main tasks for future research on inequalities in strategic voting. First, re-

searchers can apply and improve our framework to measure inequalities in other settings, which would help determine the extent to which the differences we find are deep-seated or due simply to the particularities of the three UK elections we study. Our results should be compared with results from other elections in the UK, plurality elections elsewhere,[42] and elections carried out under different electoral rules. Researchers could also investigate whether strategic behavour directed at government formation also varies across groups. Second, additional research could help us understand why differences in strategic voting arise. We took a first step by checking whether observed differences in strategic responsiveness disappear when we control for specific factors that might differ across groups, such as levels of information or general attitudes toward vote choice. Future studies might go further not just by extending our approach (ideally with better measures of these alternative factors) but also by using panel data to explore the role of experience in explaining differences in strategic behavior by age, experimentally varying the information available to voters, or priming different aspects of vote choice.

[42] See Eggers, Rubenson and Loewen (2019), who examine the Canadian case.

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