# The theory of straight ticket voting*

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**Abstract**

This paper explores the effects of the straight-ticket voting option (STVO) on the positions of politicians. STVO, present in some U.S. states, allows voters to select one party for all partisan elections listed on the ballot, as opposed to filling out each office individually. We analyse the effects of STVO on policy-making by building a model of pre-election competition. STVO results in greater party loyalty of candidates, while increasing the weight of non-partisan voters' positions in candidate selection. This induces an asymmetric effect on vote shares and implemented policies in the two-party system.

KEYWORDS: Ballot Design, Elections, Political Positions; *JEL*: D72, K16, N42.

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# 1 Introduction

In U.S. general elections, ballots cover many different races. In some states, one can circumvent race-by-race voting by ticking a single box at the top of the ballot that automatically registers a vote for every candidate from a particular party in partisan races. This is known as the Straight Ticket Voting Option (STVO), Master Lever or Partisan feature.[1]

To STVO or not to STVO is a controversial question. For example, in the run up to the 2016 general election, Michigan's GOP-held legislature passed a bill banning STVO—but the Democratic party immediately challenged that decision. In the end, the Supreme Court sided with the Democrats; straight-ticket voting was reinstated just before the election and, unexpectedly, brought more Republicans into power.[2]

Despite heated political debates surrounding STVO and confusion about its consequences, no theoretical model exists that clarifies which party benefits from it, how it impacts candidate selection and the effect it ultimately has on policy; this paper helps fill the gap. Using a pre-election competition model a là Downs (1957), we incorporate the two-principals paradigm into a standard probabilistic voting model (Hinich, 1978; Lindbeck and Weibull, 1987). For each contested office, parties nominate candidates who maximise vote share discounted by the distance in their positions from party bliss points. The trade-off both parties face is therefore the choice between increasing vote share by fielding candidates who are better aligned with voters and maintaining ideological purity or party unity over the political agenda.

In an election with STVO, voters must first decide whether to use the option or instead go through the ballot and vote in each race individually. At the time of the decision, voters only observe candidates' political positions and party affiliations. Going through the ballot is costly for the voter, therefore the trade-off he faces is between fine-tuning the choices in every race, on the one hand, and saving his time and effort by using the STVO, on the other.

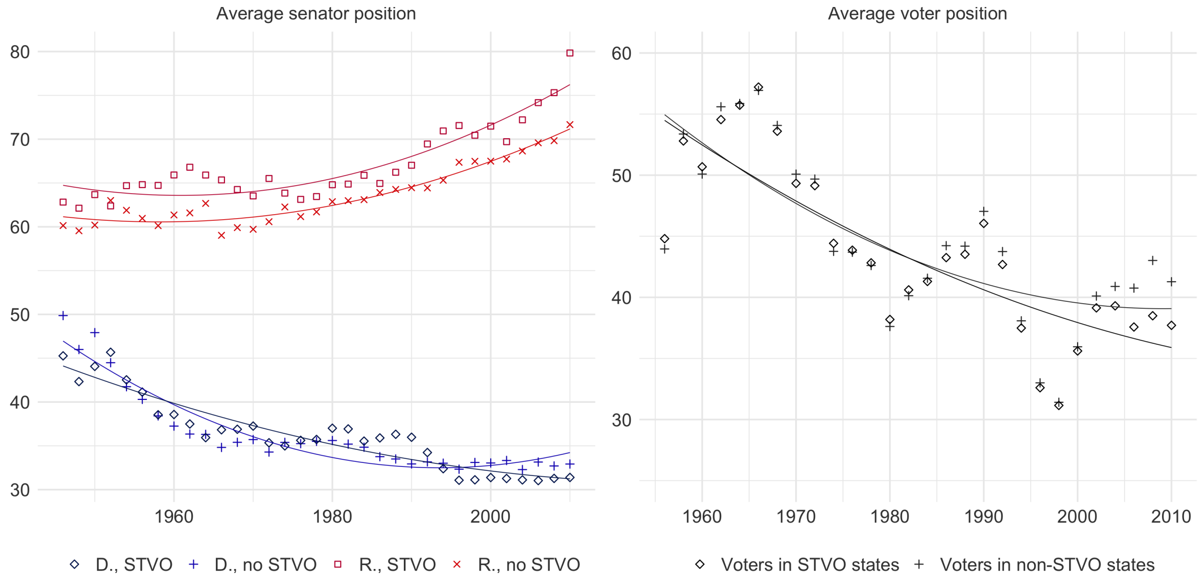
Specifically, if the voter does not use the STVO and goes through the ballot, he solves a sequence of utility maximisation problems, choosing the candidate who delivers greatest utility in each race. Voters' utility from electing a candidate has three components: first, a measure of distance between the candidates' and the voter's political positions (voters prefer candidates who are closer to them ideologically); second, a bonus for the candidate's affiliation with a party if the voter is its partisan; third, an idiosyncratic shock that captures the voter's valuation of the candidate's quality. The latter is observed only if the voter goes through the ballot. Thus, if a voter uses the STVO, his party choice is based on the expectation of total utility from the party's candidates, conditional on the voter's own political positions and partisanship status.

We start by formally exploring STVO's effect on the position of candidates in each party. Since going through the ballot is costly, voters who are nearly indifferent between voting a straight ticket and making partisan exceptions in a small number of races will be *most* tempted to use it.[3] Thus, introducing STVO diverts partisan voters away from positional voting. This impacts politicians' positions in two different ways. First, because many voters "buy in bulk", individual candidates' characteristics such as political positions and quality matter less. Consequently, politicians are more inclined to cater to their party's political agenda, and not their constituency. We label this STVO effect the *party loyalty effect*.

[1] See Appendix D for a sample ballot with the STVO. For a list of states where STVO is currently available, see the National Conference of State Legislature website.

[2] See "Supreme Court Lets Michigan Use Straight-Party Voting in November" by the Associated Press [accessed 2020-11-05]. For several historical examples of debates surrounding ballot design and straight-ticket voting, see Walker (1966).

[3] According to the 2018 Cooperative Congressional Election Study, the majority of strong partisans in STVO states used the option in the 2018 election (Kuriwaki, 2018; Thornburg, 2019). The use of STVO is consistent with the empirical evidence of choice fatigue (see *e.g.*, Danziger *et al.*, 2011; Iyengar and Kamenica, 2010; Levav *et al.*, 2010), and the impact of candidate name order on election outcomes (*e.g.*, Miller and Krosnick, 1998). Frequent abstentions in races listed lower on the ballot—also known as voter roll-off—has been consistently found in the empirical literature (see, *e.g.* Augenblick and Nicholson, 2016; Bowler and Donovan, 2000; Bowler *et al.*, 1992; Burnham, 1965; Dubois, 1979; Taebel, 1975; Thomas, 1968; Walker, 1966). Roll-off can be seen as the flip-side of STVO use and is particularly pronounced in nonpartisan candidate elections (see, *e.g.*, Hall, 1999; Schaffner *et al.*, 2001).




*Note.* Left-hand graph shows average senatorial positions by party and STVO status. Right-hand graph displays self-declared average voter positions by STVO presence. Senators' positions correspond to the first dimension of DW-NOMINATE, a multi-dimensional scaling application developed by Poole and Rosenthal (2015). Voters' positions are the first dimension of Enns and Koch (2013)'s dynamic scale of voters' policy "moods". Data on the presence of the STVO on state ballots are from Gorelkina *et al.* (2019). All positional data are projected onto a left (0) right (100) axis. State-level data on voters' partisanship and positions calculated at the beginning of each Congressional term. See Gorelkina *et al.* (2019) for a full description of the data used to generate each graph.

Figure 1: Voters' and senators' positions with and without STVO

Second, non-partisan (swing) voters become relatively more important in determining electoral outcomes so politicians align with them in order to win their support.[4] We call this the *swing voter effect.*

More specifically, the optimal candidate's platform on an issue is a convex combination between the party's bliss point and the position of the average voter in the constituency with a drift proportional to the covariance between the swing voter propensity and political positions. Introducing STVO strengthens the multipliers on the party's bliss point and covariance and weakens the multiplier on the average voter's position. Intuitively, STVO leads to an unequivocal increase in partisan votes, meaning both parties can more readily "afford" to put forward candidates who are ideologically closer to their respective bliss points (party loyalty effect). Meanwhile, non-partisan, positional (or swing) voters become more decisive in electoral outcomes, so politicians' platforms change to accommodate them (swing voter effect).[5] The STVO's combined effect is thus determined by the level of partisanship in a state and the distribution of political positions among partisan and swing voters.

Proposition 1 establishes that STVO can have an asymmetric effect across party—*e.g.*, it may make one party's candidates more moderate in equilibrium, while candidates from the opposing party become more extreme. This result aligns with available data. According to Figure 1's right-hand graph, voters in STVO states do not systematically differ from voters in non-STVO states (apart from perhaps a few recent observations). Yet Figure 1's left-hand graph suggests STVO correlates with right-wing Republican senators but has no visible relationship to the positions of senators from the Democratic party. (See also Gorelkina *et al.* (2019) for additional evidence supporting this conclusion.)

Proposition 2 examines the impact STVO has on vote shares. In the model, the Republican party's vote share increases as more voters become Republican partisans, and as the average voter's views tend to the right; the opposite holds for the Democratic party. The first effect of the STVO is to reinforce the impact of partisanship on vote shares. In contrast, the STVO diminishes the effect of the average

[4] We use "swing" and "non-partisan" interchangeably throughout the paper.

[5] For example, if the election occurs in a non-partisan state where non-partisans (swings) are more likely to be right-wing relative to the state's average, then introducing STVO will cause both parties to put forth more right-wing candidates in order to appeal to them.

voter's position as it brings the swing (non-partisan) voter to the forefront. When the STVO is available, fewer partisan voters elect by position as they pull the partisan lever instead; thus, the fraction of swing (non-partisan) voters among those who do elect by position increases. Swing voters become more decisive in determining electoral outcomes.

With Proposition 3 we show that the expected position of the election winner is subject to the compound effect of the STVO on candidates' positions and vote shares. Consistent with Proposition 2 that states partisanship is a more important determinant of vote share when the STVO is present, it also becomes a more important determinant of elected candidates' platforms with the introduction of STVO. Elected candidates' platforms hew more closely to the party that has more partisans in the state. The effect of partisanship advantage acts on all issue dimensions and is reinforced by the STVO. Furthermore there are spillover effects between the issues. The STVO induces a spillover effect in the covariance between partisanship and voters' political positions when that covariance on one issue affects an elected official's position on another issue. Thus, two constituencies that differ only on the covariance between partisanship and voters' political positions on a single issue will nevertheless elect politicians that differ across *all* issue dimensions. Intuitively, issue spillovers are due to the correlation in parties' bliss points: on each issue, parties are on opposite sides of the origin. This induces correlation across the positions of elected candidates and explains how the prolonged use of STVO has likely contributed to clustering in candidates' political positions and sorting of the electorate (for empirical evidence, see *e.g.*, Krasa and Polborn, 2014a).

Our paper contributes to the literature in several ways. First, we are the first to formally model the link between a common element of ballot design and the positions of elected politicians. This work builds on research in several related contexts, including split-ticket voting and coattail effects. For example, Zudenkova (2011) shows that coattail voting is the outcome of an optimal re-election scheme through which voters incentivise politicians' efforts; Halberstam and Montagnes (2015) find that the coattails in presidential elections have an adverse effect on ideological polarisation among candidates. Meanwhile, Chari *et al.* (1997) study split-ticket voting in an environment where the government finances its spending by uniform taxes. Focusing on the interaction between executive and the legislature when choosing policy, Alesina and Rosenthal (1996) show that some voters split the ticket in equilibrium.

Our study further emphasises the relationship between party identification and voters' positions. Dziubiński and Roy (2011) and Krasa and Polborn (2014b) develop models of vertically differentiated candidates, where voters take into account not only the candidates' political positions but also their fixed identities—*e.g.*, cultural, religious, or social (partisanship in this paper). In particular, they study the effects of ideological polarisation of voters on the candidates' positions on economic issues; thereby polarisation results in voters' party preferences hinging more strongly on cultural issues. This paper offers another insight into issue spillovers (when voters' views on one issue affect the candidate's campaign on another issue) by adopting a model where both issues are treated as different dimensions of the candidate's platform, and the platform is endogenous. A voter's partisanship status is exogenous but *correlated* with her political position. We show that issue spillovers may arise in this framework: a party may select a socially conservative candidate running in a socially liberal state, as long as social issues do not dominate the election. Such spillovers become stronger when straight ticket voting is facilitated (for example by the STVO), and by extension, when candidates' party affiliation becomes more conspicuous or important to voters.

A recent survey article Dal Bó and Finan (2018) stresses the importance of parties in candidate selection. However, our paper joins only a handful of studies that explore the effect of institutions on intra-party dynamics. Kselman (2017) compares the equilibria of different electoral systems and finds that open list proportional representation avoid the free-riding problem inherent in closed-list proportional representation systems. Buisseret and Prato (2018) focus on the conflict of party and individual politicians' goals and show that flexible lists in proportional representation systems may weaken politicians' incentives to cater to voters and focus on toeing the party line instead. Buisseret *et al.* (n.d.) study party nomination strategies in list proportional representation systems, focusing on candidate quality (human capital). Motivated by insights from Hix (2002) and Carey (2007), we contribute to this earlier work by exploring a setting where candidates face two principals—the voter and the party—and uncovering how ballot design can have an asymmetric impact on candidate selection that depends on the correlation between voters' partisanship and political positions.

Our model also sheds a new light on the classic median-voter theorem (Black, 1948; Downs, 1957) and provides an explanation for the possibly asymmetric effects of STVO. In particular, we show that while candidates chosen by parties are not at the median voter's position, their platforms depend critically on the non-partisan voter, which is the source of asymmetry. The position of partisan voters—who tend to be more extreme—is less significant to the party's choice of candidate in STVO states, since it takes partisan votes there for granted. On the one hand, the party's relative disregard for partisan voters' positions produces an effect similar to Downs's original insight where extreme voters matter less to politicians. On the other hand, swing (non-partisan) voters—who are less sensitive to party labels when they vote—play a more decisive role in determining parties' candidate choices, but their political positions may, in fact, be very far from the median voter. Theoretically, this swing voter effect creates an asymmetry absent from the original Downs model.

Finally, empirical motivation for theoretically exploring the effects of STVO comes from evidence of voter roll off and the importance of ballot design.[6] Of particular relevance are Gorelkina *et al.* (2019), Hall (1999), and Schaffner *et al.* (2001): the latter two papers show that roll-off is higher in elections featuring nonpartisan candidates; the former demonstrates an empirical link between the STVO's presence and policy-making. More generally, we believe our findings are also useful for interpreting empirical research on the impact of ballot design, and especially those features facilitating straight-ticket voting.[7]

The rest of the paper is organised as follows. In Section 2, we develop a simple probabilistic model of electoral competition. In Section 3 we solve the model with and without STVO and derive the impact it has on candidates' platforms, vote shares and the expected platform of the election winner. Section 4 concludes.

# 2 Setup

Fix a U.S. state and an election period and let the offices listed on a ballot be indexed by $k \in \mathcal{K} \equiv \{1, 2, ldots, K\}$. $\mu \in \{0, 1\}$ indicates the availability of a straight-ticket voting option (STVO), where $\mu = 1$ when the STVO is present and $\mu = 0$ when it isn't. Our policy space is multi-dimensional and defined as the product of $N$ unit-length intervals:

$$\mathcal{P} \equiv \left[-\frac{1}{2}, \frac{1}{2}\right]^N,$$

where $N$ is the number of policy issues (*e.g.*, economics or national defense). Three types of actors are positioned within $\mathcal{P}$: voters, parties, and candidates.

Each party $j \in \{R, D\}$ (Republican or Democratic) has a bliss point denoted by a vector of issue positions

$$Y_j \equiv (Y_{j1}, Y_{j2}, \ldots, Y_{jN}) \in \mathcal{P}.$$

Without loss of generality, positions are labelled so that the Democratic party's bliss point is always to the left of the Republican party, *i.e.*, $Y_{Dn} < Y_{Rn}$, for all $n \in \{1, 2, \ldots, N\}$.

Candidates are characterised by an office, $k$, the party they represent, $j$, and their positions, $y$. For

[6] See Reilly and Richey (2011) for an excellent overview of the literature on voter roll-off.

[7] For example, Rusk (1970) found that voters split the ticket more frequently when faced with an office block (Massachusetts) ballot compared to the more partisan-oriented party column (Indiana) ballot.

each office, the pool of candidates is $\mathcal{P}$ and each party selects exactly one candidate, $y_{jk} \in \mathcal{P}$, to represent it and run for the open seat (see Equation (5) below).

There is a unit mass of voters, indexed by $i$, each with a bliss point given by $x_i$,

$$x_i \equiv (x_{i1}, x_{i2}, \ldots, x_{iN}) \in \mathcal{P}.$$

To obtain the average voter's position in the state-period, integrate over the mass of voters:[8]

$$X \equiv \int_{[0,1]} x_i \,\mathrm{d}i \in \mathcal{P}.$$

(Consequently, the average voter's position on issue $n$ is given by $X_n \equiv \int_{[0,1]} x_{in} \,\mathrm{d}i \in \left[-\frac{1}{2}, \frac{1}{2}\right]$.)

Apart from their political positions, voters are characterised by partisanship status. Let $p_i(j)$ denote the probability that voter $i$ (whose position is $x_i$) is a partisan of party $j$.[9] The realisation of the random variable is denoted by the indicator $I_i^P$, where $I_i^P = 1$ implies that the voter is a partisan, and $I_i^P = 0$ implies he is a non-partisan, or *swing*. Assuming $i$ is partisan to at most one party, his total probability of being a partisan voter is defined as

$$p_i \equiv p_i(j) + p_i(-j),$$

where $-j = \{R, D\} \setminus j$ (*e.g.*, if $j = R$ then $-j = D$). Party $j$'s partisan advantage in the state is $p(j) - p(-j)$, where $p(j) = \int_{[0,1]} p_i(j) \,\mathrm{d}i$ is the mass of party $j$ partisans. By analogy, $p = \int_{[0,1]} p_i \,\mathrm{d}i = p(j) + p(-j)$ is the share of partisans, irrespective of party affiliation.

We do not assume a specific causal relationship between partisanship and political orientation—their joint distribution can be any. We denote their covariance by $\sigma_n \equiv \int (p_i - p)(x_{in} - X_n) \,\mathrm{d}i$ but more often refer to the negative of $\sigma_n$, namely the covariance between voters' positions on issue $n$ and their likelihood of being swing (non-partisan):[10]

$$\bar{\sigma}_n \equiv -\int (p_i - p)\,(x_{in} - X_n)\,\mathrm{d}i. \tag{1}$$

If $\bar{\sigma}_n > 0$, then non-partisan status is associated with a more right-wing position on issue $n$ compared to the rest of the state. Similarly, $\bar{\sigma}_n < 0$ implies that swing voters tend to be to the left—and partisans to the right—of the state's average position on issue $n$.

**Actions, payoffs and timing.** Our model of an election with STVO is a game between two parties and a mass of voters. The game proceeds according to the following timeline:

$t = 1$ Party $j$ chooses a candidate, $y_{jk}$, to compete for seat $k = 1, \ldots, K$. The party derives utility from the vote share $V_j$ it wins but incurs a loss increasing in the distance between the candidate's positions and the party's bliss points $Y_{jn}$:

$$\max_{y_{jkn}} \left\{ V_j - \sum_n \gamma_n \left(Y_{jn} - y_{jkn}\right)^2 \right\}.$$

$t = 2$ If the STVO is on the ballot, voter $i$ decides whether to use it. He makes his decision by comparing the cost $c_i$ and the estimated benefit $\mathbb{E}[U_i^* - \hat{U}_i | x_i, I_i^P]$ of going through the ballot. (More detail below.)

[8] Here and throughout the paper, we integrate over the index $i$ as a way to leave the distribution unspecified, so, for example, $\int_{[0,1]} x_{in} \,\mathrm{d}i \equiv \int z \,\mathrm{d}F_{x_n}(z)$, where $F_{x_n}(z)$ is the marginal distribution of positions on dimension $n$.

[9] Alternatively, $p_i$ can be thought of as the mass of partisan voters within *voter group* $i$ characterised by position $x_i$.

[10] Here we use $(1 - p_i) - (1 - p) = -(p_i - p)$.

$t = 3$ If voter $i$ does not use the STVO, he selects the candidate that maximises $u_{ik}(j)$ (Equation (3)) for each of the $k = 1, \ldots, K$ offices on the ballot.

We solve the game by backward induction.

$t = 3$ : **Electing candidates.** This sub-game is only reached if the voter does not use the STVO. In that case, he votes by solving a sequence of $K$ distinct maximisation problems. His aggregate utility is defined as

$$U_i^* \equiv \sum_{k=1,\ldots,K} \max_{j_k \in \{R,D\}} u_{ik}(j_k), \tag{2}$$

where

$$u_{ik}(j) = \begin{cases} -\sum_n \omega_n \left(x_{in} - y_{jkn}\right)^2 + \beta_k + \varepsilon_{ij}, & \text{if } i \text{ is a partisan of } j, \\ -\sum_n \omega_n \left(x_{in} - y_{jkn}\right)^2 + \varepsilon_{ij}, & \text{otherwise.} \end{cases} \tag{3}$$

The voter's utility function in Equation (3) builds upon the probabilistic voting framework of Lindbeck and Weibull (1987). Its first component, $-\sum_n \omega_n \left(x_{in} - y_{jkn}\right)^2$, is a weighted function of the distance between candidate $j$'s positions and $i$'s bliss points (where every issue $n$ has weight $\omega_n > 0$, $\sum_n \omega_n = 1$) and reflects the dis-utility $i$ experiences from electing a candidate whose views do not precisely mirror his own. The second component is a partisanship "bonus" $0 < \beta_k < 1$. It represents the extra payoff a voter enjoys if the candidate from his preferred party wins the race for seat $k$.[11] Thirdly, $\varepsilon_{ij}$ is an idiosyncratic shock capturing $j$'s quality (valence) advantage over his opponent $-j$ perceived by voter $i$, where $\varepsilon_{ij} = -\varepsilon_{i,-j}$; it is the result of factors such as advertising and endorsements, perceived differences in personality traits and competence, that the voter associates with the candidate's name. Since the perceived quality differences are voter-specific and centered around zero, candidates do not systematically differ in quality. Voter $i$ draws $\varepsilon_{ij}$ from a uniform distribution on $\left[-\frac{1}{2}, \frac{1}{2}\right]$ at $t = 3$; the draw is independent of $(x_i, p_i)$.[12] Although the realisation of $\varepsilon_{ij}$ is known only to $i$, its distribution is common knowledge so our model contains no aggregate uncertainty.

$t = 2$ : **Voter's choice to use the STVO.** The time and effort it costs voter $i$ to go through the ballot race-by-race is denoted by $c_i$. $c_i \in \mathbb{R}_+$ is an i.i.d. random draw from a finite set with a associated cumulative distribution function $F$. We assume that $c_i$ is orthogonal to $i$'s politics.

Race-by-race voting benefits the voter by allowing him to fine-tune his selection of candidates. This is equal to the difference between Equation (2) and the solution to a single maximisation problem under the straight-ticket constraint:[13]

$$\hat{U}_i \equiv \max_{j \in \{R,D\}} \sum_{k=1,\ldots,K} u_{ik}(j). \tag{4}$$

The true benefit of going through the ballot, $U_i^* - \hat{U}_i$, isn't observed until $t = 3$. At $t = 2$, the voter only observes the estimated benefit $\mathbb{E}[U_i^* - \hat{U}_i | x_i, I_i^P]$, which is conditional on his partisanship status; the expectation is taken over the random variables $\left(\varepsilon_{ijk}\right)_{j=R,D;k=1,\ldots,K}$ realised in period $t = 3$. Hence, the voter decides whether to use the STVO by comparing the cost and expected benefit of not using it. He uses the STVO if $\mathbb{E}[U_i^* - \hat{U}_i | x_i, I_i^P] \leq c_i$; otherwise, he votes race-by-race.

As regards the information structure, note that the uncertainty that is resolved by choosing not to use the STVO relates to the voter's idiosyncratic valuations of candidates' quality, and not to their political positions in the election which are observed.

[11] The model predictions do not change if the utility function is modified so that electing a "counter-party" candidate yields a *negative* payoff to a partisan voter; the assumption $\beta_k < 1$ guarantees an interior solution.

[12] See Hammond and Sun (2008) for a discussion of the framework with a continuum of random variables that are conditionally independent.

[13] Note that as the maximisation on right-hand side of Equation (4) is over a strict subset relative to Equation (2), the latter's more refined solution—*i.e.*, $\left(j_{i1}^*, j_{i2}^*, \ldots, j_{iK}^*\right) \in \{R, D\}^K$—always yields a greater utility to the voter; thus $\hat{U}_i \leq U_i^*$.

$t=1$ : **Party's choice of candidate.** The party's problem is a tradeoff between attracting votes and satisfying its own policy agenda (ideological purity).[14] We assume it is separable across offices, meaning the other $K-1$ races on the ballot only impact a party's choice of candidate in race $k$ by changing the tradeoff to the voter of going through the ballot and using the STVO. Thus, the party solves the following optimisation problem for each office:[15]

$$\max_{y_{jk}\in\mathcal{P}} \left\{ V_j - \sum_n \gamma_n \left(Y_{jn} - y_{jn}\right)^2 \right\}, \tag{5}$$

where $V_j$ is the share of votes earned by party $j$'s candidate, the office subscript $k$ has been dropped. The weighting $j$ puts on issue $n$ is represented by $\gamma_n > 0$; it satisfies in a given state $\gamma_n/\omega_n \geq 1/2$ for all $n$—*i.e.*, parties cannot put too little weight on issues that are important to voters. (See Appendix A for further detail.)

Equation (5)'s first term, $V_j$, reflects the driving force of political competition, namely the party's desire to capture more votes. The second term corresponds to the party's loss from disagreeing with the candidate on policy issues—for example, politicians with views that diverge from $Y_j$ may be less determined to pass bills supporting the party's agenda. Generally speaking, it captures those forces that deter parties from achieving policy convergence.

Lastly, whether the candidate actually implements $y_j$ is not relevant for what follows. The key is that voters consider $y_j$ to be a candidate's true position, *e.g.*, because it is observed (as in our setup) or the politician is able to credibly campaign on it. We therefore use the terms platforms and positions interchangeably throughout the paper.

# 3 Results

In this section, we study the model's solutions with and without STVO and deduce its effects on three outcomes: candidates' platforms (Proposition 1), their vote shares (Proposition 2), and the expected platform of the election winner (Proposition 3).

## 3.1 Candidates' platforms

We start by characterising the optimal platform $y^*_{jn}$ derived as a solution to the three-stage game. Since the choice set of candidates is unconstrained (*i.e.*, it is the whole policy space, $\mathcal{P}$), $y^*_{jn}$ also corresponds to the party's optimal choice of candidate.[16]

**Proposition 1.** *The optimal position for the candidate of party $j$ on issue $n$ is a convex combination of the average voter's position $X_n$ and the party's bliss point $Y_{jn}$, with a drift proportional to the swing-*

[14] See, *e.g.*, Carey (2007) on the importance of legislative voting unity. He names the following factors as reasons for parties to care about party unity in legislative voting: (i) the need to ratify budgets, taxes, and treaties; (ii) the greater credibility of parties—as opposed to individual politicians—as information conduits to citizens; and (iii) the ability of parties and governments to deliver on platform promises.

[15] Our assumption of additive separability allows us to focus directly on Equation (5), but one can think of the party's global election problem—*i.e.*, the problem where the party cares about all seats $k \in \mathcal{K}$—as

$$\max_{y_{jkn}} \left\{ \sum_k \pi_k \mathbb{E}_i \Pr\left(j_k \succ_i -j_k\right) - \sum_{k,n} \gamma_{jkn} \left(Y_{jn} - y_{jkn}\right)^2 \right\},$$

where $\pi_k$ and $\gamma_{jkn}$ are weights.

[16] We assume that parties can freely select any candidate, $y_j \in \mathcal{P}$. Alternatively, their choice may be constrained to those candidates able to win in primary elections, in which case $y_j$ would be confined to a subset of the policy space, $\mathcal{P}$. We do not study this possibility here. (Hirano *et al.* (2010) and McGhee *et al.* (2014) find little evidence of primaries affecting the polarisation—and thus the positions—of elected politicians.)

*position covariance $\bar{\sigma}_n$:*

$$y^*_{jn} = \frac{1-\mu\, p}{1-\mu\, p+\alpha_n} X_n + \frac{\alpha_n}{1-\mu\, p+\alpha_n} Y_{jn} + \frac{\mu\,(\lambda^p - \lambda^s)\,\bar{\sigma}_n}{1-\mu\,\lambda+\alpha_n}, \tag{6}$$

*where $\alpha_n \equiv 2\,\gamma_n/\omega_n$ and $\lambda^p$ and $\lambda^s$ are the probabilities that partisan and swing voters use the STVO, respectively.*

Absent STVO ($\mu = 0$), Proposition 1 implies that the optimal candidate's position on issue $n$ lies between the average voter's position and the party's bliss point on that issue. Moreover, as shown in Lemma C.1 (Appendix C), partisans are more likely than swing voters to use the STVO (*i.e.*, $\lambda^p - \lambda^s > 0$). This implies the following.

**Corollary 1.** *Introducing STVO increases the weight of the party's bliss point, $Y_{jn}$, and the effect of the swing-position covariance, $\bar{\sigma}_n$.*

STVO influences candidates' positions by diverting their partisan voters away from positional voting. On the one hand, this means that candidates' positions have less of an impact on voters' behaviour so parties can nominate more "loyal" candidates (party loyalty effect). On the other hand, since swing voters are weighted more heavily among positional voters, parties will pay more attention to their particular preferences (swing voter effect). We discuss these effects as they appear in Equation (6); a short derivation of the STVO's total effect as a sum of both components is shown in Lemma C.4 (Appendix C).

**Party loyalty effect** To pin down the first effect, we focus on a state in which voters' partisanship status and positions on issue $n$ are uncorrelated ($\bar{\sigma}_n = 0$).[17] In this case, the candidate's optimal political position is a convex combination of the average voter and party bliss points. In the presence of STVO, the party can afford to choose a candidate whose views on the issue are closer to those of the party.

**Swing voter effect** Now drop the assumption of zero covariance and suppose we are in a state with few partisan voters, so that the party loyalty effect is small. In this case, introducing STVO forces both parties to follow the direction of the swing voter. The reasoning is as follows. Assume that $\bar{\sigma}_n > 0$ so that holding more left-wing views on issue $n$ is associated with being a partisan and, as a result, use of the straight-ticket option. In this case, STVO attracts left-wing voters, so the average position of those who go through the ballot—and judge the candidates by their political positions—shifts to the right. Hence, the candidate's optimal position must satisfy the more right-wing swing voters when STVO is introduced. More generally, STVO makes swing voters more decisive in electoral outcomes so when $\bar{\sigma}_n > 0$ the swing voter effect is also positive (more extreme Republican candidate, more moderate Democrat), and vice versa for $\bar{\sigma}_n < 0$.

Due to the separability of our model across dimensions, the STVO's impact may vary by issue. Consider for instance a state that is left wing in social issues and right wing in economics. Introducing STVO will induce the state's Democratic party to choose candidates who are more extreme on social issues while *possibly* opting for candidates with moderate positions on economic issues; conversely, the Republican party will likely put forward candidates who are more extreme on the economy but moderate with respect to social issues.

Along with the effects of introducing STVO in an election (*i.e.*, the effect of binary variable $\mu$), Equation (6) allows us to study the local effects of model variables: $p$, $X_n$, and $\bar{\sigma}_n$. For example, when $X_n$ marginally increases, so does the optimal candidate's position on the same issue, whether STVO is available or not. Observe that we restrict our attention to marginal changes in model parameters; effects of non-marginal changes cannot be inferred due to the potential equilibria multiplicity. Similarly, the following Propositions 2 and 3 focus on marginal effects and local equilibrium dynamics.

[17] As an illustration, consider any 0-symmetric distribution of positions $x_{in}$ and let partisanship $p_i$ be an even function of the position, *i.e.*, $p_i(x_{in}) = p_i(-x_{in})$.

## 3.2 Vote share

While both parties choose candidates to maximise vote share, one may be at a disadvantage due to the average partisanship and distribution of voters' positions in a state. The STVO differentially impacts the relative importance of these determinants of election success.

**Proposition 2.** *For all $n$, the Republican (Democratic) vote share increases (decreases) in the: (i) Republican partisan advantage, $p(R) - p(D)$; (ii) swing-position covariance $\bar{\sigma}_n$ (only with STVO); and (iii) average voter bliss point $X_n$. STVO increases effect (i) and decreases effect (iii) on the distribution of votes between parties.*

Voters' positions and partisanship have the anticipated effect on parties' electoral success: the greater the party support in the state and the closer the party is to the average voter the higher its vote share ((i) and (iii) of the proposition, respectively). (ii) is also straightforward: $\bar{\sigma}_n$ determines electoral outcomes only with STVO present, in which case it benefits the party that follows the direction of swing voters (Republicans if positive; Democrats if negative).

Proposition 2's most intriguing result is that STVO has a differential effect on (i), (ii) and (iii). While it reinforces the role of partisanship and swing-position covariance, it diminishes the importance of being positionally proximate to the average voter. To illustrate, suppose an exogenous shock causes a uniform rightward shift in all voters' positions but has no effect on their partisanship status. According to Proposition 2, the shock benefits Republicans most when STVO is *absent* since without it, the average voter's position is a more important determinant of vote share.

Note that voters' positions across issues are substitutes with respect to party vote share. Suppose that in a given state the average voter becomes more right-wing in economic issues $X_{econ}$, but more left-wing in social issues $X_{soc}$. If shifts are inversely proportional to the weights of the issues then a Democratic (Republican) candidate's probability of winning will not change.

## 3.3 Expected positions of elected politician

Knowing the optimal positions of candidates and their corresponding vote shares, we can evaluate the expected position of the election winner:

$$y_n^{**} = V_j y_{jn}^* + (1 - V_j)\, y_{-jn}^*. \tag{7}$$

$y_n^{**}$ is a convex combination of the endogenous positions of the Republican and Democratic candidates, where weights are determined by each party's respective vote share.

**Proposition 3.** *An elected politician's expected position on issue $n$, $y_n^{**}$, tends to the right as the following increase: (i) the Republican partisan advantage, $p(R) - p(D)$; (ii) the swing-position covariance in all issues, $\bar{\sigma}_m$, for all $m$, only with STVO present; (iii) the average voter bliss point in all issues, $X_m$ for all $m$. The STVO increases the effect (i); its effect on (iii) depends on the relative importance of issues, $\{\alpha_n\}_{n=1,2,\dots,N}$.*

Proposition 3 shows how Propositions 1 and 2 interact with each other and describes the STVO's impact on policy implementation. Consider first point (i): $y_n^{**}$ tends to the right as the Republican partisan advantage increases. Recall that our model contains two parties, one of which is (by construction) consistently more right-wing than the other (*i.e.*, $Y_{Dn} < Y_{Rn}$, for all $n \in \{1, 2, \dots, N\}$). This implies that an increase in the vote share of the Democratic party shifts all dimensions of every candidate's political platform to the left, while an increase in the vote share of the Republican party shifts them all to the right. For example, suppose the number of Republican partisans increases in a state (*ceteris paribus*). Because partisan voters are more likely to elect candidates from the parties they identify with, elected politicians will become more right-wing on every issue. The STVO then reinforces this effect since partisan voters are more likely to use the option. That is, adding STVO to the ballot will cause partisan voters to cast even more straight tickets and increase the uniform shift in the positions of elected politicians.

Point (ii) highlights that the positions of swing voters relative to the general population becomes an important determinant of elected officials' platforms when the STVO is present. Some partisans use the STVO to vote a straight party line although they would have voted positionally had the option not been made available. Thus, STVO increases the proportion of swing voters—and reduces the proportion of partisan voters—who vote positionally. Since candidates from both parties cater to positional voters, $y_n^{**}$ shifts towards swings.

Point (iii) describes the direct and spillover effects, respectively, of voters' positions on elected politicians' platforms regardless of STVO status. To understand both effects, consider a state's electorate becoming more right-wing on only one issue dimension, *e.g.*, social issues (*i.e.*, $X_{soc}$ goes up but, say, $X_{econ}$ remains unchanged, where *soc* and *econ* stand for social and economic issues, respectively). From Proposition 3 (iii), elected politicians will now be further to the right not only on social issues (*i.e.*, $y_{soc}$ goes up), but *also* on economic issues (*i.e.*, $y_{econ}^{**}$ goes up). While the effect of the average voter position on the vote share and the average optimal candidate's position declines when STVO is introduced, the option's effect on $y_n^{**}$ is generally ambiguous. However, in the special 'symmetric' case where parties and voters assign the same weights to issues (*i.e.*, $\gamma_n = \omega_n$ for all $n$) STVO decreases the impact of $X_m$ on $y_n^{**}$ for all $m$ and $n$. To continue with the example of two states that only differ in $X_{soc}$, the implication is that removing the STVO in both states will drive their elected politicians further apart on both social and economic issues.

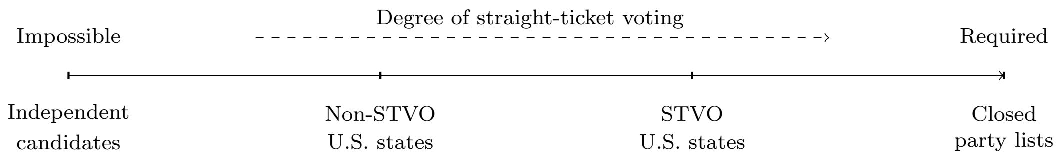
To conclude this section, we have shown that the straight-ticket voting option changes the importance of political positions relative to partisanship in a state and thus affects the types of voters targeted by candidates. When the STVO is present, partisanship becomes more significant in that it is a more important determinant of vote shares and may thus allow candidates to offer platforms closer to the parties they represent. In terms of the political positions of the electorate, the average voter loses significance, whereas swing voters and their positions become more decisive.

# 4 Conclusion

This paper explores how STVO impacts candidate selection, vote share and the expected positions of elected politicians. Introducing STVO induces more partisan voters to cast straight-party ballots, meaning fewer of them vote by position. This grants candidates extra flexibility in appealing to the party (party loyalty effect) and remaining positional voters (swing voter effect). As a result, partisanship status and the positions of swing voters become more decisive determinants of vote share and the expected positions of election winners. Meanwhile, the average voter's position becomes less decisive for vote share; the direction of its impact on the expected positions of election winners depends the relative importance of issues to parties and voters.

Our model is specific to STVO but speaks to a broader question on the impact of ballot design on candidates' platforms. Figure 2 maps a range of electoral systems according to the degree to which their ballots facilitate straight-ticket voting: on the one end, it's mandatory; on the other, elections and their ballots eschew party affiliation entirely.[18] Introducing each should result in a change in the type of voters targeted by candidates—and therefore a change in platforms they run on—that is similar to the STVO's effect but proportionate to the extent to which the electorate is encouraged to vote on a straight-party line.

[18]Note that U.S. states with and without STVO lie between the two extremes of the spectrum; non-STVO states with non-partisan primaries—*e.g.*, California, Washington and Louisiana—are arguably even further to the left of non-STVO states. (See also Barnes *et al.* (2017) for straight-ticket voting in Argentina.)




*Note.* Figure shows the availability and ease of voting a straight ticket in different electoral systems and the implied strength of association between parties and their candidates, from no association (left) to full association (right).

Figure 2: Party-candidate association in elections

By exploring the consequences of STVO, we also address how ballot design affects party influence through candidate selection. In electoral systems where straight-ticket voting is enforced, the party has full control over the politicians who represent it, since it is impossible to vote for individual candidates. In systems that have abandoned party allegiance, however, voters do not associate candidates with party labels and parties have no control over the electoral process. Each of these systems shapes party influence via candidate selection—as occurs with STVO—but again in a manner that relates to how much the system facilitates straight-ticket voting.

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# Appendix

## A Assumptions

**Assumption 1.** $\sum_n \omega_n = \sum_n \gamma_n = 1$, $\beta_k < 1$, *for all* $k$.

We normalize the issue weights, $\sum_n \omega_n = \sum_n \gamma_n = 1$, and bound the payoff to partisanship, $\beta_k < 1$, to guarantee that the solutions are interior.

**Assumption 2.** $\omega_n/\gamma_n \leq 2$, *for all* $n$.

We assume $\omega_n/\gamma_n \leq 2$—or equivalently, $\alpha_n \equiv 2\,\gamma_n/\omega_n \geq 1$—for all $n$, which implies that parties cannot put too little weight on issues that are important to the voters. (If parties and voters assign the same weights to issue $n$ then $\omega_n/\gamma_n = 1$ and $\alpha_n = 2$.) This assumption is used in the proof of Proposition 2: It allows us to unambiguously sign the second order cross derivative $\partial^2 V_j/\partial X_n \partial\mu$, Footnote 24.

## B Additional Notation

In this appendix, we use the following additional notation. Let $\Delta y_{jn} = y_{jn} - y_{-jn}$ be the difference in the two nominated candidates' positions for issue $n$ and $\overline{y_n} = (y_{jn} + y_{-jn})/2$ the average of the two. Similarly, $\Delta Y_{jn}$ and $\overline{Y_n}$ denote the difference and the average of the parties' bliss points. We drop the subscript $k$ from all equations as we focus on one office from Lemma C.2 onward.

## C Theoretical Proofs

**Lemma C.1.** *If $\lambda^p$ and $\lambda^s$ are the respective probabilities for a partisan voter and a swing voter to use the STVO, then $\lambda^p > \lambda^s$.*

*Proof.* The decision of voter $i$ to use the STVO is given by the following: (i) if $c_i \geq \mathbb{E}[U_i^* - \hat{U}_i | x_i, I_i^P]$ then use the STVO; (ii) if $c_i < \mathbb{E}[U_i^* - \hat{U}_i | x_i, I_i^P]$ then go through ballot. His payoff is then given by:

$$\begin{cases} \sum\limits_{k=1,..K} \left( -\sum_n \omega_n \left( x_{in} - y_{\hat{j}_i kn} \right)^2 + \beta_k I_i^P(\hat{j}_i) + \varepsilon_{i\hat{j}_i k} \right) \equiv \hat{U}_i, & \text{if STVO,} \\ \sum\limits_{k=1,..K} \left( -\sum_n \omega_n \left( x_{in} - y_{j_{ik}^* kn} \right)^2 + \beta_k I_i^P(j_{ik}^*) + \varepsilon_{ij_{ik}^* k} \right) - c_i \equiv U_i^* - c_i, & \text{otherwise,} \end{cases}$$

where $I_i^P(j) = 1$ if voter $i$ is partisan of $j$, $I_i^P(j) = 0$ otherwise, and:

$$\begin{aligned} \hat{j}_i &\in \operatorname*{arg\,max}_{j \in \{R,D\}} \left\{ -\sum_{k=1,..K} \left( -\sum_n \omega_n \left( x_{in} - y_{jkn} \right)^2 + \beta_k I_i^P(j) + \varepsilon_{ijk} \right) \right\}, \\ j_{ik}^* &\in \operatorname*{arg\,max}_{j_k \in \{R,D\}} \left\{ -\sum_n \omega_n \left( x_{in} - y_{j_k kn} \right)^2 + \beta_k I_i^P(j_k) + \varepsilon_{ij_k k} \right\}, \end{aligned}$$

for all $k = 1, ..K$. That is, $\hat{j}_i \in \{R, D\}$ is voter $i$'s STVO choice of party, and $\{j_{ik}^*\}_{k=1,..K}$ is the sequence of solutions to the voter's $K$ individual maximization problems, if he goes through the ballot. At stage $t = 2$, the voter's estimate of the utility difference between voting race-by-race and using the STVO is given by:

$$\mathbb{E}\Big[U_i^* - \hat{U}_i \,\big|x_i, I_i^P\Big] = \mathbb{E}\Bigg[\sum_{k=1,..K}\bigg( \quad -\sum_n \omega_n \left(x_{in} - y_{j_{ik}^* kn}\right)^2 + \beta_k I_i^P(j_{ik}^*) + \varepsilon_{ij_{ik}^* k}\bigg)$$
$$- \sum_{k=1,..K}\bigg(-\sum_n \omega_n \left(x_{in} - y_{\hat{j}_i kn}\right)^2 + \beta_k I_i^P(\hat{j}_i) + \varepsilon_{i\hat{j}_i k}\bigg)\Bigg], \tag{8}$$

where the expectation is taken over the random variables $(\varepsilon_{ijk})_{j=R,D;k=1,..K}$ realized in period $t = 3$. The difference between the right hand sides of Equations (8) for the swing (non-partisan) and the partisan voter is non-negative:

$$\begin{aligned}
&\mathbb{E}\left[U_i^* - \hat{U}_i \,\big|x_i, I_i^P = 0\right] - \mathbb{E}\left[U_i^* - \hat{U}_i \,\big|x_i, I_i^P = 1\right] \\
&= \sum_{k=1,..K} \beta_k + \mathbb{E}\Bigg[\sum_{k=1,..K} \max_{j_k \in \{R,D\}} \left\{-\sum_n \omega_n \left(x_{in} - y_{j_k kn}\right)^2 + \varepsilon_{ij_k k}\right\} \\
&\quad - \sum_{k=1,..K} \max_{j_k \in \{R,D\}} \left\{-\sum_n \omega_n \left(x_{in} - y_{j_k kn}\right)^2 + \beta_k I_i^P\left(j_k\right) + \varepsilon_{ij_k k}\right\}\Bigg] \\
&= \mathbb{E}\Bigg[\sum_{k=1,..K} \max_{j_k \in \{R,D\}} \left\{-\sum_n \omega_n \left(x_{in} - y_{j_k kn}\right)^2 + \varepsilon_{ij_k k}\right\} \\
&\quad - \sum_{k=1,..K} \max_{j_k \in \{R,D\}} \left\{-\sum_n \omega_n \left(x_{in} - y_{j_k kn}\right)^2 - \beta_k \left(1 - I_i^P\left(j_k\right)\right) + \varepsilon_{ij_k k}\right\}\Bigg] \\
&\geq 0.
\end{aligned} \tag{9}$$

The probability that a voter uses the STVO is given by

$$\Pr\Big(c_i \geq \mathbb{E}\Big[U_i^* - \hat{U}_i \,\big|x_i, I_i^P\Big]\Big) = 1 - F\Big(\mathbb{E}\Big[U_i^* - \hat{U}_i \,\big|x_i, I_i^P\Big]\Big). \tag{10}$$

Since $F(\cdot)$ is strictly increasing, Equations (9) and (10) imply that

$$\lambda_i^p \equiv 1 - F\Big(\mathbb{E}[U_i^* - \hat{U}_i|x_i, I_i^P = 1]\Big) \geq 1 - F\Big(\mathbb{E}[U_i^* - \hat{U}_i|x_i, I_i^P = 0]\Big) \equiv \lambda_i^s,$$

*i.e.*, that a partisan voter uses the STVO with greater probability than a non-partisan (swing) voter. □

**Lemma C.2.** *For fixed positions $y_{jn}$ and $y_{-jn}$ for all $n$,*

$$\begin{aligned}
V_j &= \mathbb{E}_i \Pr(j \succ_i -j) \\
&= \frac{1}{2} + \frac{1}{2}\mathbb{E}_i[(\mu\,\lambda_i^p\,(1-\beta) + \beta)\,\Delta p_i(j)] \\
&\quad + \frac{1}{2}\sum_n \omega_n \mathbb{E}_i[(1 - \mu\,\lambda_i)\,\Delta y_{jn}\,(x_{in} - \overline{y_n})] + \frac{\mu}{2}\mathbb{E}_i\Big[s_i \lambda_i^s \Pr\Big(\hat{j}_i = j\,\big|I_i^P = 0\Big)\Big].
\end{aligned}$$

*Proof.* If the STVO is on the ballot ($\mu = 1$), the total probability that $i$ votes for $j$ is given by[19]

$$\begin{aligned}\Pr(j \succ_i -j)\big|_{\mu=1} = p_i(j)\,\lambda_i^p + \frac{s_i\bar{\lambda}_i^s}{2}\left[\sum_n \omega_n\left((x_{in}-y_{-jn})^2-(x_{in}-y_{jn})^2\right)+1\right] \\ + \frac{p_i\bar{\lambda}_i^p}{2}\left[\sum_n \omega_n\left((x_{in}-y_{-jn})^2-(x_{in}-y_{jn})^2\right)+1+\beta\frac{\Delta p_i(j)}{p_i}\right] \\ + \frac{s_i\lambda_i^s}{2}\Pr\left(\hat{j}_i = j\,\middle|\,I_i^P = 0\right).\end{aligned} \tag{11}$$

If the STVO is absent from the ballot ($\mu = 0$), the total probability that $i$ votes for $j$ is given by

$$\Pr(j \succ_i -j)\big|_{\mu=0} = \frac{1}{2}\left[\sum_n \omega_n\left((x_{in}-y_{-jn})^2-(x_{in}-y_{jn})^2\right)+1+\beta\Delta p_i(j)\right]. \tag{12}$$

Equations (11) and (12) can be combined in one expression:

$$\begin{aligned}\Pr(j \succ_i -j) = \mu\,p_i(j)\,\lambda_i^p + \frac{1}{2}\left(1-\mu+\mu\underbrace{\left(s_i\bar{\lambda}_i^s+p_i\bar{\lambda}_i^p\right)}_{\equiv\bar{\lambda}_i}\right)\times \\ \times\left[\sum_n \omega_n\left((x_{in}-y_{-jn})^2-(x_{in}-y_{jn})^2\right)+1\right] \\ + \frac{\mu\bar{\lambda}_i^p+1-\mu}{2}\beta\Delta p_i(j) + \frac{\mu s_i}{2}\lambda_i^s\Pr\left(\hat{j}_i = j\,\middle|\,I_i^P = 0\right).\end{aligned} \tag{13}$$

The party $j$'s vote share $V_j$ is the average (across voters) probability of preferring party $j$ to party $-j$

$$V_j = \mathbb{E}_i\Pr(j \succ_i -j). \tag{14}$$

Combining (13) and (14) we obtain the difference in the two parties' vote shares[20]

$$\begin{aligned}\Pr(j \succ_i -j) - \Pr(-j \succ_i j) = \mu\,\lambda_i^p\Delta p_i(j) + \left(1-\mu+\mu\bar{\lambda}_i\right)\sum_n \omega_n\Delta y_{jn}\left(x_{in}-\overline{y_n}\right) \\ + \left(\mu\,\bar{\lambda}_i^p+1-\mu\right)\beta\Delta p_i(j) + \mu s_i\lambda_i^s\Pr\left(\hat{j}_i = j\,\middle|\,I_i^P = 0\right)\end{aligned}$$

where $\bar{\lambda}_i = s_i\bar{\lambda}_i^s + p_i\bar{\lambda}_i^p$, denotes voter $i$'s overall propensity to go through the ballot (*i.e.*, to not use the

[19] For swing voters, $j \succ_i -j$ implies

$$-\sum_n \omega_n\left(x_{in}-y_{-jn}\right)^2 + \left(\varepsilon_{ij}-\varepsilon_{i,-j}\right) \geq -\sum_n \omega_n\left(x_{in}-y_{-jn}\right)^2$$

and $\Pr(\varepsilon_{ij}-\varepsilon_{i,-j} < x) = \left[\frac{1}{2}+\frac{x}{2}\right]_0^1$. For partisan voters, $j \succ_i -j$ implies

$$-\sum_n \omega_n\left(x_{in}-y_{-jn}\right)^2 + \beta p_i(j) + \left(\varepsilon_{ij}-\varepsilon_{i,-j}\right) \geq -\sum_n \omega_n\left(x_{in}-y_{-jn}\right)^2 + \beta p_i(-j).$$

[20]

$$\begin{aligned}(x_{in}-y_{-jn})^2-(x_{in}-y_{jn})^2 &= -2x_{in}y_{-jn}+y^2{}_{-jn}+2x_{in}y_{jn}-y^2{}_{jn} \\ &= 2x_{in}\left(y_{jn}-y_{-jn}\right)-\left(y_{jn}-y_{-jn}\right)\left(y_{jn}+y_{-jn}\right) \\ &= \left(2x_{in}-y_{jn}-y_{-jn}\right)\left(y_{jn}-y_{-jn}\right) \\ &= 2\left(x_{in}-\overline{y_n}\right)\Delta y_{jn}.\end{aligned}$$

STVO), $\Delta y_{jn} = y_{jn} - y_{-jn}$ and $\overline{y_n} = (y_{jn} + y_{-jn})/2$. Hence,

$$\begin{aligned} V_j = \mathbb{E}_i \Pr(j \succ_i -j) = \frac{1}{2} &+ \frac{1}{2}\mathbb{E}_i\left[\left(\mu\,\lambda_i^p + \left(\mu\bar{\lambda}_i^p + 1 - \mu\right)\beta\right)\Delta p_i\,(j)\right] \\ &+ \frac{1}{2}\sum_n \omega_n \mathbb{E}_i\left[\left(1 - \mu + \mu\bar{\lambda}_i\right)\Delta y_{jn}\,(x_{in} - \overline{y_n})\right] \\ &+ \frac{\mu}{2}\mathbb{E}_i\left[s_i \lambda_i^s \Pr\left(\hat{j}_i = j\,\middle|I_i^P = 0\right)\right]. \end{aligned}$$

Provided that $\bar{\lambda}_i^s = 1 - \lambda_i^s$ and $\bar{\lambda}_i^p = 1 - \lambda_i^p$, we can simplify the expression as follows,

$$\begin{aligned} V_j = \mathbb{E}_i \Pr(j \succ_i -j) &= \frac{1}{2} + \frac{1}{2}\mathbb{E}_i[(\mu\,\lambda_i^p\,(1-\beta) + \beta)\,\Delta p_i\,(j)] \\ &+ \frac{1}{2}\sum_n \omega_n \mathbb{E}_i[(1-\mu\,\lambda_i)\,\Delta y_{jn}\,(x_{in} - \overline{y_n})] + \frac{\mu}{2}\mathbb{E}_i\left[s_i \lambda_i^s \Pr\left(\hat{j}_i = j\,\middle|I_i^P = 0\right)\right]. \end{aligned} \tag{15}$$

□

**Lemma C.3.** $\mathbb{E}_i[(\lambda_i - \lambda)(x_{in} - X_n)] = (\lambda^p - \lambda^s)\sigma_n$, *where* $\lambda \equiv \mathbb{E}_i[\lambda_i]$.

*Proof.*

$$\begin{aligned} \mathbb{E}_i[(\lambda_i - \lambda)\,(x_{in} - X_n)] &= \mathbb{E}_i[((1-p_i)\,\lambda_i^s + p_i\lambda_i^p - (1-p)\,\lambda^s - p\lambda^p)\,(x_{in} - X_n)] \\ &= \mathbb{E}_i[(\lambda_i^s + p_i\,(\lambda_i^p - \lambda_i^s) - \lambda^s + p\,(\lambda^p - \lambda^s))\,(x_{in} - X_n)] \\ &= \mathbb{E}_i[(\lambda_i^s - \lambda^s)\,(x_{in} - X_n)] + \mathbb{E}_i[(p_i\,(\lambda_i^p - \lambda_i^s) - p\,(\lambda^p - \lambda^s))\,(x_{in} - X_n)] \\ &= \mathbb{E}_i[\lambda_i^s - \lambda^s]\,\mathbb{E}_i[x_{in} - X_n] \\ &\quad + \mathbb{E}_i[(p_i\,(\lambda_i^p - \lambda_i^s) - p_i\,(\lambda^p - \lambda^s) + p_i\,(\lambda^p - \lambda^s) - p\,(\lambda^p - \lambda^s))\,(x_{in} - X_n)] \\ &= \mathbb{E}_i[(p_i\,(\lambda_i^p - \lambda_i^s - \lambda^p + \lambda^s) + (p_i - p)\,(\lambda^p - \lambda^s))\,(x_{in} - X_n)] \qquad (16) \\ &= \mathbb{E}_i[\lambda_i^p - \lambda_i^s - \lambda^p + \lambda^s]\,\mathbb{E}_i[p_i\,(x_{in} - X_n)] + (\lambda^p - \lambda^s)\,\mathbb{E}_i[(p_i - p)\,(x_{in} - X_n)] \\ &= (\lambda^p - \lambda^s)\,\sigma_n. \qquad (17) \end{aligned}$$

where the transition in (16) is due to $\mathbb{E}_i[\lambda_i^s - \lambda^s] = 0$ and (17) is due to $\mathbb{E}_i[\lambda_i^p - \lambda_i^s - \lambda^p + \lambda^s] = 0$. □

**Proof of Proposition 1.**

*Proof.* Using Equation (15), we observe that the solution to the party's problem must satisfy the following first order conditions (for each $n$)

$$\mathbb{E}_i[(1-\mu\,\lambda_i)\,(x_{in} - y_{jn})] + \alpha_n\,(Y_{jn} - y_{jn}) = 0$$

where $\alpha_n \equiv 2\gamma_n/\omega_n$ is the relative importance of issue $n$ to the party.[21] We used the fact that the derivative of $\lambda_i$ with respect to $y_{jn}$ for all $i, j$, and $n$ is almost surely zero. Solving for $y_{jn}$ we obtain

$$y_{jn}^* = \frac{\alpha_n}{\mathbb{E}_i[1-\mu\,\lambda_i] + \alpha_n} Y_{jn} + \frac{\mathbb{E}_i[(1-\mu\,\lambda_i)\,x_{in}]}{\mathbb{E}_i[1-\mu\,\lambda_i] + \alpha_n} \tag{18}$$

[21] Observe that the first order derivatives decrease in $y_{jn}$ and hence the second order conditions for the maximization of (15) are satisfied.

Substituting $\mathbb{E}_i[(\lambda_i - \lambda)(x_{in} - X_n)] = (\lambda^p - \lambda^s)\,\sigma_n$ from Lemma C.3 we can re-write Equation (18) as

$$\begin{aligned}
y^*_{jn} &= \frac{\alpha_n}{1-\mu\,\lambda+\alpha_n} Y_{jn} + \frac{X_n - \mu \mathbb{E}_i[\lambda_i x_{in}]}{1-\mu\,\lambda+\alpha_n} \\
&= \frac{\alpha_n}{1-\mu\,\lambda+\alpha_n} Y_{jn} + \frac{X_n - \mu\left(\mathbb{E}_i[(\lambda_i-\lambda)(x_{in}-X_n)] + \lambda \times X_n\right)}{1-\mu\,\lambda+\alpha_n} \\
&= \frac{\alpha_n}{1-\mu\,\lambda+\alpha_n} Y_{jn} + \frac{1-\mu\,\lambda}{1-\mu\,\lambda+\alpha_n} X_n - \frac{\mu\,(\lambda^p-\lambda^s)\,\sigma_n}{1-\mu\,\lambda+\alpha_n}
\end{aligned}$$

or, setting $\bar{\sigma}_n \equiv -\sigma_n$,[22]

$$y^*_{jn} = \frac{\alpha_n}{1-\mu\,\lambda+\alpha_n} Y_{jn} + \frac{1-\mu\,\lambda}{1-\mu\,\lambda+\alpha_n} X_n + \frac{\mu\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n}{1-\mu\,\lambda+\alpha_n}. \tag{19}$$

□

**Lemma C.4.** *The STVO effect has two additive components, one proportional to $Y_{jn} - X_n$ (the* party loyalty *effect) and one proportional to $\bar{\sigma}_n$ (the* swing voter *effect).*

*Proof.* From Equation (19), $y^*_{jn}\,|_{\mu=1} - y^*_{jn}\,|_{\mu=0}$ is equal to:

$$\begin{aligned}
&= \frac{\left((1+\alpha_n) - \left(\bar{\lambda}+\alpha_n\right)\right)\alpha_n Y_{jn} + (1+\alpha_n)\,\bar{\lambda} \times X_n - \left(\bar{\lambda}+\alpha_n\right) X_n + (1+\alpha_n)\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n}{\left(\bar{\lambda}+\alpha_n\right)(1+\alpha_n)}. \\
&= \frac{\alpha_n \lambda\,(Y_{jn}-X_n) + (1+\alpha_n)\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n}{\left(\bar{\lambda}+\alpha_n\right)(1+\alpha_n)},
\end{aligned}$$

where $\lambda = 1 - \bar{\lambda}$. Since $\alpha_n$ is positive, we obtain $y^*_{jn}\,|_{\mu=1} - y^*_{jn}\,|_{\mu=0} \gtrless 0 \Leftrightarrow \alpha_n\lambda\,(Y_{jn}-X_n) + (1+\alpha_n)\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n \gtrless 0$. □

**Proof of Proposition 2.**

*Proof.* Recall that $\Delta y_{jn} = y_{jn} - y_{-jn}$ denotes the difference in the two nominated candidates' positions for issue $n$ and $\overline{y_n} = (y_{jn}+y_{-jn})/2$ the average of the two. By Equation (19), the candidates' equilibrium positions satisfy:

$$\Delta y^*_{jn} = \frac{\alpha_n}{1-\mu\,\lambda+\alpha_n} \Delta Y_{jn}. \tag{20}$$

and

$$\overline{y^*_{jn}} = \frac{\alpha_n}{1-\mu\,\lambda+\alpha_n} \overline{Y_{jn}} + \frac{1-\mu\,\lambda}{1-\mu\,\lambda+\alpha_n} X_n + \frac{\mu\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n}{1-\mu\,\lambda+\alpha_n} \tag{21}$$

To study the STVO effect on vote share, we consider $V_j$ when the STVO is present ($\mu = 1$). Substituting (20) and (21) in Equation (15) we obtain

$$\begin{aligned}
V_j &= \mathbb{E}_i \Pr(j \succ_i -j) \\
&= \frac{1}{2} + \frac{1}{2}\mathbb{E}_i[(\mu\,\lambda^p_i\,(1-\beta)+\beta)\,\Delta p_i\,(j)] + \frac{1}{2}\sum_n \frac{\omega_n \alpha_n}{1-\mu\,\lambda+\alpha_n}\mathbb{E}_i\bigg[(1-\mu\,\lambda_i)\,\Delta Y_{jn} \times \\
&\quad \times \left(x_{in} - \left(\frac{\alpha_n}{1-\mu\,\lambda+\alpha_n}\overline{Y_{jn}} + \frac{1-\mu\,\lambda}{1-\mu\,\lambda+\alpha_n} X_n + \frac{\mu\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n}{1-\mu\,\lambda+\alpha_n}\right)\right)\bigg] \\
&\quad + \frac{\mu}{2}\mathbb{E}_i\left[s_i \lambda^s_i \Pr\left(\hat{j}_i = j\,|I^P_i = 0\right)\right].
\end{aligned} \tag{22}$$

[22] Note that

$$\begin{aligned}
\mathbb{E}_i\left[\left(\bar{\lambda}_i - \bar{\lambda}\right)(x_{in} - X_n)\right] &= -\,(\lambda^p-\lambda^s)\,\mathbb{E}_i[(p_i-p)\,(x_{in}-X_n)] \\
&= (\lambda^p-\lambda^s)\,\mathbb{E}_i[(s_i-s)\,(x_{in}-X_n)] \\
&= (\lambda^p-\lambda^s)\,\bar{\sigma}_n.
\end{aligned}$$

The mathematical expectation spanning the second and third line of the above equation,

$$\mathbb{E}_i\left[(1-\mu\,\lambda_i)\,\Delta Y_{jn}\left(x_{in}-\left(\frac{\alpha_n}{1-\mu\,\lambda+\alpha_n}\overline{Y_{jn}}+\frac{1-\mu\,\lambda}{1-\mu\,\lambda+\alpha_n}X_n+\frac{\mu\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n}{1-\mu\,\lambda+\alpha_n}\right)\right)\right]$$

is expressed as follows:

$$\begin{aligned}
&=(1-\mu\,\lambda)\,\Delta Y_{jn}\left(X_n-\frac{\alpha_n}{1-\mu\,\lambda+\alpha_n}\overline{Y_{jn}}-\frac{1-\mu\,\lambda}{1-\mu\,\lambda+\alpha_n}X_n-\frac{\mu\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n}{1-\mu\,\lambda+\alpha_n}\right)-\mu\Delta Y_{jn}\,(\lambda^p-\lambda^s)\,\sigma_n\\
&=(1-\mu\,\lambda)\,\Delta Y_{jn}\left(\frac{\alpha_n}{1-\mu\,\lambda+\alpha_n}\left(X_n-\overline{Y_{jn}}\right)-\frac{\mu\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n}{1-\mu\,\lambda+\alpha_n}\right)+\mu\Delta Y_{jn}\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n\\
&=(1-\mu\,\lambda)\,\Delta Y_{jn}\left(\frac{\alpha_n}{1-\mu\,\lambda+\alpha_n}\left(X_n-\overline{Y_{jn}}\right)\right)+\mu\left(\frac{\alpha_n}{1-\mu\,\lambda+\alpha_n}\right)\Delta Y_{jn}\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n\\
&=\frac{\alpha_n}{1-\mu\,\lambda+\alpha_n}\left((1-\mu\,\lambda)\left(X_n-\overline{Y_{jn}}\right)+\mu\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n\right)\Delta Y_{jn}
\end{aligned}$$

Thus, we have the following equivalent of Equation (22),

$$\begin{aligned}
V_j &= \mathbb{E}_i\mathrm{Pr}(j\succ_i -j)\\
&=\frac{1}{2}+\frac{1}{2}\mathbb{E}_i[(\mu\,\lambda_i^p\,(1-\beta)+\beta)\,\Delta p_i\,(j)]\\
&\quad+\frac{1}{2}\sum_n\frac{\omega_n\alpha_n^2}{(1-\mu\,\lambda+\alpha_n)^2}\left((1-\mu\,\lambda)\left(X_n-\overline{Y_{jn}}\right)+\mu\,(\lambda^p-\lambda^s)\,\bar{\sigma}_n\right)\Delta Y_{jn}\\
&\quad+\frac{\mu}{2}\mathbb{E}_i\left[s_i\lambda_i^s\,\mathrm{Pr}\left(\hat{j}_i=j\,\middle|\,I_i^P=0\right)\right].
\end{aligned}\tag{23}$$

Equation (23) demonstrates that $\frac{\partial V_j}{\partial\Delta p_i(j)}=\frac{1}{2}\,(\mu\,\lambda_i^p\,(1-\beta)+\beta)>0$ (vote share increases in partisanship advantage $\Delta p_i\,(j)$). Since $\frac{\partial^2 V_j}{\partial\Delta p_i(j)\partial\mu}=\frac{1}{2}\lambda_i^p\,(1-\beta)>0$, the effect of partisanship advantage on vote share is stronger when the STVO is on ballot.[23] This effect is the same for both parties.

For the Republican party, Equation (23) implies that vote share increases in $\bar{\sigma}_n$, but only if $\mu=1$ ($\frac{\partial V_j}{\partial\bar{\sigma}_n}{}_{|\mu=0}=0$), and in $X_n$, for all $n$, since

$$\frac{\partial V_j}{\partial X_n}=\frac{1}{2}\frac{\omega_n\alpha_n^2}{(1-\mu\,\lambda+\alpha_n)^2}\,(1-\mu\,\lambda)\,\Delta Y_{jn}.\tag{24}$$

(Recall that $\Delta Y_{Rn}>0$, $\Delta Y_{Dn}<0$.) The effect of the average voter position, $\frac{\partial V_j}{\partial X_n}$, is decreased by the STVO since $\frac{\partial^2 V_R}{\partial X_n\partial\mu}<0$.[24]

For the Democratic party, Equation (23) implies, symmetrically, that $V_D$ decreases in $\bar{\sigma}_n$ (only if $\mu=1$), and $X_n$, for all $n$; the latter effect is weaker when the STVO is on ballot. □

**Proof of Proposition 3.**

*Proof.* To compute $V_j y_{jn}^*+(1-V_j)\,y_{-jn}^*\equiv y_n^{**}$ we use the following transformation:

$$y_n^{**}=\left(V_j-\frac{1}{2}\right)y_{jn}^*+\left(\frac{1}{2}-V_j\right)y_{-jn}^*+\frac{1}{2}\left(y_{jn}^*+y_{-jn}^*\right)=\left(V_j-\frac{1}{2}\right)\Delta y_{jn}^*+\overline{y_n^*},\tag{25}$$

i) Substituting (20) and (21) in Equation (25) and taking the derivative of $y_n^{**}$ with respect to $\Delta p_i\,(j)$

[23] By definition $\mu$ is discrete; here we extend its range to evaluate the direction of monotonicity of $\frac{\partial V_j}{\partial\Delta p_i(j)}$ as a function of $\mu$.

[24] $\mathrm{sgn}\left(\frac{\partial}{\partial\mu}\left(\frac{\omega_n\alpha_n^2}{(1-\mu\lambda+\alpha_n)^2}\,(1-\mu\lambda)\,\Delta Y_{jn}\right)\right)=\mathrm{sgn}\left(\frac{-\lambda}{(1-\mu\lambda+\alpha_n)^2}+\frac{2\lambda(1-\mu\lambda)}{(1-\mu\lambda+\alpha_n)^3}\right)=\mathrm{sgn}\left(\frac{-(1-\mu\lambda+\alpha_n)+2(1-\mu\lambda)}{(1-\mu\lambda+\alpha_n)^3}\right)=\mathrm{sgn}\left(\frac{1-\mu\lambda-\alpha_n}{(1-\mu\lambda+\alpha_n)^3}\right)=-1$, since $\alpha_n\geq 1$ by Assumption 2.

we express the effect of partisan advantage as follows

$$\frac{\partial y_n^{**}}{\partial \Delta p_i(j)} = \frac{\partial V_j}{\partial \Delta p_i(j)} \frac{\alpha_n}{1-\mu\lambda+\alpha_n} \Delta Y_{jn} > 0,$$

for $j = R$. (Recall that $\Delta Y_{Rn} > 0$, $\Delta Y_{Dn} < 0$.) The effect of partisan advantage, $\frac{\partial y_n^{**}}{\partial \Delta p_i(j)}$, increases in $\mu$ (the STVO effect on $\frac{\partial y_n^{**}}{\partial \Delta p_i(j)}$)

$$\frac{\partial^2 y_n^{**}}{\partial \Delta p_i(j)\,\partial\mu} = \frac{\partial^2 V_j}{\partial \Delta p_i(j)\,\partial\mu} \frac{\alpha_n}{1-\mu\lambda+\alpha_n} \Delta Y_{jn} > 0,$$

since $\frac{\partial^2 V_j}{\partial \Delta p_i(j)\partial\mu} > 0$ by Proposition 2.

ii.a) Substituting (20) and (21) in Equation (25) and taking the derivative of $y_n^{**}$ with respect to $\bar{\sigma}_n$ we express the covariance effect as follows

$$\frac{\partial y_n^{**}}{\partial \bar{\sigma}_n} = \frac{\partial V_j}{\partial \bar{\sigma}_n} \frac{\alpha_n}{1-\mu\lambda+\alpha_n} \Delta Y_{jn} + \frac{\mu(\lambda^p - \lambda^s)}{1-\mu\lambda+\alpha_n} > 0.$$

With regards to STVO, we have $\left.\frac{\partial y_n^{**}}{\partial \bar{\sigma}_n}\right|_{\mu=1} > 0$ and

$$\left.\frac{\partial y_n^{**}}{\partial \bar{\sigma}_n}\right|_{\mu=0} = \left.\frac{\partial V_j}{\partial \bar{\sigma}_n}\right|_{\mu=0} \frac{\alpha_n}{1-\mu\lambda+\alpha_n} \Delta Y_{jn} + \left.\frac{\mu(\lambda^p - \lambda^s)}{1-\mu\lambda+\alpha_n}\right|_{\mu=0} = 0,$$

since $\left.\frac{\partial V_j}{\partial \bar{\sigma}_n}\right|_{\mu=0} = 0$ by Proposition 2.

ii.b) Taking the derivative of $y_n^{**}$ with respect to $\bar{\sigma}_m$, $m \neq n$, we express the cross-covariance effect as follows

$$\frac{\partial y_n^{**}}{\partial \bar{\sigma}_m} = \frac{\partial V_j}{\partial \bar{\sigma}_m} \frac{\alpha_n}{1-\mu\lambda+\alpha_n} \Delta Y_{jn} > 0.$$

With regards to STVO, we have $\left.\frac{\partial y_n^{**}}{\partial \bar{\sigma}_m}\right|_{\mu=1} > 0$ and

$$\left.\frac{\partial y_n^{**}}{\partial \bar{\sigma}_n}\right|_{\mu=0} = \left.\frac{\partial V_j}{\partial \bar{\sigma}_m}\right|_{\mu=0} \frac{\alpha_n}{1-\mu\lambda+\alpha_n} \Delta Y_{jn} = 0,$$

since $\left.\frac{\partial V_j}{\partial \bar{\sigma}_m}\right|_{\mu=0} = 0$ by Proposition 2.

Observe that the effects in (ii.a) and (ii.b) are qualitatively the same. Therefore, they are reported as a single result—(ii)—in the statement of Proposition 3.

iii.a) Substituting (20) and (21) in Equation (25) and taking the derivative of $y_n^{**}$ with respect to $X_n$, and using Equation (24), we express the effect of the average voter position as follows

$$\begin{aligned}
\frac{\partial y_n^{**}}{\partial X_n} &= \frac{\partial V_j}{\partial X_n} \frac{\alpha_n}{1-\mu\lambda+\alpha_n} \Delta Y_{jn} + \frac{1-\mu\lambda}{1-\mu\lambda+\alpha_n} \\
&= \frac{1}{2} \frac{\omega_n \alpha_n^2}{(1-\mu\lambda+\alpha_n)^2} (1-\mu\lambda) \Delta Y_{jn} \frac{\alpha_n}{1-\mu\lambda+\alpha_n} \Delta Y_{jn} + \frac{1-\mu\lambda}{1-\mu\lambda+\alpha_n} \\
&= \frac{1-\mu\lambda}{1-\mu\lambda+\alpha_n} \left( \frac{1}{2} \frac{\omega_n \alpha_n^3}{(1-\mu\lambda+\alpha_n)^2} (\Delta Y_{jn})^2 + 1 \right) > 0.
\end{aligned}$$

With regards to the effect of STVO, the sign of the derivative of $\frac{\partial y_n^{**}}{\partial X_n}$ with respect to $\mu$, $\frac{\partial^2 y_n^{**}}{\partial X_n \partial \mu}$, is given by:

$$\begin{aligned}
\operatorname{sgn}\left(\frac{\partial^2 y_n^{**}}{\partial X_n \partial \mu}\right) &= \operatorname{sgn}\left(\left(-\lambda \frac{\alpha_n}{(1-\mu\,\lambda+\alpha_n)^2}\right)\left(\frac{1}{2}\frac{\omega_n \alpha_n^3}{(1-\mu\,\lambda+\alpha_n)^2}(\Delta Y_{jn})^2+1\right)\right. \\
&\qquad \left. + \frac{1-\mu\,\lambda}{1-\mu\,\lambda+\alpha_n}\lambda \frac{\omega_n \alpha_n^3}{(1-\mu\,\lambda+\alpha_n)^3}(\Delta Y_{jn})^2\right) \\
&= \operatorname{sgn}\left(-\frac{1}{2}\omega_n \alpha_n^3 (\Delta Y_{jn})^2 - (1-\mu\,\lambda+\alpha_n)^2 + (1-\mu\,\lambda)\,\omega_n \alpha_n^2 (\Delta Y_{jn})^2\right) \\
&= \operatorname{sgn}\left(-(1-\mu\,\lambda+\alpha_n)^2 + \left(1-\mu\,\lambda-\frac{1}{2}\alpha_n\right)\omega_n \alpha_n^2 (\Delta Y_{jn})^2\right). \qquad (26)
\end{aligned}$$

The sign of the derivative and, hence, the effect of STVO, depends on the constellation of parameters. In the special case where parties assign the same issue weights as the voters, i.e., $\gamma_n = \omega_n$, $\alpha_n = 2$ for all $n$, Equation (26) implies that $\frac{\partial^2 y_n^{**}}{\partial X_n \partial \mu} = -1$ and hence the effect of STVO is negative.

iii.b) Substituting (20) and (21) in Equation (25) and taking the derivative of $y_n^{**}$ with respect to $X_m$, $m \neq n$, and using Equation (24), we express the cross effect of average voter position as follows

$$\begin{aligned}
\frac{\partial y_n^{**}}{\partial X_m} &= \frac{\partial V_j}{\partial X_m}\frac{\alpha_n}{1-\mu\,\lambda+\alpha_n}\Delta Y_{jn} \\
&= \frac{1}{2}\frac{\omega_m \alpha_m^2}{(1-\mu\,\lambda+\alpha_m)^2}\frac{\alpha_n(1-\mu\,\lambda)}{1-\mu\,\lambda+\alpha_n}\Delta Y_{jm}\Delta Y_{jn} > 0.
\end{aligned}$$

With regards to the effect of STVO, we have the following

$$\begin{aligned}
&\operatorname{sgn}\left(\left.\frac{\partial y_n^{**}}{\partial X_m}\right|_{\mu=1} - \left.\frac{\partial y_n^{**}}{\partial X_m}\right|_{\mu=0}\right) \\
&\quad = \operatorname{sgn}\left(\frac{1-\lambda}{(1-\lambda+\alpha_m)^2(1-\lambda+\alpha_n)} - \frac{1}{(1+\alpha_m)^2(1+\alpha_n)}\right). \qquad (27)
\end{aligned}$$

The sign of the derivative and, hence, the effect of STVO, depends on the constellation of parameters. In the special case where parties assign the same issue weights as the voters, i.e., $\gamma_n = \omega_n$, $\alpha_n = 2$ for all $n$, Equation (27) can be re-written as $\operatorname{sgn}\left(\frac{1-\lambda}{(3-\lambda)^3} - \frac{1}{3^3}\right) = -1$ for any $\lambda \in (0,1)$, which implies that the effect of STVO is negative, as in (iii.a).

Observe that the effects in (iii.a) and (iii.b) are qualitatively the same. Therefore, they are reported as a single result—(iii)—in the statement of Proposition 3.

□

# D Sample ballot featuring a straight-ticket voting option