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Journal of Elections, Public Opinion and Parties

ISSN: 1745-7289 (Print) 1745-7297 (Online) Journal homepage: http://www.tandfonline.com/loi/fbep20

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To cite this article: Ludovic Rheault, Andre Blais, John H. Aldrich & Thomas Gschwend (2018): Understanding people's choice when they have two votes, Journal of Elections, Public Opinion and Parties

To link to this article: https://doi.org/10.1080/17457289.2018.1560301

JOURNAL OF ELECTIONS, PUBLIC OPINION AND PARTIES
https://doi.org/10.1080/17457289.2018.1560301

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Understanding people's choice when they have two votes

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ABSTRACT

This paper introduces a model of vote choice in mixed-member proportional representation systems where electors cast two votes. Despite the growing popularity of mixed systems around the world, a recent stream of literature suggests that the candidate vote contaminates the list vote, inducing the type of behavior observed under majority rule. We propose a new approach to account for these so-called "contamination" effects, a phenomenon that we define as a causal influence making choices more similar across the vote decisions. Since causality entails a time ordering, we argue that contamination arises only when voters choose sequentially. By making use of new survey questions asking respondents about the timing of vote decisions, we can estimate the magnitude of these contamination effects directly. The model is tested using Bayesian multinomial probit models with survey data from the 2013 federal election in Germany. A key contribution of this paper is to show that contamination effects are present only among voters with lower levels of education, and work primarily from the list vote to the candidate vote. We also test a number of predictions about the determinants of the two vote choices in mixed systems.

Understanding why people vote the way they do is the central question in electoral studies. There is a vast literature on the factors that lead citizens to cast their single vote for a party or candidate in a given election. Our question is how to make sense of the choices that people make in mixed systems when they have two votes. There is surprisingly little research on this question in spite of the fact that the number of elections where people make two choices is growing. According to the Electoral System Design Database, 30 countries used a mixed electoral system in their most recent legislative election.[1] More than 80% of these systems have voters cast two votes, one for a

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Supplemental data for this article can be accessed 10.1080/17457289.2018.1560301.

local candidate and one for a party list (Shugart and Wattenberg 2001, Table 1.3). Because they combine proportionality and local representation, mixed electoral systems have gained in popularity in the past decades (see Bormann and Golder 2013; Linhart, Raabe, and Statsch 2018). While these systems were designed to generate proportional outcomes, a recent stream of literature suggests that the candidate vote "contaminates" the other choice, inducing the type of behavior observed under majority rule (see Ferrara, Herron, and Nishikawa 2005; Rich 2015). The model that we develop in this study allows us to challenge this conclusion, by showing that such contamination effects are negligible; in fact, the influence operates mostly the other way around, from the list vote to the candidate vote.

The presence of two votes in mixed systems has spurred interest about the magnitude and determinants of ticket-splitting, that is, people voting for a candidate associated with a party different from the one that they support on the list vote (Burden 2009; Gschwend 2007; Gschwend, Johnston, and Pattie 2003; Helmke 2009; Karp et al. 2002; Moser and Scheiner 2005, 2009; Pappi and Thurner 2002). A number of studies have also investigated the presence of contamination effects (or spillover effects), that is, whether vote choice in one election affects the choice in the other election (Cox and Schoppa 2002; Ferrara, Herron, and Nishikawa 2005; Hainmueller and Kern 2008; Herron and Nishikawa 2001; Karp 2009).[2] Yet, as far as we can tell, there has been no systematic investigation of the factors that affect each vote when people have two decisions to make, one with respect to the choice of a candidate in the local constituency and one with respect to the choice of a party list. We intend to fill that gap here by formulating a number of predictions and testing them using data collected during the 2013 German federal election. Germany has used a mixture of proportional representation (PR) and first-past-the-post (FPTP) rules since 1953. This makes the country a natural choice to test our model, since we can reasonably expect the German public to have well established strategies for casting the two votes, unlike voters in newly adopted mixed systems.

A key contribution of this study is to introduce a new framework to estimate contamination effects at the micro-level. So far, most of the debate surrounding the existence of contamination effects between electoral systems has relied upon macro evidence (see e.g. Cox and Schoppa 2002; Crisp, Potter, and Lee 2012; Ferrara 2004; Hainmueller and Kern 2008; Herron and Nishikawa 2001; Maeda 2008; Moser and Scheiner 2004). Building upon Duvergerian principles, many of those studies assess contamination by

[1]Data retrieved from https://www.idea.int/data-tools/data/electoral-system-design on 19 March2018. Note that the definition used to classify mixed systems may vary, and some include additional countries into this category (see Carter and Farrell 2010; Massicotte and Blais 1999; Shugart and Wattenberg 2001).
[2]While "spillover" has fewer negative connotations in common parlance, "contamination" has become the dominant term used in the literature.

testing whether mixed electoral systems constrain the number of parties the same way plurality systems do, as opposed to pure PR systems. However, since mechanisms leading to contamination ultimately depend on the decisions of voters, the macroscopic approach leaves a large part of the phenomenon unobserved. Existing attempts to account for contamination at the micro level are reviewed in the next section, but overall, most of them use indirect estimates. Our approach relies on survey questions about the ordering of vote decisions to provide a direct measure of causal effects across the two choices, making it possible to overcome identification issues while remaining general enough to be implemented in most situations involving simultaneous elections.

Investigating the influence across votes

A modern view about mixed electoral systems is that the two votes are not independent. Although empirical studies initially emphasized a tendency of mixed systems to induce multiparty competition in the plurality races (Ferrara 2004; Herron and Nishikawa 2001), later evidence suggested that candidates running in single-member districts have in turn an influence on voters choosing between party lists, ultimately restraining the number of viable parties compared to pure PR systems (for discussions, see e.g. Ferrara, Herron, and Nishikawa 2005; Guinjoan 2014; Rich 2015). This entails that the type of strategic voting characterizing majoritarian systems, whereby voters avoid "wasting their vote" on non-viable candidates, would contaminate the decision of voters in the PR component. This body of literature sheds doubt on the desirability of mixed systems to achieve the type of outcome expected under PR. Yet, few studies have managed to provide direct evidence of an influence across vote choices in mixed systems, an issue that we address here. Moreover, we argue that such contamination effects, if they occur, are more likely to flow from the PR component to the plurality component.

We start by defining the idea of influence across the vote decisions. If contamination does indeed alter the nature of mixed systems, it implies that for some voters, the decision to vote in one election has an influence on the choice made in the other election, independent of other factors. Thus, we define a *contamination effect* as the causal effect of a voter's decision to support a party in one election on the preference of that voter for the same party in another election. We adopt a strict interpretation of causality that entails the existence of a time ordering between vote decisions: a condition for the existence of a contamination effect from an election s to an election t is that the voter's decision in s has been made before the decision in t. Consequently, our definition rules out the possibility of simultaneous contamination for individual voters, a problematic concept at the philosophical level (see Granger 1969; Mellor 2002, Ch. 17). Elections involve discrete

choices that are made only once in each election, which precludes the possibility of a feedback once the decision in one election has been made. For each pair of elections, either a voter makes one decision before the other, or else both decisions are made at the same time. The definition also makes the distinction between a prior decision serving as a choice heuristic and situations where a third factor (say, a strong sense of party affiliation) influences both choices at the same time. As we illustrate in this study, it is possible to establish the sequence of the vote decisions for individual voters by collecting information about the timing of these choices in surveys.

The key question is what mechanism explains the influence across the two choices? Ferrara, Herron, and Nishikawa (2005, 35) distinguish between cases where voters have incentives to vote strategically for a candidate in the plurality election. Two of these cases would lead to contamination. A first case arises when a voter chooses strategically in the plurality vote (that is, by choosing the least disliked candidate with a chance to win the seat), and this choice influences the decision to vote for the same party list. This is the mechanism that would contaminate the PR component of mixed systems, since strategic voting is viewed as the main factor constraining the party system in plurality elections (Cox 1997). A second case happens if a voter chooses sincerely in the list vote, and then decides to vote for the candidate of the same party. This would make the PR component of the system spill over the plurality component. The remaining case identified by Ferrera et al. is a split-ticket, and this happens when a voter chooses strategically under plurality but sincerely in the list vote. This case does not entail any contamination, as this is how the voter behaves in expectation under each separate system.

We argue that the second case above is the most plausible, for a number of reasons. Contamination as an influence across the choices amounts to a heuristic designed to simplify decision-making. Yet, choosing a candidate first in a mixed system, and casting a strategic vote, implies a high level of sophistication. Previous research, with special relevance to those studying German elections, suggests that voters have limited knowledge about candidates running in their local district (Gschwend and Zittel 2015). Strategic voting requires that electors attach a particular importance to the identity of the candidates who are most likely to win in their local constituency, and this suggests a fair amount of knowledge about the context of the local race. It entails an ability to vote rationally, without easier cues available to orient one's decision. The reverse situation, where a voter decides between party lists first, is more consistent with the idea that contamination occurs as a heuristic. A voter can more easily decide between party labels than between specific individuals, especially given that the media and polls tend to focus on parties rather than candidates. A voter choosing a party list may then use that first decision as a guide to pick a local candidate. We thus expect a stronger contamination from the list vote toward the candidate vote than

the other way around. For similar reasons, we expect contamination effects to occur mostly among the less sophisticated voters. More sophisticated voters should not only be more likely to cast split-ticket votes, but they can also rely more easily on distinct evaluative criteria for each of the two votes, which reduces the extent of contamination.

Existing attempts to measure contamination effects at the voter level have been mostly indirect. For instance, Ferrara, Herron, and Nishikawa (2005, Ch. 5) examined whether local candidate ratings have an independent impact on the list vote choice in the 1999 New Zealand elections, controlling for a host of other factors. They found that they do and inferred the existence of a contamination effect of the candidate vote on the list vote (Ferrara, Herron, and Nishikawa 2005, 73, Table 5.1). This effect is estimated to be rather weak. For his part, Karp (2009) used data on the 2002 New Zealand election and determined whether the presence of an incumbent increases the propensity to cast a list vote for the incumbent's party in the case of the two main parties (Labour and National) and whether the presence of a local candidate enhances the likelihood of supporting the candidate's party in the PR vote. The author reported a small incumbency effect for Labour but none for National and no candidate presence effect for the minor parties. His conclusion is that "the overall impact of candidate effects appears to be quite small" (Karp 2009, 49). As far as we can tell, no previous empirical study has attempted to measure contamination effects *from* the list vote *toward* the candidate vote per se.

Determinants of vote choice in mixed electoral systems

In addition to measuring contamination effects, we make predictions about the factors affecting vote choice in a mixed electoral system with a list vote and a local candidate vote. Our model comprises five basic proximate determinants of vote choice: party ratings, leader ratings, local candidate ratings, local chances of winning, and coalition ratings. Put simply, we propose that a voter is more likely to vote for a party when she thinks of herself as close to a party, when she likes the party, its leader, its local candidate, when she believes that the party's candidate has some chance of winning locally, and when she likes the coalition that the party is associated with.

We understand that the vote decision is affected by other considerations, perhaps the most obvious being issue positions and ideology. But we assume that these are more distant factors whose effect is basically indirect. We assume that voters' ideology and attitudes affect how much they like or dislike the various parties and leaders, and that these likes and dislikes in turn determine the final vote choice. This research strategy was followed by Page and Jones (1979) and Rahn et al. (1990), among others. We focus here on the more proximate factors.

The question that we address is whether these factors have a similar influence on the two votes. The first prediction concerns the party's perceived chances in the local constituency and local candidate ratings. These two considerations should affect the candidate vote choice, but they should have no impact on the list vote. Logically, whether one likes the local candidate should have little influence on the decision to support a party list, all else equal. To be sure, Klingemann and Wessels (2001) noted previously that the German mixed system "[…] was specifically designed to strengthen personal ties between representatives and constituents (279)." However, citing empirical evidence, the authors also argue that such a personalization of politics through local candidates probably has little effect on the list vote, and is limited to the candidate vote (see Klingemann and Wessels 2001, 279–280). In the same manner, since the number of seats a party gets from the list vote is practically unaffected by the number of votes it gets in a constituency, there is no reason to defect from a party list simply because that party is unlikely to win in the local constituency. We thus predict these two factors to affect only the candidate vote.

The second prediction has to do with party and leader ratings. We expect these two factors to have a stronger effect on the list than on the candidate vote. The list vote entails expressing support for a given party, and we should thus observe that how much one likes a party has a strong effect on the propensity to vote for that party list. The marginal effect should be weaker in the case of the candidate vote since people are explicitly asked to express support for a person. We do expect a positive association, however, between party ratings and the candidate vote since people may well prefer to be represented in their local constituency by a person associated with a party that they like and trust even if they do not particularly like that person.

The same should apply to leader ratings. Poguntke and Webb (2005) argued that leaders have become increasingly important in contemporary political parties. They are the public face of the party during election campaigns, they exercise considerable control over the extra parliamentary party and its resources, and they lead the elected members in the legislature. Voting for a party is thus also implicitly voting for its leader. Again we expect a weaker effect of leader ratings on the candidate vote because the latter entails supporting a particular person in the constituency. We nevertheless anticipate a positive association because, everything else being equal, one should prefer the local candidate to be under the direction of a "good" party leader.

The third prediction is about coalition ratings. The hypothesis is that coalition preferences affect only the list vote. There is empirical evidence that in countries where coalition governments are the norm, people's vote choice depends not only on how they feel about the parties but also on how they feel about the coalitions that could be formed after the election (Abramson et al. 2008; Bargsted and Kedar 2009; Blais et al. 2006; Gschwend and Hooghe 2008; Meffert and Gschwend 2010). Such considerations,

however, should enter the calculus decision only for the list vote since the candidate vote has no consequence on the number of seats won by the various parties (and thus on the likelihood of different coalitions).

Methodology and the 2013 German federal election

Our empirical tests rely upon survey data on the 2013 German federal election. The survey includes samples from two major Landers, Bavaria and Lower Saxony, encompassing both variants of the German party system: in Bavaria, the Christian Social Union (CSU) runs in lieu of its sister party, the Christian Democratic Union (CDU), although both formations are united at the federal level under a single leader. Our data come from Internet campaign surveys conducted by Harris/Decima, which are described further in the online appendix. The dependent variables are the two vote choices as reported during post-election survey waves. For the purpose of our analysis, we focus on the five main parties in each election: CDU, Social Democratic Party (SPD), Greens, Free Democratic Party (FDP), and Left. The other parties garnered marginal vote shares, and we do not have measures of party and leader ratings for these smaller parties.

As mentioned above, our model includes five proximate determinants of the vote: party ratings, leader ratings, local candidate ratings, local chances, and coalition ratings. Each of these variables is scaled between 0 and 1, where 1 indicates a positive rating/chance of winning. To create our coalition ratings variable, we subtract the score given by respondents to the SPD-Greens coalition from the score given to the CDU-FDP coalition: a value of 1 indicates a strong preference for the CDU-FDP. The online appendix provides additional details on the measurement of each variable. We also consider age, education, gender, and party identification as control variables, again scaled between 0 and 1.

To account for contamination effects, we create time-ordered vote choice variables using information on the reported timing of the vote decisions. All post-election wave respondents were asked squarely whether they made one of the two vote decisions before the other. The wording of that survey question is "Which vote did you decide upon first?" and the response categories included "The candidate vote", "The list vote", "I decided both at the same time" and "Don't know" (translated from the German original version). Table 1 shows the distribution of responses to this question.

Table 1. Timing of the vote decisions.

Timing	Frequency	Percentage
Candidate Vote First	962	36%
Both at the Same Time	1243	46%
List Vote First	489	18%
Total	2694	

Overall, about 36% of the respondents made their decision regarding the candidate vote before they chose which party list to support, whereas approximately 18% did the opposite.[3]

Our model accounts for the ordering of choices as follows. Let us denote the event of a voter choosing in election s before election t as $s \rightarrow t$. Furthermore, we denote the contamination effect of a vote y_{sj} for party j in election s on the preference for party j in election t as θ_{st}. Denoting the local candidate vote C and the party list vote L, this allows us to write the utilities of a voter for each election as:

$$u_{Lj} = \gamma_{Lj} + \mathbf{x}_j'\boldsymbol{\alpha}_j + \theta_{\mathrm{CL}}\mathbf{1}(C \rightarrow L)y_{Cj} + \varepsilon_{Lj}, \tag{1}$$

$$u_{Cj} = \gamma_{Cj} + \mathbf{x}_j'\boldsymbol{\beta}_j + \theta_{LC}\mathbf{1}(L \rightarrow C)y_{Lj} + \varepsilon_{Cj} \tag{2}$$

where $\mathbf{x}_j$ is a vector of covariates, the γ parameters are intercepts, $\boldsymbol{\alpha}_j$ and $\boldsymbol{\beta}_j$ are vectors of parameters for each election, and $\mathbf{1}(.)$ is an indicator function equaling one if the expression between brackets is true and zero otherwise. For each election t, the ε_{tj} represent random disturbance terms. We assume that disturbances are multivariate normally distributed within each election, with mean vector zero and covariance matrix $\boldsymbol{\Sigma}_t$. The notation $\theta_{st}\mathbf{1}(s \rightarrow t)y_{sj}$ reflects the definition introduced above: a contamination effect θ_{st} is the impact of a vote decision y_{sj} on u_{tj}, given that the decision y_{sj} has been made before the decision in election t.[4] Since the events $(s \rightarrow t)$ and $(t \rightarrow s)$ cannot be true at the same time, our model is "recursive": the choice y_{sj} cannot depend in turn on u_{tj} if $(s \rightarrow t)$ is true. We measure the expressions $\mathbf{1}(L \rightarrow C)y_{Lj}$ using binary variables measuring the list vote choice conditional on having made a decision regarding party lists before the decision regarding local candidates. The expressions $\mathbf{1}(C \rightarrow L)y_{Cj}$ are constructed in a similar fashion, the other way around. For voters who choose simultaneously, both the contamination parameters are constrained to zero by construction, which means that the models can be fitted with all respondents.

The choice of empirical estimators for our vote models requires some consideration. Previous research on binary probit models with simultaneous equations suggests that when exogeneity can be achieved, univariate estimators are to be preferred (Monfardini and Radice 2007). We adopt a similar strategy by sampling parameters from separate multinomial probit estimators. Even though our models contain recursive elements (the contamination effects), the time-ordering restrictions that we impose in Equations 1–2

[3]A reason for the larger proportion choosing the candidate vote first may be the fact that this vote appears first on the German ballot. However, for the theoretical reasons outlined above, we do not expect the candidate vote to induce stronger contamination effects, all else being equal.

[4]Notice that the contamination effect parameters are not specific to party. In multi-party elections, such models will likely be estimated with multinomial models in which party-specific variables have constrained coefficients across the alternatives. As a result, there would be only one parameter for each pair of elections $\{s, t\}$.

ensure that the components $\mathbf{1}(s \rightarrow t)y_{sj}$ on the right-hand side of the latent utility functions do not introduce a correlation with the error terms ε_{tj}. This follows from the fact that $(s \rightarrow t)$ and $(t \rightarrow s)$ cannot be true at the same time, eliminating the possibility of feedback across equations. We also tested multinomial logit models estimated jointly by stacking the data for both elections. We report these results in the online appendix, and we show that they are consistent with the main findings of this paper. The multinomial probit models do not require making the independence of irrelevant alternatives (IIA) assumption, which is why we focus on these results in the main paper. We rely upon Bayesian implementations of the multinomial probit model using the marginal data-augmentation algorithm proposed by Imai and van Dyk (2005a, 2005b). Each model is sampled with three chains of one million MCMC draws, and the analysis relies upon the last 500,000 draws from each chain (see appendix for full details).

Empirical findings

Figure 1 plots the posterior distributions for our parameters of interest. The shaded distributions are the sampled parameters for the list vote, whereas the light distributions are for the candidate vote. Table 2 reports the mean and credible intervals of the posterior distributions for both models, and shows the full specification we used, including control variables. We investigate diagnostic statistics in the online appendix. Overall, the models perform well, correctly predicting 84.2% and 84.6% of actual vote choices, respectively for the list and candidate votes. Notice that, since all explanatory factors are on the same [0,1] scale, quantities of interest derived from the posterior distributions can be compared in size.

Our first prediction is that local chances of winning and local candidate ratings affect the candidate vote but not the list vote. The findings are consistent with this prediction. As shown in Figure 1(a), the posterior distribution for the local chances of winning parameter is centered around zero in the list vote equation. In contrast, the posterior density of the corresponding parameter in the candidate vote equation is unambiguously positive. A similar conclusion holds for local candidate ratings. Our results suggest that an important reason why the major parties do better than their junior partners in the candidate election is that some supporters of small parties are willing to defect at the constituency level, because they do not want to waste their vote on a candidate who is unlikely to win.

Bayesian analysis provides more direct ways to test hypotheses about differences between the coefficients of the two models. We rely on two different approaches in what follows. First, we evaluate a prediction of the type $\beta > \alpha$ by testing whether the posterior distribution $p(\beta|D)$ is larger than the most credible value of α, namely the median of its posterior distribution,

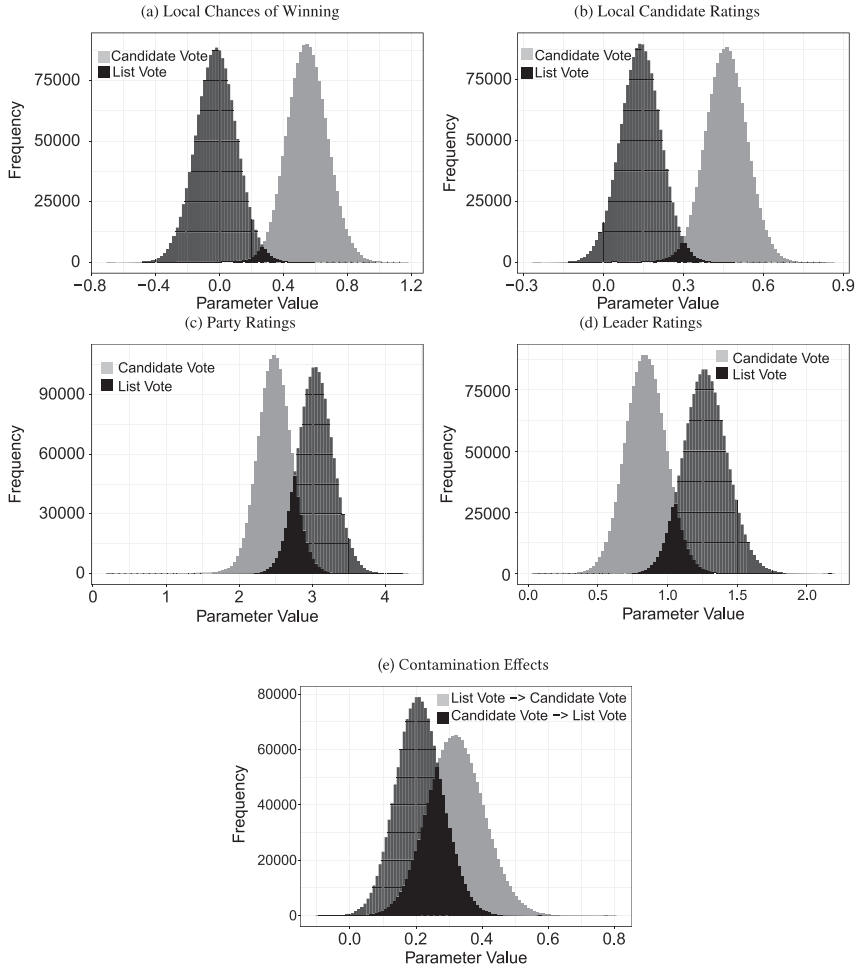

Figure 1. Posterior densities of list and candidate vote parameters.

which we denote by $\tilde{\alpha}$. Since both models include the same variables and are estimated using identical priors and specifications, the coefficients are on the same scale, allowing comparisons based on point estimates. Generally speaking, we posit hypotheses of the form H_1: $\beta > \alpha$ against the null H_0: $\beta \leq \alpha$, and rely upon non-informative priors $P(H_0) = 0.5$ and $P(H_1) = 0.5$. We then estimate the posterior probability $P(H_1|D)$ numerically using the MCMC draws, by counting the proportion of draws larger than the reference value. In other words, we estimate the probability

$$P(\beta > \tilde{\alpha}|D) = \int_{\tilde{\alpha}}^{\infty} p(\beta|D)d\beta,$$

Table 2. Bayesian multinomial probit models of list and candidate votes.

		List Vote		Candidate Vote	
Party	Variable	Mean	Credible Interval	Mean	Credible Interval
	Local Chances	−0.021	[−0.270, 0.230]	0.549	[0.304, 0.801]
	Local Ratings	0.139	[−0.009, 0.287]	0.461	[0.308, 0.614]
	Party Ratings	3.053	[2.593, 3.530]	2.477	[2.010, 2.933]
	Leader Ratings	1.274	[0.976, 1.588]	0.842	[0.561, 1.131]
	Contamination: Candidate to List	0.209	[0.077, 0.348]		
	Contamination: List to Candidate			0.322	[0.161, 0.493]
	Party ID	0.813	[0.663, 0.977]	0.550	[0.390, 0.713]
SPD	Coalition Ratings	−1.297	[−1.940, −0.644]	−1.791	[−2.488, −1.157]
	Age	0.080	[−0.411, 0.569]	0.279	[−0.167, 0.728]
	Education	−0.194	[−0.478, 0.088]	0.207	[−0.053, 0.467]
	Gender	0.093	[−0.103, 0.293]	0.016	[−0.163, 0.196]
	Bavaria	−0.018	[−0.283, 0.245]	0.315	[0.069, 0.557]
	Intercept	0.697	[0.215, 1.176]	0.318	[−0.155, 0.806]
Greens	Coalition Ratings	−1.061	[−1.828, −0.331]	−0.483	[−1.231, 0.221]
	Age	−0.365	[−0.965, 0.226]	0.090	[−0.486, 0.651]
	Education	0.213	[−0.146, 0.584]	0.258	[−0.074, 0.608]
	Gender	0.079	[−0.162, 0.324]	0.115	[−0.107, 0.345]
	Bavaria	0.173	[−0.146, 0.498]	0.172	[−0.117, 0.469]
	Intercept	0.110	[−0.485, 0.687]	−0.503	[−1.118, 0.083]
FDP	Coalition Ratings	1.393	[0.499, 2.300]	0.158	[−0.854, 1.142]
	Age	−0.393	[−1.042, 0.250]	−1.296	[−2.062, −0.562]
	Education	0.120	[−0.282, 0.537]	−0.048	[−0.481, 0.405]
	Gender	−0.143	[−0.432, 0.133]	−0.106	[−0.431, 0.202]
	Bavaria	0.536	[0.105, 0.984]	0.639	[0.154, 1.174]
	Intercept	−1.267	[−2.093, −0.490]	−0.633	[−1.569, 0.222]
Left	Coalition Ratings	−0.980	[−1.867, −0.104]	−0.791	[−1.696, 0.105]
	Age	−0.225	[−0.997, 0.539]	0.146	[−0.648, 0.935]
	Education	−0.479	[−0.946, −0.016]	−0.208	[−0.673, 0.255]
	Gender	0.058	[−0.270, 0.387]	0.139	[−0.192, 0.468]
	Bavaria	−0.071	[−0.455, 0.310]	0.163	[−0.209, 0.541]
	Intercept	0.567	[−0.136, 1.253]	−0.338	[−1.071, 0.358]
% Correctly Predicted			84.2%		84.6%
Observations			2694		2694
Monte Carlo Draws			1,500,000		1,500,000

Summary statistics of the posterior predictive distributions of parameters from the list and candidate vote equations, estimated with Bayesian multinomial probit models. The 95% credible intervals are reported between brackets.

numerically. We also compute Bayes factors as

$$B_{10} = P(H_1|D)P(H_0)/P(H_0|D)P(H_1),$$

which represent the odds of observing the data given that our hypothesis is true, relative to the null hypothesis. Following usual conventions, these values can be assessed using the scale proposed by Kass and Raftery (1995) for twice the log Bayes factors.[5]

Second, since our posterior distributions are approximately normal, a difference between coefficients $\beta - \alpha$ is also normally distributed, and we can invoke

[5]The evidence in favor of the hypothesis is considered very strong if 2 $\log(B_{10})$ is greater than 10, strong if between 6 and 10, positive if between 2 and 6, and barely worth mentioning if between 0 and 2 (Kass and Raftery 1995, 777). The null is supported if the value is negative.

Table 3. Hypothesis testing.

	Method 1		Method 2	
Hypothesis	Probability	2 log(B_{10})	Probability	2 log(B_{10})
Local Chances	1.000		0.999	13.769
Local Ratings	0.999	13.280	0.997	11.864
Party Ratings	0.992	9.652	0.959	6.312
Leader Ratings	0.998	12.537	0.979	7.719
Contamination	0.915	4.763	0.850	3.472
Coalition: SPD	0.070	−5.181	0.143	−3.587
Coalition: Greens	0.941	5.521	0.863	3.673
Coalition: FDP	0.996	11.158	0.966	6.706
Coalition: Left	0.665	1.370	0.617	0.952

Bayesian hypothesis tests based on the models reported in Table 2. Method 1 compares the posterior distribution of the parameter of a vote model against the most credible value of the parameter in the other vote model (the median). Method 2 uses the difference between MCMC draws across vote models. 2 log (B_{10}) means twice the log Bayes factors.

the exchangeability assumption to compute the posterior distribution of this difference numerically, again using the MCMC draws of both parameters. This method accounts for the variance of parameters. However, we need to make the strong assumption that the correlation between the coefficients is zero, which was not necessary using the first approach. Despite the caveat with the second method, replicating the tests with two different strategies helps to assess the robustness of our findings. Using the posterior distribution of differences between parameters, the probability $P(H_1|D)$ becomes:

$$P(\beta-\alpha > 0|D) = \int_0^\infty p(\beta-\alpha|D)d(\beta-\alpha),$$

which we estimate using the proportion of the difference between draws greater than zero. Table 3 reports the relevant values for hypothesis tests computed with these two methods.

Using these methods for testing our hypotheses, we find clear evidence supporting our first prediction. As can be seen from Table 3, the probability that local chances of winning and local candidate ratings have a larger influence on the candidate vote is close to 1, using either of the two approaches described above. The log Bayes factors are also above 10 in both cases, which suggest a very strong support for the two hypotheses.[6]

The second set of predictions, according to which party and leader ratings should have a stronger impact on the list vote than on the candidate vote, is also supported by the data. Starting with party ratings, the mean of the posterior distribution in the list vote model is greater than the 97.5 percentile of the corresponding parameter's density in the candidate vote equation, as shown in Figure 1(c). The log Bayes factors fall between 5 and 10 using

[6]Note that the Bayes factor cannot be computed in one case for which 100% of the draws are greater in size than the median in the other vote model.

either of our two methods, which suggests strong evidence in favor of our hypothesis. We note that party ratings do influence the candidate vote, though to a lesser extent, which is consistent with our assumption that some people simply vote for their preferred party's candidate in the local constituency. The conclusions are very similar for leader ratings (Figure 1(d)). The probability estimates for our hypothesis are close to one, substantiating our prediction that leader evaluations have a stronger effect on the list vote.

On the other hand, the third prediction, that coalition preferences disproportionately affect the list vote, is only partially supported. Table 3 (rows 6–9) shows that our hypothesis is supported in only three cases, and we find strong evidence only for the FDP. Everything else being equal, the more one prefers the CDU–FDP coalition over the SPD–Green coalition, the less likely one is to vote for the SPD, Green and Left party lists, compared to the CDU. Conversely, the FDP benefits most from those coalition preferences. However, our results indicate that coalition preferences also affect the SPD candidate vote, which runs contrary to our initial expectation.[7]

Finally, our results provide a concrete assessment of contamination effects across votes. As explained earlier, the predetermined vote choice variables enter as exogenous regressors in each equation, and they represent estimates of the causal effect of a previously reached vote decision on the other vote. We do find evidence of contamination effects in both directions, as can be seen by comparing the posterior densities in Figure 1(e), which both lie above zero. However, these effects appear larger from the list vote toward the candidate vote than the other way around. Interestingly, even though more respondents declared making up their mind about the local vote first (see Table 1), this pattern does not induce a larger contamination effect going in that direction. In fact, the opposite effect prevails: the smaller number of voters who chose in the list vote first were more likely to support the same party in their local constituency. For the plurality component, we estimate that the overall proportion of votes cast differently without contamination effects would be about 2.2%, compared to 1.2% for the PR component. To infer these values, we compared the predicted choice of respondents before and after constraining the contamination effects to zero in the models (details appear in the appendix). Although consistent with our expectation, the evidence is not strong, as can be seen in the fifth row of Table 3. The posterior probability $P(\theta_{LC} > \theta_{CL}|D)$ approximates to 0.92 using our first approach, and 0.85 using the second approach, meaning that we are only 85% percent confident that θ_{LC} is larger than θ_{CL} using the more conservative test.

[7]The effect of coalition preferences on the vote is an important question that would deserve a thorough analysis, one that we could not include in this paper (on the topic, see Meffert and Gschwend 2010; Plescia and Aichholzer 2017).

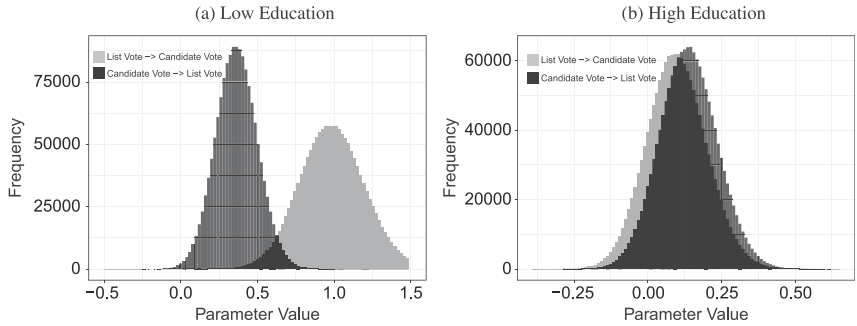

Figure 2. Posterior densities of contamination effects, by education level.

The results differ when considering the level of sophistication of voters. To show this, we reassess our predictions after including interaction terms between the level of education and each of the party-specific indicators. The rest of the specification is the same as before. Table A5 in the appendix reports the full results. As can be seen by comparing the posterior distributions in Figure 2, contamination effects are essentially driven by voters with lower levels of education. When considering respondents with a lower level of educational attainment (lower secondary or incomplete secondary schooling), our estimates now clearly support our initial expectation that contamination effects are more important from the list vote toward the candidate vote than the other way around (Figure 2(a)). The log Bayes factor is 13.22, suggesting strong evidence in favor of our initial hypothesis. The same is not true for voters with a high level of education. We also note that, apart from contamination effects, most of our other predictions are substantiated even more clearly when focusing on voters with a high level of education. These results reinforce the idea that sophisticated voters are more likely to consider separate criteria for each of the two vote decisions.

Overall, our results on contamination suggest that such effects are rather modest in scope. They affect mostly the decision process of less sophisticated voters, and contamination from the list vote toward the candidate vote appears more sizable. This last finding lends credence to the view that the list vote, which determines how many seats the party gets in the legislature, is the most important of the two. Our results are also consistent with the literature at the party level, which shows that contamination effects are clearly from the PR component to the FPTP component. That is, in compensatory systems where the PR dimension dominates (as in the German case), small parties tend to nominate more candidates in the local constituencies than they would "normally" do in a FPTP election, because they have already decided to present them in the PR election (Ferrara, Herron, and Nishikawa 2005, 63; Gschwend, Johnston, and Pattie 2003, 119). Our own conclusion is

that contamination effects, when they arise, are more likely to run in the same direction for voters too, from the more "important" component (PR) to the less important (FPTP).

Conclusion

In many elections voters are faced with two decisions when they are making up their mind how to vote: which party list to support and which candidate to support in the constituency. As far as we can tell, no previous study has examined the determinants of the two votes using an integrated framework.

We formulated hypotheses regarding five proximate determinants of voting and their relative influence on the two vote decisions in mixed systems. As predicted, local chances of winning and local candidate ratings affect mostly the candidate vote, while party and leader ratings affect more strongly the list vote. We have also found coalition preferences to affect mostly (although not uniquely) the list vote. We believe that the methodology proposed here is the most logical way to proceed. There are two votes, and scholars must provide an explanation for each. Because the factors driving voter behavior are expected to be similar for both votes, we argue in favor of a general model comprising the same variables in each vote equation. The goal is to determine whether some of the factors have a greater influence on the candidate vote than on the list vote.

We have found some differences, and these differences make sense. The most important is that perceptions of local chances affect the candidate vote but not the list vote. Moreover, our analysis helps to understand why ticket splitting is not more widespread. The fact is, for both votes, the most crucial proximate factor is how one feels about the parties. This is obvious with respect to the list vote but less so for the candidate vote. The two votes are first and foremost an expression of party preferences, and this is why most people support the same party with their two votes.

Moreover, our methodology allows us to make a contribution to the microfoundations of contamination effects. We developed a general framework to estimate potential contamination effects between votes, and we relied upon a direct measure of these effects by leveraging information on the timing of vote decisions. Our findings suggest that contamination effects are more likely to affect the decision-making process of voters with lower levels of education. Previous studies have examined whether the list vote is influenced by the local candidate vote and they have found weak contamination effects. We observe a weak contamination effect in that direction using our survey data at the time of the 2013 German federal election. In particular, our data suggest that more voters make up their minds about local candidates first, before choosing a party list. Nonetheless, spillovers can go in the opposite direction, from the list vote to the candidate vote, and we have found stronger evidence

of this type of effect. This result matters for policy-makers interested in electoral reforms, by refuting the idea that in mixed compensatory systems the plurality component contaminates the PR vote.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Social Sciences and Humanities Research Council of Canada [grant number 412-2009-1004].

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