Please Don't Vote for Me: Strategic Voting in a Natural Experiment with Perverse Incentives

Spenkuch, Jörg L.

University of Chicago

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Jörg L. Spenkuch
University of Chicago

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Abstract

Whether individuals vote strategically is one of the most important questions at the intersection of economics and political science. Exploiting a flaw in the German electoral system by which a party may gain seats by receiving *fewer* votes, this paper documents patterns of strategic voting in a large, real world election. During the 2005 elections to the Bundestag, the sudden death of a right-wing candidate necessitated a by-election in one electoral district. Knowing the results in all other districts and aware of the paradoxical incentives in place, a substantial fraction of the electorate reacted tactically and either voted for a party other than their most preferred one, or abstained. As a result, the Christian Democratic Union won an additional mandate, extending its narrow lead over the Social Democrats.

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I. Introduction

Elections are the cornerstone of democracy. But social choice theory has shown almost all voting systems to be susceptible to systematic manipulation (Arrow 1951, Gibbard 1973, Satterthwaite 1975). That is, voters may have an incentive to misrepresent their true preferences in order to affect the outcome of an election. Although tactical voting is individually rational, it may be socially undesirable, as it precludes the proper aggregation of preferences, and can thereby lead to inferior allocations.

Thus, whether individuals cast strategic ballots to avoid 'wasting their vote' (Duverger 1954, Downs 1957) is one of the most important questions at the intersection of economics and political science. While strategic voting is well understood in theory (Myerson and Weber 1993, Cox 1994, Carroll 2011), the unobservability of preferences has made it very difficult to document tactical behavior empirically—despite substantial anecdotal evidence.[1] In fact, in an important paper Degan and Merlo (2009) prove that, given commonly available cross-sectional data, it is impossible to identify strategic voting without imposing restrictions on voters' preferences.[2]

It may therefore not be surprising that the existing literature draws mixed conclusions. While Coate et al. (2008) reject the pivotal-voter model, Cox (1997) presents a swath of evidence broadly consistent with strategic behavior in different electoral systems. More recently, Kawai and Watanabe (2010) estimate a structural model of preferences and voting decisions, from which they infer that between 75% and 80% of voters act strategically. In stark contrast, relying on survey responses about preferences, expectations, and votes, a large number of earlier studies argue that the prevalence of instrumentally rational voting is actually very low—estimates typically range from 3% to 17% (e.g., Blais et al. 2001, Niemi et al. 1993, and Abramson et al. 1992; see Alvarez and Nagler 2000 for a discussion of various problems associated with the survey approach).[3]

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[1] An important exception are small-scale laboratory experiments relying on induced preferences. These studies typically find convincing evidence of strategic voting, which increases with the availability of co-ordination devices such as polls or access to voting histories (e.g., Forsythe et al. 1993, 1996). Palfrey (2009) provides a useful review.

[2] Intuitively, Degan and Merlo (2009) show that one can always find preference profiles to rationalize *any* cross-section of votes.

[3] Kawai and Watanabe (2010) as well as Alvarez et al. (2006) point out that some of the literature mistakes the share of voters who actually voted for someone other than their most preferred candidate as equal to the fraction of voters who would do so if their preferred candidate was believed to be unlikely to win the race. Not surprisingly, both papers estimate the former number to be significantly smaller than the latter.

Instead of taking survey responses at face value or making assumptions about voters' underlying preferences, this paper contributes to the existing literature by providing evidence from a natural experiment. The empirical strategy relies on a geographically localized, temporary reversal of incentives due to a flaw in the German electoral system by which a party may actually gain seats if it receives *fewer* votes. Using multiple years of election data and comparing the behavior of affected voters with that of unaffected ones (exploiting both geographic variation and variation over time), identification in this paper is not subject to Degan and Merlo's (2009) impossibility result.

Eleven days before the 2005 elections to the Bundestag the candidate (*Direktkandidat*) of the far right-wing National Democratic Party (NPD) in Electoral District 160 (Dresden I) passed away unexpectedly. Although she had virtually no chance of being elected, electoral law required a by-election. But in contrast to prior cases, her death occurred too close to election day for the by-election to be held on the originally scheduled date. Consequently, almost 220,000 eligible voters in Saxony's District 160 were given the opportunity to cast their ballots two weeks after everybody else, and *after* the Federal Returning Officer (*Bundeswahllleiter*) had announced the preliminary results of the election.[4]

Based on these results the Christian Democratic Union (CDU) and its Bavarian sister party, the Christian Social Union (CSU), would win 225 seats in the Bundestag, whereas the rival Social Democratic Party (SPD) would only receive 222. Under ordinary circumstances, one would hardly expect less than .5% of the electorate to influence the outcome of an election, especially not when the allocation of seats is approximately proportional to the number of votes. Yet, in 2005 a few hundred votes could make the difference between a 2-, 3-, or even 4-seat lead for the CDU/CSU.

Although the German electoral system aims for proportional representation of all parties clearing a 5%-threshold, determining a party's exact number of seats is substantially more complicated. The crucial point is that voters cast two different votes—a list vote and a candidate vote—and that due to rounding a party may lose a seat in the legislature by obtaining "too many" list votes in states in which it won the plurality of the candidate vote in sufficiently many districts (see Section II for a detailed explanation). In 2005 exactly this situation occurred.

[4] Given that the electorate in prior by-elections was not aware of the results in other districts, it may not be surprising that the results of these by-elections are practically indistinguishable from "regular" election outcomes.

Figure 1 illustrates the paradoxical incentives in place during the by-election. If the CDU were to win more than approximately 41,000 list votes in Saxony's District 160—it had received 49,638 in the 2002 election—then it would lose a seat in the Bundestag. On the other hand, it might even increase its seat total by one if it garnered few list votes, but the plurality of the candidate vote. [5]

Critically, since the by-election was conducted almost two weeks after the preliminary results had been announced, the electorate in District 160 was potentially aware of the peculiar circumstances *before* going to the polls.[6] In fact, due to the closeness of the national race between the CDU/CSU and the SPD, the by-election received intense media coverage with pundits lamenting the perverse incentives. Consequently, if voters acted strategically, one would expect the following: (i) The CDU should garner fewer list votes in the by-election than under ordinary circumstances, but (ii) it should receive a larger share of the candidate vote.[7]

In the end, the CDU did win the plurality of the candidate vote, while receiving "only" 38,208 list votes. It was, therefore, able to extend its narrow lead over the SPD. A priori, however, is not clear whether this would have happened even in the absence of the by-election, or whether (parts of) the electorate did vote strategically.[8]

The empirical evidence presented in this paper points clearly toward strategic voting. For instance, the upper panel in Table 1 shows that between 2002 and 2005 the CDU's share of list votes declined by 6.1 percentage points in District 160, whereas it decreased only 3.4 percentage points in Saxony's other districts, or 3.0 percentage points in East Germany as a whole. Yet, between 2005 and 2009 the CDU gained 9.9 percentage points in District 160, relative to 5.3 and 3.4 percentage points in the comparison groups. By contrast, the lower panel in Table 1 indicates that going from the 2002 to the subsequent 2005 elections, the CDU's share of the candidate vote

[5] Given past election results in District 160 only the CDU had a realistic chance of gaining or losing a seat. While other parties stood to gain a mandate in the state of Saxony, this would have come at the expense of a mandate in some other state.

[6] The inherent uncertainty in a party's number of votes in each state makes it almost impossible to predict similar situations in advance, although ex post one can in most election years find instances in which a party may have benefited by receiving fewer votes in some state.

[7] It is important to note that it is always a weakly dominant strategy to cast one's candidate vote for one's most preferred party/candidate. While winning the plurality of the candidate vote may not necessarily increase a party's seat total in regular election years (cf. Section II), in the 2005 by-election it was known that the CDU (but not the SPD, or any other major party) would gain a seat in the Bundestag by securing the direct mandate in District 160.

[8] In the recent German political science literature the by-election in District 160 is a commonly used example for situations in which votes may carry negative weight (see, e.g., Korte 2010). This paper, however, constitutes the first quantitative investigation with respect to strategic voting.

actually increased in District 160, while it decreased in the remainder of Saxony.[9] The opposite is true for the difference between 2005 and 2009. Thus, consistent with voters behaving tactically, the raw data suggest that the CDU won an unusually low fraction of list votes, but received a higher than normal share of the by-election's candidate vote.

Using hitherto unavailable official election data on the sub-district level, the main result of this paper establishes that the disparities documented in Table 1 are quite robust (even to the inclusion of district specific trends) and unlikely to be due to chance. Moreover, exploiting the different incentive structure associated with candidate and list votes, the evidence presented below indicates that supporters of the rival SPD voted for the CDU (in an attempt to hurt it), whereas adherents of the latter either abstained or substituted toward the libertarian Free Democratic Party (FDP)—the CDU's traditional coalition partner.

Although the by-election was a highly unusual event and not all voters might have even been aware of their optimal strategy, the point estimates in this paper indicate that at least 12% of all eligible voters in District 160 reacted strategically when faced with the new incentive structure. Hence, this paper identifies (under relatively weak assumptions) a lower bound on the share of strategic voters that is at least as large as, or even larger, than most findings in the previous literature.[10]

The remainder of the paper proceeds as follows. Section II provides background information on the electoral system used in Germany's elections to the Bundestag, as well as further details on the natural experiment. Section III describes the data, and Section IV contains the empirical results. The last section concludes. A Data Appendix with the precise definitions and sources of all variables is also provided.

II. Germany's Electoral System and the Case of District 160

Elections of representatives to the Federal Diet of Germany (*Bundestag*) are held according to a mixed member system with approximately proportional representation. Except for minor

[9] Since the political landscape in East Germany continues to be quite different from that in the West, electoral districts in West Germany may be a relatively poor comparison group. Nevertheless, the results in this paper are qualitatively robust to including those districts as well (cf. Table 6).

[10] The most important exception is the structural estimate of Kawai and Watanabe (2010). Although unlikely to be binding, the present paper also places an upper bound on the share of strategic voters equal to 69.2%. Interestingly, this number is somewhat smaller than the lower bound in Kawai and Watanabe (2010). Given that Kawai and Watanabe's (2010) estimates pertain to Japan's general elections, whereas this paper studies a highly unusual by-election in Germany, the estimates might not be directly comparable though.

modifications, the same system has been in place since 1957 (see Bawn 1993 for an account of its genesis).[11] This section explains the specifics of the German voting system in which a party may gain seats by receiving fewer votes. Furthermore, it provides additional information on the by-election in District 160 and the perverse incentives in place. Readers satisfied with the description in the introduction may skip this section without much loss in continuity.

A. Perverse Incentives in Germany's Federal Elections

As mentioned before, each voter in Germany casts two votes. The first, or candidate vote (*Erststimme*), is used to elect a constituency representative in each of 299 single-member districts according to plurality rule. The winners of these races hold direct mandates, and are automatically awarded a seat in the legislature. More importantly, the second, or list vote (*Zweitstimme*), is cast for a party list; and the total of party members in the Bundestag is roughly proportional to a party's share of the national list vote among parties clearing a 5%-threshold.[12] Approximately proportional representation is achieved by deducting direct mandates from the number of mandates to which parties are entitled based on the list vote, i.e. their list mandates.

Deviations from strict proportionality are due to three factors: the 5%-threshold, rounding, and overhang mandates (*Überhangmandate*). The latter are a peculiarity of the German system that arises if in some state a party wins more direct mandates than seats under proportional representation. In such cases, the total number of seats in the Bundestag is raised and said party gets to keep all direct mandates without losing seats in other states.

More formally, let $d_{p,s}$ denote the number of direct mandates accruing to party p in state s. $v_{p,s}$ is the number of list votes that p received in s, with the equivalent number on the national level given by $\tilde{v}_p$, i.e. $\tilde{v}_p = \sum_s v_{p,s}$. With this notation in hand, party p's seat total is calculated in three steps:

Step 1: Proportional Allocation of List Mandates to Parties. Absent overhang mandates, there are 598 seats in the Bundestag. These are allocated by proportionality rule to the set of parties clearing the 5%-threshold or winning at least three direct mandates. That is, the number of list mandates of party p equals

[11] In describing the German electoral system this section borrows from Korte (2010).
[12] A party list is a pre-determined ranking of candidates based on which list mandates are awarded. By law parties must post different lists in each state, and a candidate can appear on only one list (§27 BWG).

$$\tilde{l}_p \cong \begin{cases} 598\times \tilde{v}_p/\sum_{p\prime\in P}\tilde{v}_{p\prime} & \text{if } p \in P \\ 0 & \text{if } p \notin P\text{'} \end{cases}$$

where $P = \{p|\, \tilde{v}_p/\sum_{p'} \tilde{v}_{p'} \geq .05 \vee \sum_s d_{p,s} \geq 3\}$ and $\cong$ represents equality after rounding according to the method of Hare-Niemeyer.[13] Also known the 'largest remainder method', Hare-Niemeyer first assigns each party a number of seats equal to the integer part of $598\times \tilde{v}_p/\sum_{p\prime\in P}\tilde{v}_{p\prime}$. The parties with the largest remainders are then allocated one additional list mandate until all available seats have been distributed. This ensures that $\sum_p \tilde{l}_p = 598$.

Step 2: Proportional Allocation of Mandates to State Lists. By law parties are required to decide on different lists in each state. Hence, $\tilde{l}_p$ needs to be broken down to the state level, $l_{p,s}$, with $\tilde{l}_p = \sum_s l_{p,s}$. Again, this is done in approximately proportional fashion. More precisely, for all s and all p,

$$(1) \qquad l_{p,s} \cong \begin{cases} \tilde{l}_p\times v_{p,s}/\tilde{v}_p & \text{if } p \in P \\ 0 & \text{if } p \notin P\text{'} \end{cases}$$

where $\cong$ is defined as above.

Step 3: Determination of the Actual Number of Seats. The *actual* number of seats that party p receives in state s is given by

$$(2) \qquad n_{p,s} = \max\{d_{p,s}, l_{p,s}\} \;\; \forall p.$$

If $d_{p,s} < l_{p,s}$ then, in addition to the district winners, the first $l_{p,s} - d_{p,s}$ candidates on p's list in s are elected to the Bundestag as well. Otherwise, only holders of direct mandates receive a seat.

Note that unless a party can secure overhang mandates, i.e. unless $d_{p,s} > l_{p,s}$ for some s, its seat total, $\tilde{n}_p = \sum_s n_{p,s}$, equals (apart from rounding) the number of seats it would be assigned under proportional representation, i.e. $\tilde{l}_p$. Empirically, overhang mandates are not uncommon—15 occurred after the 2005 elections and 24 after those in 2009.[14]

Importantly for the purposes of this paper, there also exist scenarios in which a party *loses* a seat by *gaining* list votes. To see this consider a small increase in $v_{p,s}$, not large enough to affect $\tilde{l}_p$. Although the total number of p's list mandates does not change, even a small gain in $v_{p,s}$ may

[13] In 2009 the Sainte-Laguë method was used instead.
[14] Generally they accrue only to the two major factions, i.e. the CDU/CSU or the SPD.

be enough for $\tilde{l}_p \times v_{p,s}/\tilde{v}_p$ in equation (1) to be rounded upward instead of downward. But for $\tilde{l}_p = \sum_s l_{p,s}$ to continue to hold, an increase in $l_{p,s}$ must result in a corresponding reduction in $l_{p,s'}$ for some s'. If $d_{p,s} > l_{p,s}$ and $d_{p,s'} < l_{p,s'}$, then according to (2) that small increase in votes would actually lower party p's seat total. In words, a small gain in the number of list votes may lead to the reassignment of a list mandate from a state in which a party won few direct mandates to one in which it secured more direct mandates than seats under proportional representation. But since the actual number of seats it receives in any state equals the maximum of direct and list mandates (cf. Step 3), reallocating a list mandate from one state to another may lead to a lower seat total.

In general, the occurrence of such a situation is very difficult to predict in advance—primarily because the inherent uncertainty in $v_{p,s}$ makes rounding in (1) almost impossible to anticipate. This was not the case, however, leading up the 2005 elections in District 160.

B. The Case of District 160

On September 5, 2005, Kerstin Lorenz, running as the National Democratic Party's (NPD) direct candidate in Electoral District 160 (Dresden I), suffered a stroke during a campaign event. As a result of the stroke she passed away on September 7—eleven days before the elections to the Bundestag.

German electoral law requires a by-election whenever a direct candidate dies prior to election day (cf. §43 BWG and §82 BWO). In similar instances by-elections were usually held on election day itself. But in the case of District 160, Lorenz's death occurred too close to the originally scheduled date for the NPD to be given sufficient time to nominate another candidate, and for new ballots to be printed. Thus, the electorate in District 160 was asked to go to the polls on October 2, while elections in all other districts took place on September 18.[15] Yet, by October 2 the Federal Returning Officer (*Bundeswahlleiter*) had already announced the preliminary official results of the election (Bundeswahlleiter 2005c).

According to these results, the Christian Democratic Union (CDU) was entitled to 179 seats in the Bundestag, and its Bavarian sister party, the Christian Social Union (CSU), would be

[15] In Germany, elections are almost always held on Sundays. It is important to point out that October 3, 2005 was a national holiday. While the fact that the by-election was held on a three-day-weekend may explain the lower turnout, it cannot account for the CDU receiving a lower share of the list vote while simultaneously garnering a higher fraction of the candidate vote (see Section IV).

represented by 46 delegates. The rival Social Democratic Party (SPD) received only 222 mandates. Thus, prior to the by-election in District 160 the CDU/CSU had a narrow 3-seat lead over the SPD, making it the largest faction.[16]

Table 2 displays the preliminary result (excluding District 160), as well as the calculations used to determine the CDU's seat total. Based on these results and past outcomes in District 160, no party could hope to win an additional list mandate on the national level (cf. Step 1). Focusing on the second step, however, it is straightforward to verify that the CDU found itself in the perverse situation described above.

Should, say, 42,000 voters cast their list votes for the CDU, then it would receive 11 instead of 10 list mandates in Saxony, and 46 instead of 47 in the state of North Rhine-Westphalia. But given the number of direct mandates it had already won in these states, receiving "too many" list votes in the by-election would actually cost the CDU a seat in the Bundestag (cf. Step 3).

However, if it received fewer than 41,000 list votes, then the number of list mandates in the state of Saxony would remain at 10 (and potentially increase from 2 to 3 in the Saarland offset by a corresponding reduction in North Rhine-Westphalia). Thus, by winning the direct mandate in District 160 while not receiving "too many" list votes, the CDU/CSU faction could even gain a seat (cf. Figure 1).

Due to the closeness of the national race, the by-election received a lot of attention from the media. Although coverage focused mostly on the competition for the outstanding direct mandate, a number of pundits also commented on the perverse incentives associated with the list vote.

Moreover, parties adapted their campaign strategies. Besides having volunteers reach out to the electorate in order to explain the unusual situation, the CDU posted banners promoting its direct candidate ("Erststimme für Andreas Lämmel"). The SPD contender used an interview with the local newspaper to ask supporters of the Green Party, whose nominee had virtually no chance of being elected, for their support (Sächsische Zeitung 2005a). Interestingly, despite the fact that the FDP could not gain an additional seat in the Bundestag, it printed more than 1,000 new posters prompting voters to cast their first vote for the CDU candidate and their second vote for

[16] Traditionally the president (*Bundespräsident*) charges the leader of the largest faction with forming a new government.

the FDP (see Figure 2). Although the FDP is the CDU's traditional coalition partner, it is generally rare for a party to spend resources and explicitly campaign for another candidate.[17]

The columns on the right of Table 2 show the final result. In the end, the CDU received "only" 38,208 list votes, and won the plurality of the candidate vote.[18] Therefore, it ended up gaining one seat.

Given the intense media coverage and parties' campaign efforts, it seems reasonable to assume that a non-trivial fraction of voters were aware of the reversed incentives. But since a single vote has almost no chance of being decisive, it is not clear whether individual voters would indeed react strategically, or whether the CDU would have won the additional seat even under ordinary circumstances.[19]

III. Data Sources and Summary Statistics

In order to answer this question, the present paper relies on data from several sources. The primary data set consists of the official results of the 2002, 2005, and 2009 elections to the Bundestag by polling precinct (*Wahlbezirk*). In Germany, polling precincts are the smallest administrative units at which votes are counted. Each precinct is fully contained in an electoral district, and is associated with one polling station, where a returning officer is to ensure the lawfulness of the election. As a rule, no precinct should consist of more 2,500 eligible voters. The data include information on the number of list and candidate votes for each party, the number of eligible voters, as well as the number of invalid votes. They have been obtained from the Federal Statistical Office, and were until recently not publicly available.

Although the total number of districts remained unchanged between 2002 and 2009, migration led to the redrawing of electoral districts in a small number of instances. In particular, the state of Saxony contained 17 districts in 2002 and 2005, but only 16 in 2009 (see Figure 3 for a map of electoral districts in the state of Saxony as of 2005). In order to ensure comparability

[17] Both FDP and CDU officials denied allegations of collusion. In the past the FDP had often campaigned for the list votes of CDU supporters in order to pass the national 5%-threshold. But it hadn't asked its own supporters to abandon the FDP direct candidate in favor of that of the CDU. In 2005, the FDP gained 9.8% of the national list vote, and was thus far from failing to clear the 5%-threshold. By winning enough list votes in District 160 the FDP could only receive an additional list mandate in Saxony at the expense of one in North Rhine-Westphalia or Saxony-Anhalt.

[18] Note that, compared to the preliminary results, the final list vote count changes slightly in other districts.

[19] Unfortunately, it is not possible to estimate to what extent parties' efforts increased strategic voting. It is only possible to address the more primitive question of whether voters did, indeed, behave tactically.

over time, this paper constructs (based on the appendices to the respective versions of the *Bundeswahlgesetz*) a consistent mapping between precincts and districts. All results build on this mapping.[20]

Information on demographic as well as socio-economic characteristics of districts is provided by Bundeswahlleiter (2002b, 2005d, 2009b). These publications rely on official numbers from the Federal Statistical Office, aggregated to the level of the electoral district. Unfortunately, there exists no comparable information on polling precincts.

Differentiating between District 160 and Saxony's other districts, Table 3 presents summary statistics for all variables used throughout the analysis. Not surprisingly, given that District 160 consists of the southern parts of the city of Dresden, there exist important differences. Not only is District 160 substantially more urban, but in contrast to other districts its population is actually growing. Moreover, residents of District 160 are less likely to work in manufacturing, and experience lower rates unemployment—although unemployment is still a major problem. In terms of election results, the CDU receives on average somewhat lower vote shares in District 160, whereas the SPD and the Green Party fare slightly worse in the remainder of Saxony.

Although differences in political preferences appear to be less stark than those in socio-economic characteristics, District 160 is clearly not perfectly representative. It is, therefore, important to account for district specific idiosyncrasies in determining the electorate's reaction to the paradoxical incentives it faced during the by-election.

IV. Evidence of Strategic Voting

A. Econometric Approach

The empirical approach in this paper mirrors a classical difference-in-differences (DD) strategy; with District 160 being "treated" and all other districts in the state of Saxony serving as the "control group".[21] The only important difference is that there are three instead of the usual two periods. As voters in District 160 faced disparate incentives only during the 2005 elections, it is useful to think of 2005 as the "treatment" period, whereas 2002 and 2009 should be regarded as

[20] See the Data Appendix for additional information on the construction of the mapping. Since individual precincts change considerably between 2002 and 2009 and there do not exist data on the sub-precinct level, it is not possible to link precincts over time.

[21] Districts in the same state are likely subject to similar overall trends and may thus be a better comparison group than districts in East Germany as a whole, or even West Germany. The robustness checks in Table 6 show that the main results are qualitatively robust to the choice of control group.

pre- and post-treatment periods, respectively. The key identifying assumption, however, is the same as that in the standard DD approach: In the absence of treatment, i.e. without a by-election, District 160 would have followed the same path as districts in the comparison group.

Although this assumption is not directly testable, one might be willing to judge its reasonability by comparing outcomes in the pre- and post-treatment periods. To this end, consider the upper panel in Figure 4. The graph on the left plots the CDU's share of the list vote in 2002 against that in 2009; and the graph on the right does so for its share of the candidate vote. Each dot corresponds to an electoral district in Saxony. Evidently the CDU's 2009 vote share in District 160 is in both cases very close to what one would predict based on that in 2002. That is, in non-treatment years District 160 appears to conform to the same general pattern as other districts in the same state.

By contrast the middle and bottom panels in Figure 4 plot the CDU's vote shares in 2005 against those in 2002 and 2009, respectively. In each of these graphs District 160 is a clear outlier. While the CDU received substantially *fewer* list votes in 2005 than predicted based on the outcome of the previous election, the opposite is true for 2009. Conversely, it received a *larger* than predicted share of the candidate vote in the year of the by-election, but a smaller one thereafter. The pattern of deviations conforms, therefore, exactly to what one would expect if a substantial fraction of the electorate in District 160 did, indeed, vote strategically.

To quantify the deviations more precisely, consider the following econometric specification:

$$(3) \qquad v_{p,i,t} = \tau_t + \mu_d + \delta \mathbf{1}[d = 160] \times \mathbf{1}[t = 2005] + \epsilon_{p,i,t},$$

where $v_{p,i,t}$ denotes party p's vote share in polling precinct i during election year t. τ_t and μ_d mark comprehensive sets of time and district fixed effects, with d indexing electoral districts. $\mathbf{1}[d = 160]$ is an indicator variable equal to one if precinct i is part of District 160, and zero otherwise. Similarly, $\mathbf{1}[t = 2005]$ equals one for the 2005 elections. The parameter of interest is δ. It indicates what effect the incentives described above had on the voting behavior of the constituency in District 160.

B. Empirical Results

Table 4 presents the main empirical results. The estimates therein correspond to δ, obtained from estimating equation (3) by weighted least squares, with weights corresponding to the number of

voters. In order to be conservative the reported standard errors assume homoscedasticity, since those clustered at the district or at the year level are estimated to be somewhat smaller.[22] Results in the top panel are based on district level data, whereas the bottom one uses all available information by relying on individual polling precincts as the level of observation. Moving from the left to the right within each group of regressions, the set of included fixed effects steadily grows. The last column within each group even controls for district specific linear trends.

As one would expect, point estimates based on district and precinct level data align quite closely, but the latter are estimated more precisely.[23] More importantly, estimates controlling for year as well as district fixed effects differ very little from those that also account for trends. This suggests that different trends cannot explain the patterns shown graphically in Figure 4.

Quantitatively, δ is estimated to be fairly large. For instance, in the absence of the by-election the CDU is predicted to have garnered about 4.9% less of the candidate vote, but an additional 3.6% of the list vote. Under most reasonable assumptions on turnout, the latter would have resulted in substantially more than 41,000 list votes; and, therefore, cost the CDU a seat in parliament.

The last set of regressions uses the *difference* in the CDU's share of the candidate and list vote as dependent variable. It pursues a triple-differencing strategy to isolate the effect of the by-election and its unusual incentive structure. Note that even if there was an unobserved shock specific to District 160 and the 2005 election, as long as it did not have a differential impact on voters' perceptions of the CDU's direct candidate and the CDU as a whole, the estimates reported in columns (9)–(12) and (21)–(24) would still be consistent.

Therefore, it may be comforting to know that the triple-difference estimate of δ continues to be large, i.e. about 8.5 percentage points, and is very similar to what one would expect based on its difference-in-difference components in the columns to the left. Moreover, the precision of the estimates makes it quite unlikely that the results in Table 4 are due to chance. It appears much more plausible that at least some voters in District 160 internalized the incentives and cast strategic ballots.

[22] This is because negative autocorrelation in the estimated residuals leads to a negative intracluster correlation coefficient.
[23] Again, clustering at the district or year level leads to a reduction in standard errors.

Table 5 exploits the sub-district nature of the data, and presents additional evidence in favor of this assertion. Columns (1) and (2), for instance, explore the effect on turnout.[24] If the electorate was, indeed, aware of the peculiar incentives and reacted rationally, there should have been lower turnout in the by-election—after all the distribution of seats had for the most part been already determined.

In line with this prediction, overall turnout is estimated to be 4.8 percentage points lower. Interestingly, the additional interaction term in column (2) hints at a larger effect for CDU partisans. To see this, note that voters who wish the CDU to gain an additional mandate, should never cast their candidate vote for the rival SPD. Thus, the share of a precinct's candidate vote accruing to the SPD can be interpreted as a proxy for the fraction of voters that do not support the CDU. By this measure, turnout is estimated to be higher among voters who view the CDU unfavorably. Given that CDU supporters could potentially cost their most preferred party a seat by voting for it, whereas supporters of other parties couldn't influence their parties' seat totals, it may not be entirely surprising that turnout is estimated to have been lower among the former.

Columns (3) and (4) of Table 5 demonstrate that the FDP, the CDU's traditional coalition partner, benefited from the by-election. Taking the coefficient in (3) at face value, the FDP received an additional 7% of the list vote. By a similar argument as above, column (4) shows that this gain was much lower, even negative, in precincts more critical of the CDU. This suggests that CDU partisans who did go to the polls voted strategically by casting their list vote for the FDP.

If supporters of the SPD (and potentially those of other parties as well) fully grasped the situation and behaved tactically, then one might even expect them to attempt to hurt the CDU by voting for it. While in regular election years there is a very strong negative correlation between a precinct's SPD share of the candidate vote and its CDU share of the list vote, the positive interaction term in column (6) indicates that this relationship was much weaker during the 2005 elections in District 160. Furthermore, column (8) demonstrates that the usual near one-to-one correspondence between the CDU's list and candidate vote shares does not hold in the by-election. The evidence, therefore, suggests that CDU supporters substituted toward the FDP and other parties' followers attempted to hurt the CDU by voting for it.

[24] The number of observations in columns (1) and (2) of Table 5 is lower than in the remaining columns because turnout cannot be calculated for precincts which handle only absentee ballots. Absentee voters are included in the turnout figure of the precinct in which they reside.

Lastly, the results shown in columns (9) and (10) indicate that the SPD received a higher than usual fraction of the by-election's candidate vote. Since the Green Party's own candidate had essentially no chance of winning the direct mandate, and given that the Green Party is much closer in policy space to the SPD than the CDU, strategic Green Party supporters should choose the SPD candidate with their first vote. Although the interaction term in (10) is not statistically significant, it appears that at least some of the additional SPD voters were adherents of the Green Party. While this particular piece of evidence is not very strong, it is nevertheless consistent with tactical voting behavior.

C. Sensitivity and Robustness Analysis

Broadly summarizing, the results presented above indicate that parts of the electorate reacted rationally to the perverse incentives in the by-election. Supporters of the CDU either abstained or cast their list vote for the FDP, whereas adherents of the rival SPD appear to have voted for the CDU. This subsection explores the sensitivity and robustness of these results.

To this end the upper panel in Table 6 probes the sensitivity of δ with respect to different specifications. For comparison the first row displays the baseline results, i.e. those from columns (1), (3), (5), (7), and (9) in Table 5. Successive rows vary the weighting scheme, the set of included controls, as well as the control group. The last row estimates the baseline model using vote shares calculated as the percentage of all eligible voters. Since turnout is itself affected by the reversal of incentives and the distribution of seats depends on the *number* of list votes, these estimates may be more informative for answering certain questions than ones based on ordinary vote shares.

Although individual point estimates do, of course, vary, δ is qualitatively quite robust. Neither different covariates, nor changing the control group seem to have much influence on the conclusions drawn in this paper.

At first glance there would seem to be two exceptions, however. The CDU's share of the candidate vote actually decreases when calculated as the percentage of all eligible voters; and the SPD's gain is estimated to be much smaller than at baseline. Given that turnout is itself endogenous this may not be entirely surprising. If supporters of all parties were more likely to abstain than in ordinary years, but adherents of the CDU did so disproportionally, then this alone may explain the differences.

The lower panel in Table 6 performs robustness checks on the additional interaction terms included in columns (2), (4), (6), (8), and (10) of Table 5. Again, the first row shows the baseline results; and as was the case for the main effects, the estimates appear to be very robust.

V. Concluding Remarks

Whether, and if so to what extent, individuals cast strategic votes is one of the most important questions at the intersection of economics and political science. This paper provides empirical evidence from a natural experiment in which a party benefited by receiving *fewer* votes. Comparing the behavior of constituencies facing different incentives, identification in this paper is not subject to the impossibility result by Degan and Merlo (2009).

The evidence presented above points clearly toward a non-trivial incidence of strategic voting, despite the fact that the by-election could at most have had a very small effect on the overall distribution of seats.

Taking the estimates at face value, one can derive a lower bound on the fraction of strategic agents. To do so add the change in the FDP's share of the list vote, the change in the SPD's share of the candidate vote (both calculated as percentage of all eligible voters, cf. Table 6), and the by-election's effect on turnout. While this number classifies CDU supporters substituting toward the FDP, adherents of other parties supporting the SPD candidate, as well as voters choosing not to go to the polls as having reacted tactically to the change in incentives, it does not include SPD supporters casting their list votes for the CDU, nor does it encompass FDP adherents voting for the CDU candidate. Therefore, it is likely to understate the true extent of strategic voting.[25]

Nevertheless, according to this measure at least 12% of the electorate behaved tactically when faced with new, paradoxical incentives. Thus, with the exception of Kawai and Watanabe's (2010) structural estimate, the lower bound identified (under relatively weak assumptions) in this paper is among the largest of findings in the literature. This suggests that the share of strategic voters may be much higher than previously thought.[26]

[25] Moreover, given the unusual character of the by-election, it seems plausible that not all voters were even aware of their optimal strategy. Thus, individuals who might cast strategic ballots under ordinary circumstances might not have done so in 2005.

[26] One may also derive on upper bound on the share of strategic voters, although it is unlikely to be tight. To do so note that individuals voting for the direct candidates of the FDP, Green Party, The Left, or the NPD cannot have cast strategic ballots, since these candidates were known to have had virtually no chance of winning the district, or being tied for first (see, for instance, the representative poll published nine days before the by-election in the Sächsische

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Data Appendix to
"Strategic Voting: Evidence from a Natural Experiment"

This appendix provides a description of all data used in the paper as well as precise definitions together with the exact sources of all variables.

A. Precinct Level Variables

Data containing the official results of the 2002, 2005, and 2009 elections to the Bundestag by polling precinct (*Wahlbezirk*) have been purchased from the Federal Statistical Office of Germany. These data include information on the number of list and candidate votes for each party and each candidate, the number of eligible voters, as well as the number of valid and invalid votes. Throughout the analysis the following precinct level variables are used:

Number of Eligible Voters is defined as the number of residents of each precinct that were allowed to vote in the particular year. In general this encompasses all German citizens over the age of 18, who have not been declared mentally unfit, or whose voting rights have not been suspended due to criminal behavior.

Absentee Precinct is an indicator variable equal to one if a given precinct handles only absentee ballots.

Turnout is defined as the number of actual voters over the number of eligible voters. This number cannot be calculated for Absentee Precincts, as absentee voters are included in the number of eligible voters in their district of residence. Hence, in-person turnout in each district needs to be adjusted for absentee voters. In practice, this is done by multiplying the number of issued absentee ballots by .95 (which corresponds to the empirical frequency with which they are cast) and adding them to the ballots that are cast in person.

CDU Share of Candidate Vote is defined as the portion of all valid candidate votes (in %) that are cast for the respective candidate of the Christian Democratic Union (CDU).

SPD Share of Candidate Vote is defined as the portion of all valid candidate votes (in %) that are cast for the respective candidate of the Social Democratic Party (SPD).

FDP Share of Candidate Vote is defined as the portion of all valid candidate votes (in %) that are cast for the respective candidate of the Free Democratic Party (FDP).

The Left Share of Candidate Vote is defined as the portion of all valid candidate votes (in %) that were cast for the respective candidate of The Left in 2005 and 2009, or for the candidate of the Party of Democratic Socialism (PDS) in 2002.

Green Party Share of Candidate Vote is defined as the portion of all valid candidate votes (in %) that are cast for the respective candidate of the Green Party.

Others' Share of Candidate Vote is defined as the portion of all valid candidate votes (in %) that were not cast for candidates of the parties listed above.

CDU Share of List Vote is defined as the portion of all valid list votes (in %) that are cast for the Christian Democratic Union (CDU).

SPD Share of List Vote is defined as the portion of all valid list votes (in %) that are cast for the Social Democratic Party (SPD).

FDP Share of List Vote is defined as the portion of all valid list votes (in %) that are cast for the Free Democratic Party (FDP).

The Left Share of List Vote is defined as the portion of all valid list votes (in %) that are cast for The Left in 2005 and 2009, or for the Party of Democratic Socialism (PDS) in 2002.

Green Party Share of List Vote is defined as the portion of all valid list votes (in %) that are cast for the Green Party.

Others' Share of List Vote is defined as the portion of all valid list votes (in %) that are not cast for the parties listed above.

B. District Level Variables

Information on demographic and socio-economic characteristics of districts has been taken from Bundeswahlleiter (2002, 2005, 2009). The numbers in these publications are based on official figures from the Federal Statistical Office which have been aggregated to the level of the electoral district (or when necessary imputed). The following district level variables are used throughout the analysis:

Population is defined as the number of individuals of all ages (in 1,000) that reside within the district.

Population Density is defined as a district's number of residents over its geographic area (in km^2).

Population Growth is defined as the yearly change in the number of residents (from all sources) per 1,000 residents.

Number of Cars is defined as the number of officially registered cars per 1,000 residents.

Percent of Labor Force in Manufacturing is defined as the share of all workers subject to social insurance contributions that work in manufacturing.

Percent of Labor Force in Service Industry is defined as the share of all workers subject to social insurance contributions that work in commerce and sales, telecommunications, or other service jobs.

Unemployment Rate is defined as the number of all officially registered unemployed individuals over the sum of the gainfully employed and those registered as unemployed. For each year this number corresponds to the published official unemployment rate.

C. Mapping Polling Precincts into Electoral Districts

As mentioned in the main text, the state of Saxony contained 17 electoral districts in 2002 and 2005, but only 16 in 2009. This necessitates the construction of a consistent mapping from Saxony's polling precincts into districts, on which the main results can be based. In constructing this mapping the paper relies on municipality identifiers contained in the raw data as well as the appendices to the *Bundeswahlgesetz*, which list all municipalities in any given district. 2005 serves as the base year. In a very small number of instances absentee precincts are associated with multiple municipalities which (in another election year) belonged to different electoral districts. In such cases the absentee precinct is allocated to the district that contains the greater municipality. In the robustness checks in Table 6 this paper also uses other districts in East and West Germany as a comparison group. Since migration led to the redrawing of districts in a number of instances, a second mapping had to be constructed. This mapping assigns a unique identifier to all districts in 2002. If a district remained unchanged over the course of 2002-2009,

then the same identifier is also used in subsequent years. In cases in which borders were redrawn a new (unique) identifier is assigned to the resulting district.

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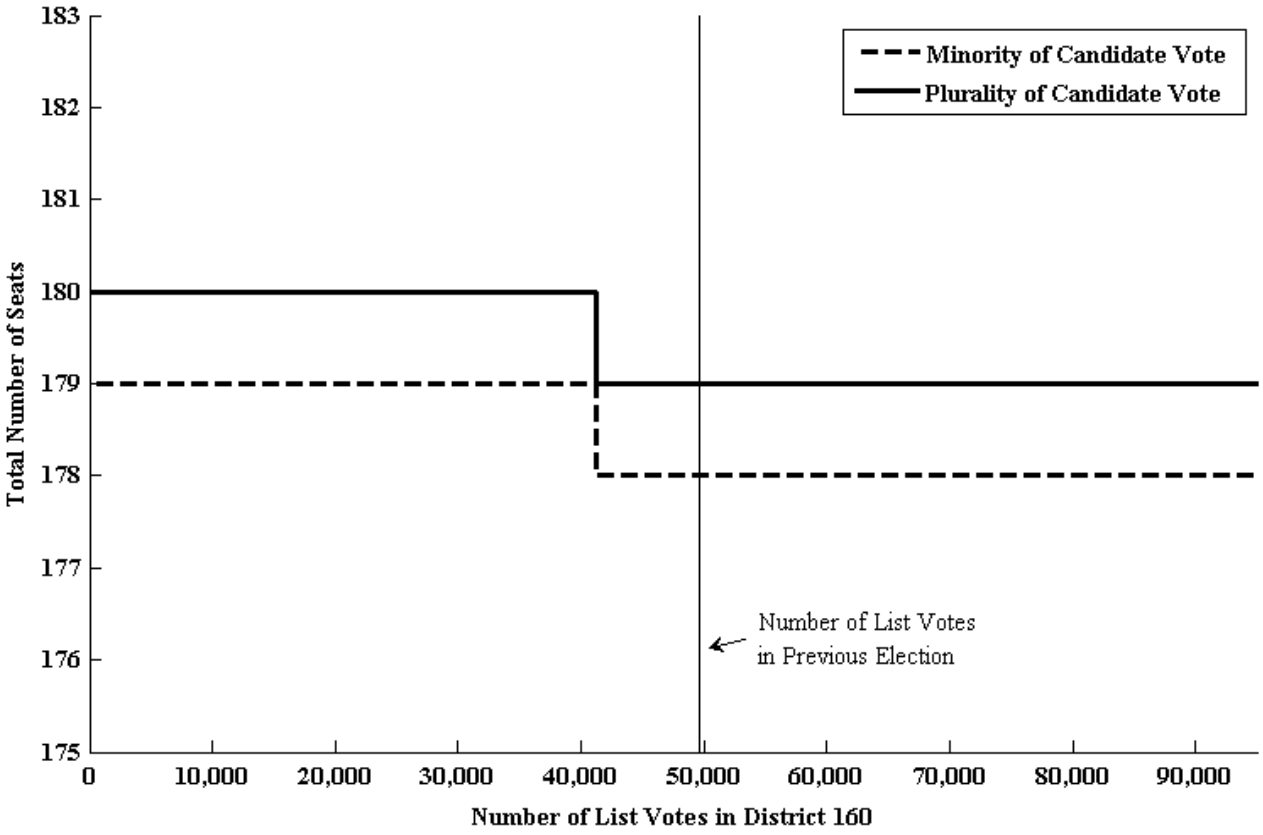
Figure 1: Seats Accruing to the CDU in the 16th Bundestag as a Function of List Votes in District 160

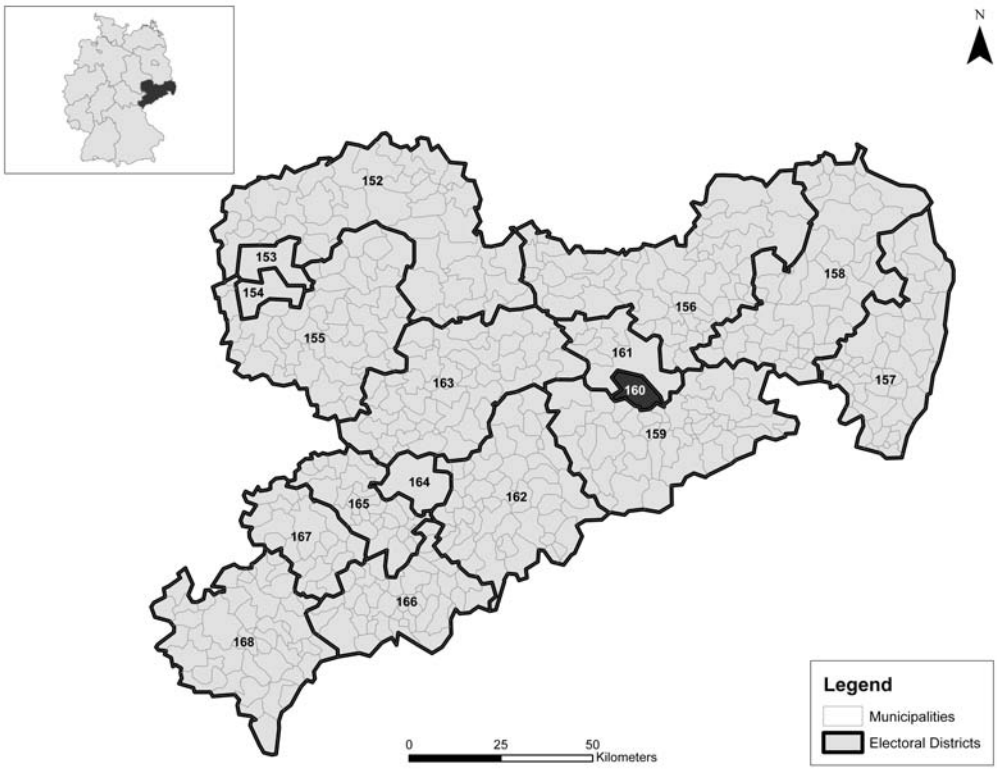


Notes: Figure shows the total number of seats accruing the CDU as a function of its number of list votes in District 160, and whether it wins the outstanding direct mandate. Although not essential for the location of the discontinuty or the general shape of the seat-vote curve, the figure is drawn under the assumption that all other parties receive a number of list votes similar to that in the 2002 election. Since the CSU won 46 seats, the total number of seats of the CDU/CSU faction could range from 224 to 226.

Figure 2: Campaign Poster Used by the Free Democratic Party

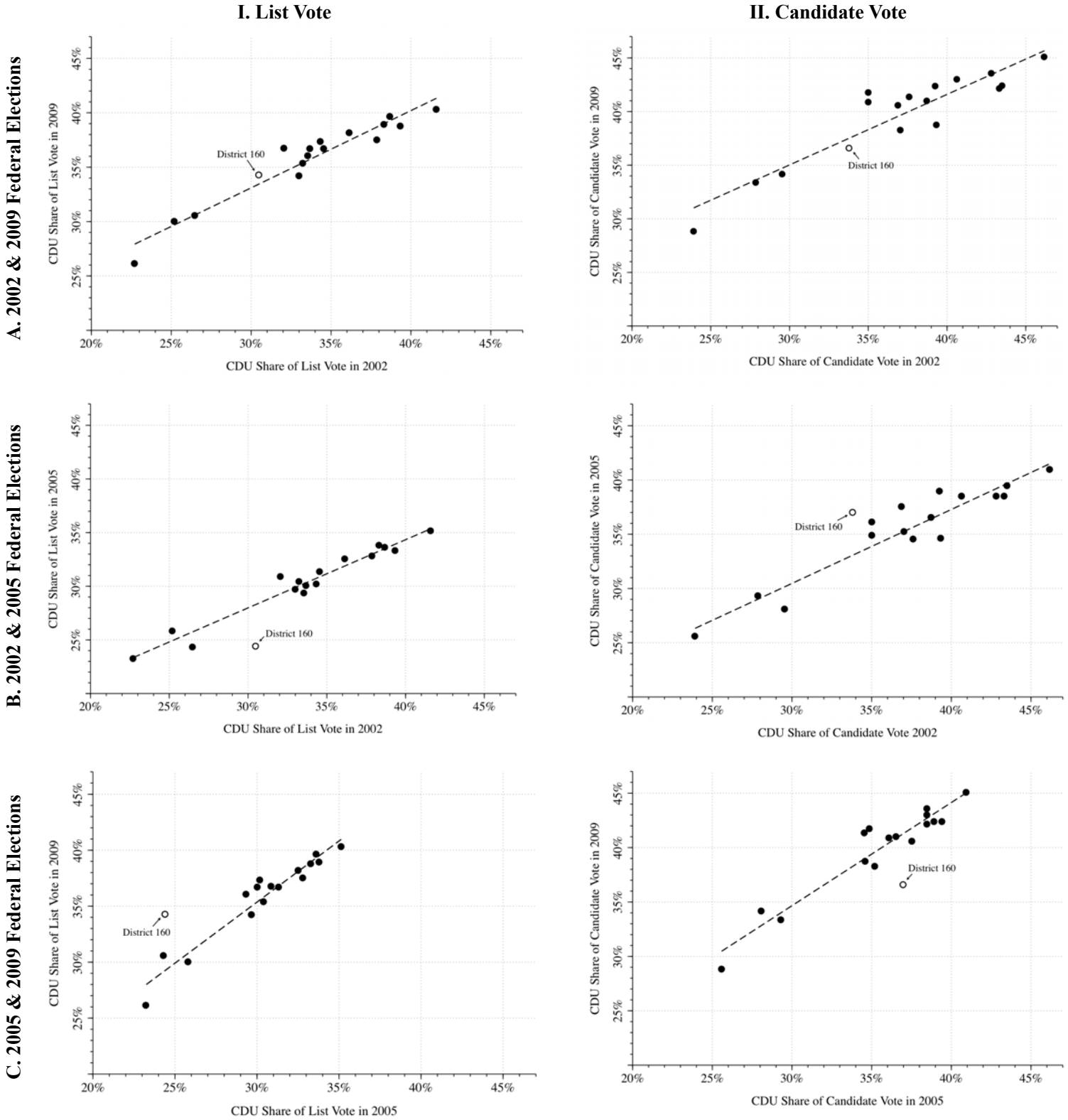
Notes: The text translates to "Candidate Vote CDU", "List Vote FDP", and "Typical Dresden ;-) Black & Yellow. Good for Germany!"

Figure 3: Electoral Districts in the State of Saxony as of the 2005 Elections to the Bundestag



Sources: Based on Bundeswahlleiter (2005b) and Landesvermessungsamt Sachsen (2006).

Figure 4: Share of List and Candiate Votes Accruing to the CDU in the State of Saxony



Notes: Graphs on the left plot the CDU's share of the list vote in one election year against its share in a subsequent election. Graphs on the right use the CDU's share of the candidate vote instead. Each dot represents an electoral district in the state of Saxony.

Table 1: List Votes Accruing to the CDU in the 2002, 2005 and 2009 Elections to the Bundestag

A. List Vote

	Share of List Vote			Δ Share of List Vote	
	2002	2005	2009	2005 − 2002	2009 − 2005
Electoral District 160	30.5%	24.4%	34.3%	-6.1%	9.9%
Other Districts in Saxony	33.8%	30.4%	35.7%	-3.4%	5.3%
Other States in East Germany	27.0%	24.0%	27.4%	-3.0%	3.4%

B. Candidate Vote

	Share of Candidate Vote			Δ Share of Candidate Vote	
	2002	2005	2009	2005 − 2002	2009 − 2005
Electoral District 160	33.8%	37.0%	36.6%	3.2%	-0.4%
Other Districts in Saxony	37.3%	35.4%	39.7%	-1.8%	4.3%
Other States in East Germany	28.6%	27.2%	29.6%	-1.5%	2.4%

Sources: Author's calculations based on Bundeswahlleiter (2002a, 2005a, 2009a).

Table 2: Determining the Number of Seats for the CDU in the 16th Bundestag

Step 1: Proportional Allocation of List Mandates to Parties

	Preliminary Result (Excluding District 160)			Final Result		
Party	Number of List Votes	Equivalent Number of Seats	Rounded Number of Seats	Number of List Votes	Equivalent Number of Seats	Rounded Number of Seats
SPD	16,148,240	213.307	213	16,194,665	213.170	213
CDU	13,096,556	172.996	**173**	13,136,740	172.919	**173**
CSU	3,494,564	46.161	46	3,494,309	45.996	46
Green Party	3,826,194	50.541	51	3,838,326	50.524	51
FDP	4,619,519	61.021	61	4,648,144	61.184	61
The Left	4,086,134	53.975	54	4,118,194	54.208	54
Total	45,271,207	598.000	598	45,430,378	598.000	598

Step 2: Proportional Allocation of Mandates to State Lists (CDU)

	Preliminary Result (Excluding District 160)			Final Result		
State	Number of List Votes	Equivalent Number of Seats	Seats under Proportionality	Number of List Votes	Equivalent Number of Seats	Seats under Proportionality
Schleswig-Holstein	623,922	8.242	8	624,510	8.224	8
Hamburg	272,798	3.604	4	272,418	3.588	4
Lower Saxony	1,599,867	21.134	21	1,599,947	21.070	21
Bremen	82,411	1.089	1	82,389	1.085	1
North Rhine-Westphalia	3,524,374	**46.555**	**47**	3,524,351	**46.413**	**46**
Hesse	1,130,099	14.928	15	1,131,496	14.901	15
Rhineland-Palatinate	877,213	11.588	12	877,632	11.558	12
Baden-Württemberg	2,282,729	30.154	30	2,283,085	30.066	30
Saarland	191,065	**2.524**	**2**	191,067	**2.516**	**3**
Berlin	408,809	5.400	5	408,715	5.382	5
Mecklenburg-Vorpommern	293,278	3.874	4	293,316	3.863	4
Brandenburg	322,394	4.259	4	322,400	4.246	4
Saxony-Anhalt	357,638	4.724	5	357,663	4.710	5
Thuringia	372,593	4.922	5	372,435	4.905	5
Saxony	757,366	**10.004**	**10**	795,316	**10.474**	**10**
Total	13,096,556	173.000	**173**	13,136,740	173.00	**173**

Step 3:Determination of the Actual Number of Seats (CDU)

	Preliminary Result (Excluding District 160)			Final Result		
State	Number of Direct Mandates	Seats under Proportionality	Actual Number of Seats	Number of Direct Mandates	Seats under Proportionality	Actual Number of Seats
Schleswig-Holstein	6	8	8	6	8	8
Hamburg	0	4	4	0	4	4
Lower Saxony	4	21	21	4	21	21
Bremen	0	1	1	0	1	1
North Rhine-Westphalia	24	47	47	24	46	46
Hesse	8	15	15	8	15	15
Rhineland-Palatinate	10	12	12	10	12	12
Baden-Württemberg	33	30	33	33	30	33
Saarland	0	**2**	**2**	0	**3**	**3**
Berlin	1	5	5	1	5	5
Mecklenburg-Vorpommern	3	4	4	3	4	4
Brandenburg	0	4	4	0	4	4
Saxony-Anhalt	0	5	5	0	5	5
Thuringia	3	5	5	3	5	5
Saxony	**13**	**10**	**13**	**14**	**10**	**14**
Total	105	**173**	**179**	106	**173**	**180**

Notes: The table shows the calculations in determining the CDU's number of seats in the 16th Bundestag. The columns on the left are based on the preliminary results of the 2005 election, i.e. before the constituency of District 160 voted, whereas the columns on the right use the final vote counts in all districts. As explained in the main text, Step 1 calculates the number of parties' list mandates on the national level. Step 2 assigns these to party lists in individual states, and Step 3 determines the actual number of seats by taking the maximum of list and direct mandates. Rounding in Step 1 and 2 is done according to the method of Hare-Niemeyer.

Sources: Based on Bundeswahlleiter (2005a, 2005c).

Table 3: Summary Statistics of District and Precinct Level Variables for the 2002, 2005 and 2009 Elections to the Bundestag

	Full Sample		Electoral District 160		Other Districts in Saxony	
	Mean	SD	Mean	SD	Mean	SD
District Level Variables:						
Population (in 1,000)	260.7	(22.5)	272.1	(7.3)	260.0	(23.0)
Population Density (residents per km^2)	656.6	(879.8)	3,330	(70.5)	476.5	(549.4)
Population Growth (per 1,000 residents)	-6.642	(7.139)	4.967	(7.836)	-7.424	(6.461)
Number of Cars (per 1,000 residents)	589.4	(76.7)	477.5	(31.5)	596.9	(72.9)
Percent of Labor Force in Manufacturing	33.63	(7.51)	22.52	(1.56)	34.34	(7.16)
Percent of Labor Force in Service Industry	63.66	(8.61)	76.82	(1.78)	62.81	(8.17)
Unemployment Rate (in %)	17.31	(3.21)	14.20	(2.05)	17.53	(3.18)
Precinct Level Variables:						
Share of Candidate Vote (in %):						
CDU	37.25	(8.17)	35.75	(5.02)	37.35	(8.33)
SPD	24.66	(9.19)	26.79	(7.68)	24.52	(9.27)
FDP	7.76	(3.50)	6.57	(2.64)	7.84	(3.54)
The Left	21.28	(5.93)	21.35	(5.23)	21.27	(5.97)
Green Party	4.28	(3.43)	6.07	(3.74)	4.16	(3.38)
Others	4.78	(2.98)	3.47	(1.55)	4.86	(3.03)
Share of List Vote (in %):						
CDU	32.92	(7.41)	29.71	(6.09)	33.14	(7.44)
SPD	24.57	(9.06)	25.62	(7.82)	24.50	(9.13)
FDP	10.10	(3.71)	12.23	(5.40)	9.96	(3.52)
The Left	21.02	(6.05)	19.80	(5.18)	21.10	(6.10)
Green Party	5.30	(4.11)	8.60	(4.46)	5.08	(3.99)
Others	6.09	(2.78)	4.05	(1.67)	6.22	(2.78)
Number of Eligible Voters	1,112	(391)	1,170	(238)	1,109	(398)
Turnout (in %)	72.29	(7.58)	73.12	(7.48)	72.24	(7.59)
Absentee Precinct	.144	(.351)	.233	(.423)	.138	(.345)
Number of Districts	17		1		16	
Number of Observations	13,107		774		12,363	

Notes: Entries are weighted means and standard deviations of district and precinct level variables, pooled across years. Only observations with non-missing information are used in the calculations. See the Data Appendix for the precise definition and source of each variable

Table 4: Evidence of Strategic Voting

A. District Level Regressions

	CDU Share of List Vote				CDU Share of Candidate Vote				Difference Between CDU Share of Candidate Vote and List Vote			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
District 160 × 2005	-8.700	-5.995	-3.560	-3.592	-.261	1.537	4.918	4.908	8.439	7.531	8.478	8.500
	(4.500)	(4.154)	(1.465)	(1.344)	(4.941)	(4.866)	(1.846)	(1.372)	(1.296)	(1.155)	(1.187)	(1.050)
Year Fixed Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
District Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
District Specific Trends	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes
R-Squared	.071	.270	.960	.984	.000	.106	.943	.985	.464	.607	.817	.931
Number of Observations	51	51	51	51	51	51	51	51	51	51	51	51

B. Precinct Level Regressions

	CDU Share of List Vote				CDU Share of Candidate Vote				Difference Between CDU Share of Candidate Vote and List Vote			
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
District 160 × 2005	-8.715	-6.007	-3.568	-3.600	-.266	1.535	4.921	4.911	8.450	7.542	8.488	8.510
	(.447)	(.437)	(.445)	(.442)	(.500)	(.500)	(.505)	(.499)	(.172)	(.170)	(.196)	(.193)
Year Fixed Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
District Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
District Specific Trends	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes
R-Squared	.028	.107	.381	.390	.000	.039	.345	.360	.156	.204	.275	.313
Number of Observations	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107

Notes: Entries are coefficients and standard errors on δ, obtained by estimating equation (3) using weighted least squares with weights corresponding to the number of voters. The respective dependent variables are listed at the top of each column. The upper panel uses only district level data, whereas the lower one relies on individual polling precincts as the level of observation. See the Data Appendix for the precise definitions and sources of all variables.

Table 5: Testing Additional Predictions

	Turnout		FDP Share of List Vote		CDU Share of List Vote		CDU Share of Candidate Vote		SPD Share of Candidate Vote	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
District 160 × 2005	-4.844	-20.282	7.022	21.757	-3.600	-18.086	4.911	23.434	7.064	6.763
	(.525)	(3.572)	(.194)	(1.300)	(.442)	(2.560)	(.499)	(.775)	(.317)	(.583)
SPD Share of Candidate Vote		-.241		-.205		-.833				
		(.013)		(.005)		(.010)				
District 160 × 2005		.538		-.414		.634				
× SPD Share of Candidate Vote		(.112)		(.040)		(.079)				
CDU Share of List Vote								1.050		
								(.004)		
District 160 × 2005								-.605		
× CDU Share of List Vote								(.031)		
Green Party Share of List Vote										.220
										(.012)
District 160 × 2005										.092
× Green Party Share of List Vote										(.069)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District Specific Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	.375	.393	.534	.593	.390	.605	.360	.908	.797	.802
Number of Observations	11,512	11,512	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107

Notes: Entries are coefficients and standard errors from estimating models analogous to equation (3) using weighted least squares with weights corresponding to the number of voters. The respective dependent variables are listed at the top of each column. Individual polling precincts are the level of observation. See the Data Appendix for the precise definitions and sources of all variables.

Table 6: Sensitivity and Robustness Analysis

A. Main Effects

Sample / Specification	CDU Share of List Vote	CDU Share of Candidate Vote	Turnout	FDP Share of List Vote	SPD Share of Candidate Vote
Baseline	-3.600	4.911	-4.844	7.022	7.064
	(.442)	(.499)	(.525)	(.194)	(.317)
Unweighted	-3.975	4.932	-4.778	7.426	7.345
	(.501)	(.560)	(.562)	(.220)	(.357)
Controlling for CDU Share of List Votes	-3.983	4.772	-4.520	7.208	6.506
in Previous Election	(.444)	(.502)	(.528)	(.194)	(.316)
Controlling for District Level Covariates	-5.605	1.997	-2.774	6.955	6.250
	(.548)	(.618)	(.640)	(.239)	(.391)
Control Group:					
Other Districts in East Germany	-5.169	3.434	-2.802	7.219	5.226
	(.414)	(.465)	(.529)	(.201)	(.337)
All Other Districts in Germany	-7.345	.850	-.616	7.724	4.504
	(.496)	(.545)	(.503)	(.189)	(.456)
As Percentage of All Eligible Voters	-7.820	-1.619	--	6.294	.895
	(.679)	(.769)		(.253)	(.401)

B. Additional Interaction Terms

Sample / Specification	CDU Share of List Vote	CDU Share of Candidate Vote	Turnout	FDP Share of List Vote	SPD Share of Candidate Vote
Baseline	.634	-.605	.538	-.414	.092
	(.079)	(.031)	(.112)	(.040)	(.069)
Unweighted	.610	-.519	.526	-.432	.075
	(.087)	(.036)	(.116)	(.045)	(.078)
Controlling for CDU Share of List Votes	.662	-.608	.533	-.416	.092
in Previous Election	(.078)	(.031)	(.013)	(.040)	(.068)
Controlling for District Level Covariates	.657	-.606	.536	-.415	.084
	(.078)	(.030)	(.111)	(.040)	(.068)
Control Group:					
Other Districts in East Germany	.443	-.612	.507	-.466	.173
	(.080)	(.026)	(.114)	(.036)	(.074)
All Other Districts in Germany	.635	-.594	.522	-.472	.079
	(.070)	(.029)	(.107)	(.040)	(.103)
As Percentage of All Eligible Voters	.576	.385	--	-.130	.311
	(.082)	(.072)		(.034)	(.063)

Notes: Entries in the upper panel are coefficients and standard errors on δ, obtained by estimating equation (3) using least squares. Entries in the lower panel correspond to the additional interaction terms added in columns (2), (4), (6), (8), and (10) in Table 5. The respective dependent variables are listed at the top of each column, and the relevant sample restriction or change in the set of controls is denoted on the left of each row. All specifications include year fixed effects, district fixed effects, district specific linear trends, and, if applicable, indicator variables for missing covariates. See the Data Appendix for the precise definitions and sources of all variables.