Electoral Consequences of Voter Turnout
in a Multiparty System

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ABSTRACT

A common belief in European multiparty systems is that weak voter turnout at parliamentary elections favors parties with right-of-center ideal points as well as small and governmental parties. Many of these claims, however, lack firm empirical evidence and are based on reverse causation. The fact that voter turnout is likely to be endogenous to electoral choice makes it difficult to assess the causal effect of turnout on electoral outcomes. In order to circumvent this dilemma, I draw upon a strategy proposed by Hansford and Gomez (2010) who use rainfall as an instrument for turnout to estimate electoral effects of voter turnout in the United States, and apply it to a multiparty setting—18 German federal elections since 1949. Against common wisdom I find that a marginal rise in turnout harms the main left-of-center party but benefits the Conservatives. Small parties seem to actually benefit from higher turnout. The effects of incumbency on the turnout-outcome relationship remain inconclusive.

1. INTRODUCTION

Do varying levels of turnout affect election results? In times of turnout decline in many come-of-age democracies (see, e.g., Flickinger and Studlar, 1992; Blais, 2000; Burden, 2000; Gray and Caul, 2000; Blais et al., 2004), this question has gained relevance that reaches far beyond scholarly interest alone. If particular groups cut themselves off from the urns, this has implications for the quality of representation. As long as nonvoters differ from voters in their predisposition of political preferences, (changes in) levels of turnout can affect political outcomes both with regards to the distribution of power and policy output. Counterfactual questions like 'how would the outcome of an election look like if everybody had voted' (see Highton and Wolfinger, 2001; Citrin, Schickler and Sides, 2003; Kohler, 2006; Sides, Schickler and Citrin, 2008; van der Eijk, Schmitt and Sapir, 2010; Kohler, 2011), if even less people had voted (van der Eijk and van Egmond, 2007) or how electoral rules intended to foster turnout shape voting behavior (Selb and Lachat, 2009) put the question of electoral consequences of voter turnout in a nutshell.

However, in spite of (or rather reflected by) masses of studies that try to bring light into this puzzle, there is no scholarly consensus about electoral consequences of marginal changes in turnout. What all theorists agree over is that as long as political preferences do not differ between nonvoters and voters, turnout levels do not affect election outcomes. Quite certainly however, they do. Innumerable studies have revealed socioeconomic, educational, racial, age and gender biases in individual turnout (e.g., Wolfinger and Rosenstone, 1980; Leighley and Nagler, 1992*a*,*b*; Blais, 2000). The very same factors are also stable predictors of voting behavior in various political settings. For instance, it is frequently argued that the socioeconomic bias in turnout favors the Republican party in the United States in general, and an increase in turnout is therefore expected to help the Democrats, as they have a larger potential of gaining voters (e.g., Radcliff, 1994; Martinez and Gill, 2005). According to another rationale, high turnout rates harm the incumbent, as dissatisfaction (more than satisfaction) with the government pushes voters to the urns (DeNardo, 1980; Grofman, Owen and Collet, 1999).[1] A third hypothesis brought forward by Hansford and Gomez (2010) suggests that increased turnout simply makes electoral outcomes less predictable, as peripheral voters tend to hold weaker ties to either of the party camps.

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[1]In this case however, one would not speak of a turnout effect on electoral outcomes but argue that anticipated or past political outcomes shape turnout behavior. This is not what this study at hand tries to identify.

Figure 1: Turnout rates and vote share of the Social Democrats (SPD) at German federal elections, 1949-2013. Shaded areas mark years where the SPD ran as part of the government.
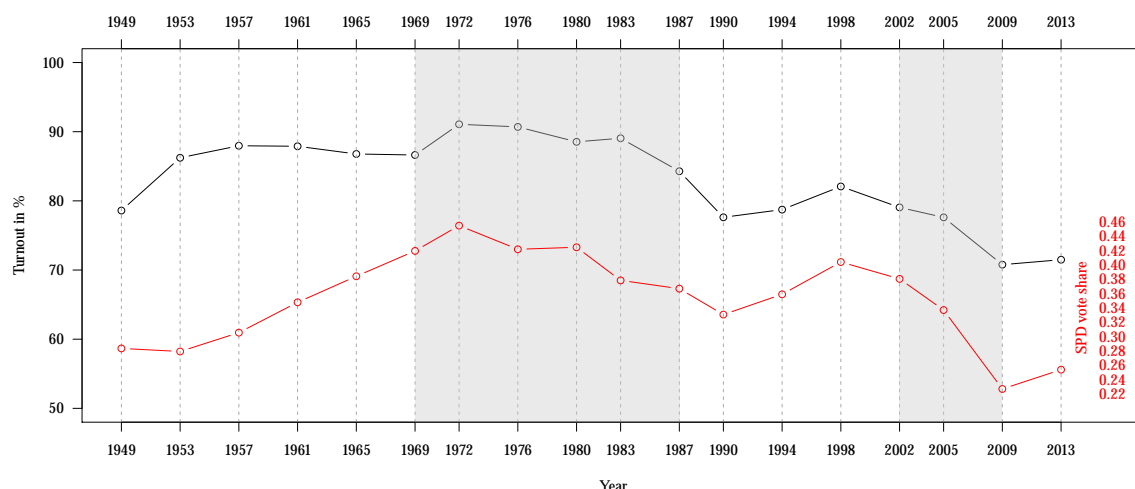
In multiparty systems where electoral outcomes are more complex in nature, variations of these claims have been brought forward. A popular conjecture is that—in analogy with the partisan hypothesis—high turnout favors left parties. This is what could be drawn from correlations between left party vote share and turnout levels, as depicted in Figure 1. The graph shows that the vote share of Germany's main left-wing party (the Social Democratic Party, SPD) at German federal elections is astonishingly closely associated with overall levels of turnout (Pearson's r = 0.70). This could tempt observers to conclude that left parties indeed suffer from lower voter turnout.

What makes assessing the causal effect of turnout on electoral outcomes so difficult is the potential of an endogenous relationship between the two variables that leaps to the eye: Both the decision to vote and whom to vote for are likely to be influenced by a similar set of factors. Further, factors idiosyncratic to an election campaign—like expected closeness or increased salience of relevant issues—may shape the incentives of voters to cast a vote (see Matsusaka and Palda, 1993, for an overview of earlier studies). Returning to Figure 1, another story than turnout *per se* affecting the electoral outcome of left-wing parties that could explain this pattern would be that bad performance of the Social Democrats as governmental party is punished by disappointed former supporters that abstain from the urns. According to this rationale, the causal mechanism would point in the other direction – bad party performance lowers levels

of turnout. Indeed, in six out of nine elections where the SPD ran as one of the government parties (shaded in the plot), both turnout and vote share declined.

There are statistical means to address problems of simultaneity. In this paper, I draw on an instrumental variable strategy suggested by Hansford and Gomez (2010) to estimate the genuine effect of turnout on electoral outcomes in a multiparty setting. The fundamental idea is to use weather conditions as an exogenous instrument for turnout. As an empirical case I focus on 18 federal elections in Germany that took place between 1949 and 2013. It is a case where it can be shown that weather conditions have a significant impact on turnout levels, a necessary condition to implement the identification strategy. Further, a considerable decline in turnout, especially after reunification in 1990, makes it a relevant scenario to study in this respect.

The paper proceeds as follows: I start with a discussion of the theoretical link between turnout and electoral outcomes and deduct a set of expectations for the multiparty case. Next, I set forth the empirical strategy to identify the causal effect of turnout on electoral outcomes and discuss the conditions which must be met by this approach to provide valid estimates. After a description of the data collection procedure, I present empirical evidence. The last section concludes.

2. THEORETICAL CONSIDERATIONS ON ELECTORAL EFFECTS OF TURNOUT

In order to understand how varying levels of turnout can effect electoral outcomes, it is important to address the process of voting first. In electoral systems where a voter is not obliged but has the choice to cast a vote, she is basically faced with two decisions: One, if to cast a vote at all, and two, whom to vote for. Turnout affects electoral outcomes if and only if these two decisions are generally not independent of each other.[2] One branch of existing explanations of the turnout–outcomes nexus builds on the role of common individual-level predictors of both turnout and voting behavior. Other hypotheses stress the importance of the point of departure at a specific election and varying incentives of government and opposition supporters to turn out. Further explanations emphasize the role of ideological positioning of parties and their chances of success. In the following, I present these hypotheses in greater detail.

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[2]In this discussion I disregard quora and other electoral laws under which turnout technically determines electoral outcomes, too.

The partisan hypothesis.　　The most popular hypothesis on the effect of turnout on election outcomes states that electoral results are persistently biased by turnout because both the decision to vote and whom to vote for are influenced by the same set of socioeconomic predictors such as education, income, race, and age. These variables are in a sense fundamental because they have often been found to be substantive and relatively stable predictors of voting behavior. With other words, ideological preference and inclination to vote are assumed to be influenced by similar factors. In the U.S., the common expectation is that Republican partisans—better equipped with socioeconomic resources—are more likely to vote, resulting in a pro-Republican bias of voting results (e.g., Burnham, 1965; Radcliff, 1994; Pacek and Radcliff, 1995). Consequently, the partisan hypothesis states that increased turnout attenuates the bias in electoral outcomes, benefiting the Democrats. Analysts of electoral systems outside the U.S. have followed the same rationale (see Lutz and Marsh, 2007, for a recent overview). Most frequently, left-wing parties are expected to suffer from turnout bias in election outcomes, as their partisans tend to be equipped with less socioeconomic resources which increases the costs of voting. For the German case, some studies have focused on partisan effects of turnout, tending to support the claim that left-wing parties benefit from increases in turnout. Analyzing individual-level survey data, Kohler (2011) provides evidence that the (left-wing) Social Democratic Party (SPD) would have gained in terms of vote share at all federal elections from 1949 to 2005 had all eligible voters participated. Based on a rich data base of turnout participation rates and party vote shares in 1,500 urban quarters in large German cities, Schäfer (2012) finds that SPD and Die Linke (Left Party) suffered most from the turnout decline.

The anti-incumbency/opposition hypothesis.　　Originally proposed by DeNardo (1980) and extended by Grofman, Owen and Collet (1999), this hypothesis states that higher turnout harms the incumbent. While the rationale that an unpopular government can pull people at the urns points to a reverse direction of the causal relationship between turnout and electoral outcomes, Hansford and Gomez (2010, p. 271) propose another justification of the theory. They argue that by definition, core voters are more likely to have established the status quo in past elections and are therefore more supportive of the government than peripheral voters. If the latter participate more at an upcoming election (and assuming relatively stable preferences in both groups of previous nonvoters and voters), this should be bad news for the incumbent. The German electoral system offers at least two ways to think about such a measure. First, there is a federal government in power which is practically elected by voters with the second

vote.[3] In accordance with the hypothesis, one should expect that governing parties are harmed by increased turnout. Expectations can be extended with regards to the first vote, the component voters use to elect their district representative. If the anti-incumbency hypothesis holds also at the local level, higher turnout in the district should harm the incumbent representative.

The small and extremist parties hypothesis. A claim frequently made by leaders of moderate parties to mobilize their partisans is that low turnout benefits ideologically extremist (and predominantly right-wing extremist) parties. The implicit rationale is that voters of extreme parties are core voters with a settled political ideology who turn out regardless of their party's chances. If peripheral voters with weaker party ties stay at home, the relative share of extreme votes rises. Empirically, this causal argument stands on shaky grounds. It has been shown frequently that voters of extremist parties tend to be disenchanted with politics and are rather protest voters than voters with a consistent and strong ideology (e.g., Lubbers and Scheepers, 2000; Arzheimer, 2008). Consequently, Bernhagen and Marsh (2007, 551-552) and Pettersen and Rose (2007) expect more radical parties to benefit from complete turnout. In the German case, I would further bring up an institutionally motivated argument. The existing five-percent threshold lowers the incentive to turn out of supporters of small parties—which right-wing extremist parties belong to in Germany—because the chances of entering parliament (and, from the voter's perspective, not to waste the vote) have shown to be very low historically. This might have turned many of them into habitual non-voters. If they were to vote though when costs for turning out are lowered, small parties would benefit from it (see also Pettersen and Rose, 2007, p. 581). In the empirical analysis I isolate the exogenous variation of turnout using weather conditions as an instrument. If the conditions for weather being a valid instrument for turnout are met, I would therefore expect to find the vote share of small parties to be positively affected by increased turnout only if they do not have any realistic chance to achieve power. Otherwise, the core rationale of this hypothesis does not apply; there is no reason to *ceteris paribus* expect supporters of small but reliably elected parties to be habitual non-voters.

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[3]In Germany, MPs are elected under two different electoral rules. The distribution of seats in parliament is entirely determined by the distribution of votes for these party lists using proportional representation (PR), with candidates being elected in one of the 299 districts via first-past-the-post (FPTP) taking half of these seats (Saalfeld, 2008).

3. ASSESSING THE PROBLEM OF ENDOGENEITY

How can the effect of turnout on electoral outcomes be assessed? Ideally, one had data about vote choices of voters and (potential) vote choices of nonvoters, that is knowledge about the voting outcome if everybody had voted. Unfortunately, the implied counterfactual – voting behavior of nonvoters – is not observable. One has to come up with other strategies to identify the effect of turnout on election outcomes.

A classical approach to assess the turnout–election outcome nexus is to use aggregate-level voting statistics, that is to regress the vote share of one party or candidate on turnout and a set of controls. This approach has been pursued by, e.g., DeNardo (1980); Erikson (1995); Nagel and McNulty (1996), and Radcliff (1994) for the US case, McAllister (1986) for Australia, McAllister and Mughan (1986) for the United Kingdom, and Schäfer (2012) for Germany (see also Lutz and Marsh, 2007). This analytical strategy is built on sand. Individual-level voting preferences, propensities to vote and determinants thereof are left out of these aggregate-level analyses, opening the doors for ecological fallacy. Further, the endogeneity problem persists (see also Hansford and Gomez, 2010, pp. 271-272).

Another approach draws on individual-level data from surveys to measure preferences of both voters and nonvoters. This identification strategy exploits reported preferences of non-voters which are not known in aggregate-level voting statistics. Revealed preferences are then used to simulate outcomes under higher (or lower) turnout rates (Citrin, Schickler and Sides, 2003; van der Eijk, Schmitt and Sapir, 2010; Highton and Wolfinger, 2001; Kohler, 2011; Martinez and Gill, 2005, e.g.,). However, the problems with survey data on reported voting behavior are well-known: Realized samples suffer from overrepresentation of voters and respondents have a tendency to overreport voting behavior, that is to report a vote although they abstained from the urn (e.g., Bernstein, Chadha and Montjoy, 2001; Brehm, 1993; Hill and Hurley, 1984; Karp and Brockington, 2005; Katosh and Traugott, 1981; Sigelman, 1982; Tittle and Hill, 1967). As both phenomena interfere, it is challenging to disentangle both components of bias and to correct for them, especially on the individual level (Selb and Munzert, 2013). Vote validation studies are no real remedy to this problem either. The problem of overrepresentation persists and it is likely that nonvoters in the sample differ from nonvoters who refused to participate along a set of factors which also determine voting decisions. A second drawback of this approach is that the technical strategy is not entirely convincing from a theoretical point of view. As Grofman, Owen and Collet (1999) rightfully point out, differences in political preferences

between voters and nonvoters do not necessarily imply that the party or candidate that is underrepresented among actual voters benefits from higher turnout. As long as one does not have a valid measure of voting propensity among nonvoters at hand, it could well be the case that, in times of higher turnout, even more supporters of the already overrepresented party are pulled to the urns.

So what to do? An attempt to disentangle the relationship between turnout and electoral outcomes for the case of Germany is presented by Schäfer (2012), who provides the to date most sophisticated analysis of turnout effects on election results at German Federal elections. He uses federal election data at the city-district level, a much more fine-grained perspective than one that focuses on electoral districts. This small-area approach enables him to compare units which are relatively homogeneous with regards to socioeconomic factors. This approach is based on the hope that the danger of ecological fallacy minimizes with sufficiently small units. However, while Schäfer's analysis is grounded on an impressive data base, the design is still vulnerable to ecological fallacy problems and does not rule out the possibility that the effect of endogenous variation in turnout is measured instead, that is variation which is caused by (non-)voting behavior due to an anticipated outcome.

Another approach to estimate electoral consequences of voter turnout recently has gained considerable attention: In a study published in the *American Political Science Review*, Hansford and Gomez (2010) propose an instrumental variable (IV) approach to account for potential bias caused by endogeneity. They employ rainfall as an instrument for turnout, arguing that weather conditions (measured as the deviation from the local 'normal' weather) have a substantive effect on turnout (as previously demonstrated in Gomez, Hansford and Krause, 2007) and are purely exogenous. The act of voting practically means that on election day, the voter has to commute to the ballot box, cast the vote, and the commute back home.[4] Thereby, the voter almost inevitably exposes herself to certain weather conditions. It has been shown that weather influences our decision to stay at home or to go outside (see Bauman and Bull, 2007; Humpel, Owen and Leslie, 2002; Tucker and Gilliland, 2007). Specifically, bad weather conditions like heavy rainfall, very high or very low temperatures tend to reduce physical outdoor activity levels. It is not expected that weather conditions shape turnout substantively, that is by any larger margins. However, (Gomez, Hansford and Krause, 2007) demonstrate that rainfall levels reduce turnout by a small but significant margin. In this paper, I draw on this strategy

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[4]This is, of course, not the case for absentee voters, who should not be affected by such costs. I exploit this logic for a robustness check of the instruments later in my analysis.

and exploit weather conditions measured at the level of electoral districts to isolate turnout effects on electoral outcomes.

Two main requirements must be met for IV to provide unbiased and consistent estimates of the effect of the endogenous variable (e.g., Morgan and Winship, 2007): First, the instrument must have sufficient explanatory power with regards to the endogenous explanatory variable, conditional on other covariates that are taken into account. Although Gomez, Hansford and Krause (2007) provide profound evidence that rainfall is a stable predictor of turnout at US Presidential elections, there has as yet been no convincing confirmation for the German case.[5] In a first analytic step, I therefore assess the relationship between weather conditions and turnout at the elections under consideration.

Second, the instrument must be uncorrelated with the error term in the main equation, that is, must not be endogenous itself. As attractive as weather as an exogenous instrument for turnout might seem to solve the turnout–electoral outcomes puzzle, there are some features of the instrument which jeopardize this assumption. First, it seems plausible that the effect of weather on voting behavior varies geographically. In areas were rain or extreme temperatures are more common, they might cause relatively lower costs on peoples' ways to the urns. One way to deal with this problem is to measure weather conditions as deviations from the local or local-temporal norm. In my analysis, I estimate both election day weather and the three-day average previous to the election and use the difference as instrument. The idea is that while weather conditions are not distributed randomly across space and are therefore likely to be correlated with spatially clustered political preferences, this does not apply to short-term deviations. For the same reason, Hansford and Gomez (2010) use deviations from the 'normal weather', computed from weather conditions at the same day (and week) in previous years. I argue that while this approach is also useful to get rid of local idiosyncrasies, it is less plausible why people should react to deviations from long-term trends. I therefore use deviations from short-term trends instead. A second critical assumption is that the effect of weather conditions on individual turnout behavior is not related to factors that shape political preferences. With other words, the marginal costs because of rainfall should be, on average, equal to all kinds of people. This assumption would be violated if, to pick a bold example,

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[5] Brennecke (1991) is the first to evaluate the relationship between weather and turnout in German local elections. However, he only uses data from one electorate, the city of Wiesbaden, and finds no effect for elections between 1949 and 1991. In another, little study, Brandt and Hülle (2005) find no evidence for a causal connection. With regards to the limited databases and the methodology used, neither of the existing studies seem appropriate for uncovering effects which should be assumed rather small, if at all existing.

left people had a somewhat 'natural' aversion to rainfall while conservatives did not (because, e.g., it is just a part of God's wonderful creation). One could still observe a negative effect of weather on turnout, but weather conditions would not be exogenous to political preferences anymore. Third and relatedly, if weather conditions *per se* influence political behavior, e.g., by increasing dissatisfaction with the government, this would be a poor instrument, too. Indeed, Mutz and Kämpfer (2011) provide evidence that weather conditions affect peoples' satisfaction with democracy and government. Egan and Mullin (2012) study the effects of local weather conditions on perceptions about global warming and find that weather has a significant impact. There is no evidence, however, whether weather also affect voting behavior and lacking a strong theory under which voters consciously or unconsciously attribute weather conditions to party performance at the urns, I would doubt that one should expect similarly strong effects. With no individual-level data at hand, I am not able to test these conjectures and have to assume that they do not damage the validity of the used instruments.

4. SETTING AND DATA

The German electoral system at the federal level provides an attractive setting to investigate turnout effects on electoral outcomes in a multiparty setting. In terms of electoral rules, it can be described as a mixed system with a strong proportional and a weaker majoritarian compo-nent. Voters cast two votes, the first (personal) for a candidate who runs in one of the currently 299 constituencies, the second (party) for one of the parties which run on state-specific lists (16 federal states in total). The distribution of votes for these party lists essentially determines the distribution of seats in parliament. Candidates who are elected by plurality voting, i.e. who receive a relative majority of first votes in their districts, take half of the parliamentary seats. Over the course of 18 elections since 1949, the landscape of political parties has notably changed. National-level politics had been dominated by the conservative parties CDU and CSU, the social democratic SPD and the liberal FDP. Since the late 1980s and reunification, the green party Bündnis 90/Die Grünen and the SED/PDS (merged in 'Die Linke' in 2007), former regime party of the German Democratic Republic, have established in the party system.

The existence of small but often pivotal parties provides empirical leverage for hypotheses which assume an effect of turnout on small party success. Further, the fact that government constellations frequently changed over time allows investigating mechanisms that rest on par-tisan logic as well as those that assume the outcome of government vs. oppositional parties to

be affected by varying levels of turnout. Furthermore, the German electoral system offers two plausible ways to test for the opposition or anti-incumbency hypothesis. The first refers to the opposition status on the federal level, i.e. if a party was part of the government in the previous legislation. The second refers to incumbency status of the direct candidate at the district level. Finally there is one limitation: The German setting provides a weak ground to test whether decreased turnout fosters the success of extremist parties. Right-wing extremist parties have never entered parliament since 1949, and it is in the eye of the beholder whether Die Linke should be considered a left-wing extremist party. While the continuously strong results in the former GDR point to the existence of a solid base of core voters with strong party ties (which drives the underlying mechanism of the extremist parties hypothesis), the party has succeeded in both East and West Germany and across different social and economic strata (Walter, 2007). For the time being, I refrain from testing the extremist parties hypothesis but will do so in a later version of the paper.

I collected data from all federal elections since the foundation of the German Federal Republic 1949 until 2013. N = 18 elections took place within this period. Outcomes are analyzed at the district-election level. One district comprises about 100,000 to 300,000 inhabitants. There are several reasons to focus on this level of aggregation. First, we can observe substantive variation of turnout both within and between elections and can measure electoral consequences on this level, too. This puts the statistical analysis on a more solid ground than, for example, an analysis on the state or even federal level. Second, the identification strategy relies on measures of weather conditions which also vary locally. It is certainly a rather simplistic approach to assume that weather conditions are constant within a district at a certain day (especially for the rural ones which cover larger areas), but I lack data on electoral outcomes for smaller units (e.g., at the precinct level) and credible weather estimates at this level. Third, as has been noted above, the mixed electoral system induces races at the district-level. Therefore, we can observe substantively interesting outcomes at the district level that are potentially affected by varying levels of turnout.

4.1. *Constructing a panel of electoral districts*

Information about district-level turnout was provided by the electoral management body (*Bundeswahlleiter*).[6] Constructing a panel of electoral districts for $N = 18$ elections poses a challenge. A minor problem is that districts were often renamed during their existence. This renaming process can be retraced in legislative documents. A major problem stems from redistricting, especially when major redistricting efforts result in abandoned, newly established or re-established districts. At some points in time, the total number of districts was changed, most dramatically in 1990 when the area of the former German Democratic Republic was incorporated into the election body. Further, geographic information on districts is not available for elections prior to 1990, which makes the estimation of weather conditions at the district level more difficult. To account for these issues, I proceeded as follows: First, I gathered geographical point coordinates for every district since 1949.[7] Second, I used these positions as reference for identifying electoral districts as same observations. In cases where districts were split, I randomly assigned one district the follow-up unit and treated the other as new observation. While the number of districts lies between 242 (1949-1953) and 328 (1990-1998), the number of unique districts classified this way is 359.

4.2. *Generating weather reports for electoral constituencies*

Weather data were gathered from the German Meteorological Service (Deutscher Wetterdienst, DWD), which provides daily meteorological information for, on average, 487 stations dispersed over the whole country. The geographic distribution of stations and districts is displayed in Figure A1 in the Appendix. In order to generate information on weather conditions for every district, I interpolated data from the available weather stations by inverse distance weighting (IDW). Weather stations which are near to a district's center point should provide

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[6]Data are available at http://www.bundeswahlleiter.de/de/bundestagswahlen/fruehere_bundestagswahlen/ (accessed Thursday 4th June, 2015).

[7]Electoral districts in Germany are often named after their biggest town or after the biggest administrative district they include. It cannot be assumed, of course, that this town is somehow 'geographically representative' in the sense that it lies fairly in the middle of the geographical unit. However, as positional differences of at maximum 40 kilometers should not influence the estimation of weather conditions too strongly, I used the position of this town or administrative center of the county as geographical identifier for the district. Geographical coordinates were drawn from so-called GeoHacks provided by the 'WikiProject Geographical coordinates' (see http://en.wikipedia.org/wiki/Wikipedia:WikiProject_Geographical_coordinates, accessed Thursday 4th June, 2015), which are linked to virtually every entry on German electoral or administrative districts.

a more reliable measure of the actual weather than other stations which are located more far away. In estimating quantities at a certain point in space, IDW considers nearby stations with a higher weight than remote stations, with the weight being a function of the inverse distance.[8] Temperature is measured in °C, rainfall in mm (which equals liter per square meter).

Election day weather alone is a poor instrument for turnout in this scenario, as we cannot assume it to be uncorrelated with the error term in the main equation: Political preferences are geographically clustered (e.g., Johnston and Pattie, 2006), just as normal weather conditions are. Further, Hansford and Gomez (2010, p. 274) hypothesize that "the behavioral effect of election day rain depends on the typical weather conditions experienced in a county on that day." Therefore, they take the election day rain deviation from normal day rainfall (calculated over the whole time span for the election's week) as an instrument. I take a slightly different approach and use the deviation of election day rainfall and temperature from the immediate context in which the election takes place, that is the average rainfall and temperature on the three days before the election takes place. The idea is that people are influenced by short-term rather than long-term deviations of weather conditions. For example, I expect that perceived costs to go outside are less when it has rained for some days and less so on election day, but not necessarily less when it rains less than the average amount at that time of the year. The estimated deviations of election-day rainfall and temperature from pre-election weather conditions are visualized in Figures A2 and A3 in the Appendix.

4.3. Measurement of core variables

The specified hypotheses require different dependent variables to be regressed in the IV models. In order to test the partisan and the small parties hypotheses, I use the second vote shares at the district level. A test of the opposition hypothesis requires an incumbency or parties-in-power measure. At the district level, I encoded the incumbency status for each party. At the national level, I created a variable indicating whether the party had been member of gov-

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[8]The interpolation function can be written as

$$t^*(k_o) = \frac{\sum_{i=1}^{n} \frac{t(k_i)}{d^x(k_o,k_i)}}{\sum_{i=1}^{n} \frac{1}{d^x(k_o,k_i)}},$$

where t^* is the unknown value at location k_o to be estimated, $t(k_i)$ is the measure at station i, and $d^x(k_o,k_i)$ is the distance between locations k_o and k_i, exponentiated with x, usually specified smaller than 2. The sum of weights is then normed by the sum of inverse distances (see Willmott and Matsuura, 1995).

ernment in the previous term. In order to test the incumbency hypothesis at the district level, I use first vote share as the dependent variable because they decide over the district winner and focus on the Christian Democratic Union (CDU) and the Social Democratic Party (SPD) which have won the overwhelming majority of seats through first vote shares are regressed on instrumented turnout and an interaction term of instrumented turnout and incumbency status.

Additionally, I introduce a measure of baseline turnout in the regression models. The variable *mean previous turnout* is computed at the district level and on the basis of the last three previous elections.[9] The rationale behind including this measure in the turnout models is that it helps discriminate marginal effects of turnout change on electoral outcomes (what I would attribute 'causal' effects) from structural factors which may shape both turnout levels and party support. I expect such structural effects to be partly but not fully captured by district fixed effects, because the structural composition can change over the long period of observation.

5. RESULTS

A first look at the bivariate relationships between district-level turnout and second vote share for a given party and election provides some insight under which turnout conditions certain parties perform better or worse. Figures A5 to A10 reveal no clear patterns for SPD and CDU/CSU across all elections covered. They indicate that the FDP tended to be more successful in low-level turnout districts until the late 1960s but the relationship has changed since the 1994 election. Similarly, the Greens tended to perform better in high-level turnout districts since 1994. Vote shares of Die Linke/PDS are negatively associated with turnout at the district level, particularly in the eastern constituencies. The relationship between turnout and vote shares for other small parties is weakly negative. However, as has been discussed thoroughly above, these figures do not tell much about the *causal* impact of turnout on party vote shares. Therefore, I unfold the more sophisticated identification strategy.

To justify the identification strategy, Table 1 reports results from OLS regressions of turnout on weather conditions. According to models (1) and (2), both rainfall and temperature have a significant negative effect on turnout in the district sample. On average, 10 mm/sqm of rain reduce turnout by 0.7%. An increase in 1 °C is associated with a decrease in turnout of about 0.1%. District and election fixed effects are included and explain large fractions of explained

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[9] If there are less than three previous elections, I used the last two or only the last election.

Table 1: Weather determinants of district-level turnout at German Federal Elections, 1949-2013

	Dependent variable:				
	Turnout			Turnout x SPD gov.	Turnout x SPD inc.
	(1)	(2)	(3)	(4)	(5)
Rain (mm)	-0.07^{***}		-0.07^{***}	-0.03	1.35^{***}
	(0.01)		(0.01)	(0.03)	(0.21)
Temperature (°C)		-0.09^{***}	-0.08^{***}	-0.03	0.88^{*}
		(0.02)	(0.02)	(0.03)	(0.39)
Rain x SPD government				0.02	
				(0.03)	
Temperature x SPD government				-0.12^{*}	
				(0.05)	
Rain x SPD incumbent					-1.75^{***}
					(0.24)
Temperature x SPD incumbent					-3.92^{***}
					(0.34)
Mean previous turnout, $t-1, 2, 3$	51.45^{***}	50.83^{***}	51.23^{***}	-3.17^{*}	39.74^{*}
	(1.19)	(1.19)	(1.19)	(1.25)	(20.26)
Election fixed effects	✓	✓	✓	✓	✓
District fixed effects	✓	✓	✓	✓	✓
Observations	4,535	4,535	4,535	4,535	4,535
R^2	0.96	0.96	0.96	1.00	0.64
Adjusted R^2	0.95	0.95	0.95	1.00	0.61
Residual Std. Error	1.50	1.50	1.50	1.57	25.52
F Statistic	254.70^{***}	252.90^{***}	254.75^{***}	$8,599.15^{***}$	20.00^{***}
F test, excluded instruments for turnout	43.36^{**}	14.89^{***}	27.98^{***}	4.82^{***}	51.73^{***}

*p<0.05; **p<0.01; ***p<0.001

variance in turnout. Model (3) represents the first-stage estimates from most of the reported IV models, with both rainfall and temperature entering the equation as explanatory variables for turnout. Models (4) and (5) present first-stage estimates of my IV strategy to identify turnout effects conditional on the party's government status at the national level and incumbency status at the district level. The explanatory power of the instruments is tested using F statistics on the instruments. With the exception of Model (4), the statistics are well above the usually suggested threshold of 10 as an indicator for sufficient explanatory power (Staiger and Stock, 1997).

For means of comparison, Table 2 presents OLS estimates for the effect of turnout on party second vote shares at the district level. Again, district and election fixed effects are included as controls, as well as the moving average of previous turnout levels. According to these estimates, SPD and FDP suffer from increased turnout, while CDU/CSU, the Greens and, to a somewhat lesser extent, the Left are profiteers. Other small parties are not affected.

How do the IV results compare to the OLS estimates? Table 3 reports party-specific effects of instrumented turnout. The effect sizes of the turnout predictor are (apart from the

Table 2: District-level vote share at German Federal Elections, 1953-2013 (OLS estimates)

	Dependent variable: second vote share					
	SPD	CDU/CSU	FDP	Greens	Left	Others
	(1)	(2)	(3)	(4)	(5)	(6)
Turnout	−0.24***	0.12**	−0.11***	0.14***	0.05*	−0.01
	(0.03)	(0.04)	(0.01)	(0.01)	(0.02)	(0.03)
Mean previous turnout, $t − 1, 2, 3$	0.04	−0.07	−0.15***	0.07***	−0.42***	0.14***
	(0.03)	(0.04)	(0.02)	(0.02)	(0.03)	(0.03)
Election fixed effects	✓	✓	✓	✓	✓	✓
District fixed effects	✓	✓	✓	✓	✓	✓
Observations	4,535	4,535	4,535	2,585	2,089	4,535
R^2	0.91	0.86	0.77	0.92	0.97	0.78
Adjusted R^2	0.90	0.84	0.75	0.91	0.97	0.76
Residual Std. Error	0.03	0.04	0.02	0.01	0.01	0.03
F Statistic, all covariates	113.48***	67.15***	37.14***	78.12***	175.08***	39.19***

*p<0.05; **p<0.01; ***p<0.001

Green model) markedly larger than in the baseline model. While SPD, FDP and the Greens in contrast to CDU/CSU and the Left are successful in environments with high *previous* turnout (controlled for district fixed effects), *marginal* positive shifts in turnout mostly benefit the Conservatives and small parties. On the other hand, SPD and FDP are harmed by a marginal increase in turnout. Note that the positive effect for the Greens from the baseline model does not hold anymore. The findings for the SPD contrast with the partisan hypothesis and previous evidence from Kohler (2011) and Schäfer (2012), who both find that the SPD would profit from participation of non-voters. The significant positive effect in the fringe party model (last column of Table 3) provides some evidence for the revised small and extremist parties hypothesis, that is that they actually profit from a marginal *increase* in turnout. The fact that the FDP and (although not significantly) the Greens seem to suffer from a turnout increase does not stand against this rationale. Studies on voting behavior have revealed that these parties are generally supported by voters who are economically well equipped with socioeconomic resources.

As has been discussed earlier, this identification strategy rests on the assumption that weather conditions affect electoral outcomes only through turnout. This assumption can be violated if, for example, bad weather makes voters more dissatisfied in general, which may again affect their satisfaction with the party in power. Whether the exclusion restriction applies or not is untestable. However, I provide a simple falsification test to gauge its plausibility which has been suggested by Nunn and Wantchekon (2011) and, among others, applied by Acharya, Blackwell and Sen (2014). The idea is to estimate the reduced-form relationship between the instruments—here, the weather condition indicators—and electoral outcomes, but separate between settings in which the relationship motivating the instrument should apply

Table 3: District-level vote share at German Federal Elections, 1953-2013 (IV estimates, 2SLS , 2nd stage)

| | Dependent variable: second vote share | | | | | |
| | SPD | CDU/CSU | FDP | Greens | Left | Others |
	(1)	(2)	(3)	(4)	(5)	(6)
Turnout	−0.84**	1.28**	−0.97***	−0.11	0.19	0.59*
	(0.31)	(0.41)	(0.21)	(0.09)	(0.11)	(0.26)
Mean previous turnout, $t − 1, 2, 3$	0.34*	−0.66**	0.29**	0.15***	−0.45***	−0.17
	(0.16)	(0.21)	(0.11)	(0.03)	(0.04)	(0.13)
Election fixed effects	✓	✓	✓	✓	✓	✓
District fixed effects	✓	✓	✓	✓	✓	✓
Observations	4,535	4,535	4,535	2,585	2,089	4,535
R^2	0.90	0.83	0.66	0.91	0.97	0.75
Adjusted R^2	0.90	0.82	0.63	0.90	0.97	0.73
Residual Std. Error	0.03	0.05	0.02	0.01	0.01	0.03

*p<0.05; **p<0.01; ***p<0.001

and others in which it should not (or less so). Recall that the rationale behind the instrument was that unfavorable weather conditions raise voting costs and should therefore negatively affect turnout rates. This relationship has been tested in the models of Table 1. If the assumed mechanism behind this association is valid, though, on should expect it to be weaker with an increasing share of postal voters.[10] As I lack district-level information on postal voting behavior to test the impact of postal voting on the relationship, I employ a coarser strategy and use information about national-level postal voting rates (available from Bundeswahlleiter, 2014) to separate elections with low from others with high postal voting rates. Postal voting was introduced at the third German Federal election in 1957. Postal voting rates have been risen since then from 4.9% to 24.3% in 2013 (see Table A1 in the Appendix). To retain variation in weather conditions, I split the sample into observations of 1949 to 1987 (mean postal vote rate 7.1%) and of 1994 to 2013 (mean postal vote rate 18.6%) and estimated the reduced-form relationships for the parties which ran at all elections (SPD, CDU/CSU and FDP) The results are reported in Table A2 in the Appendix. What can be observed is that for five of six predictors the effects are indeed markedly lower in the 1994-to-2013 or high postal vote rate sample than in the 1949-to-1987 sample, which should increase confidence in the IV estimates.

The German electoral system offers two ways to test for the opposition or anti-incumbency hypothesis. The first refers to a party's opposition status at the federal level. The second refers to incumbency status of the direct candidate at the district level. I test both expectations by regressing first and second vote shares on instrumented turnout and the interaction of instru-

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[10]In the extreme, if all voters voted via the absentee ballot, we would expect no election-day weather effects at all.

Table 4: District-level vote shares at German Federal Elections, 1953-2013 (IV estimates, 2SLS, 2nd stage). Tests of government and incumbency effects.

	Dependent variable: SPD vote share	
	1st vote	2nd vote
	(1)	(2)
Turnout	0.01	−0.04
	(0.30)	(0.52)
SPD incumbent	−0.54***	
	(0.12)	
Turnout x SPD incumbent	0.69***	
	(0.14)	
Turnout x SPD government		−1.58
		(0.97)
Mean previous turnout $t − 1, 2, 3$	−0.16	−0.11
	(0.15)	(0.29)
Election fixed effects	✓	✓
District fixed effects	✓	✓
Observations	4,535	4,535
R^2	0.89	0.88
Adjusted R^2	0.88	0.87
Residual Std. Error	0.04	0.04

*p<0.05; **p<0.01; ***p<0.001

mented turnout and incumbency/government membership. Therefore, the interaction terms have to be instrumented with the products between rainfall and government membership and temperature and government membership, respectively (see again the last two columns of Table 1 for the corresponding first-stage regressions). Government membership dummies are not included in the models, as they are fully captured by the election fixed effects. The results are provided in Table 4.[11] Recall that the basic idea of the opposition/anti-incumbency hypothesis is that higher turnout implies that previous non-voters who did not contribute to the status quo are less likely to be government supporters. Consequently, the incumbent or government party should be harmed by a marginal increase in turnout. This is not quite what can be inferred from Table 4. Model (1) reports how SPD first vote shares are affected by turnout and incumbency status in the district. Oddly, the main effect of incumbency is negative, pointing to and incumbency *disadvantage*. The interaction term, on the other hand, is positive, indicating that turnout has a positive effect on SPD first vote share if the candidate is running as an incumbent. Apparently, marginal voters are even more supportive of the incumbent candidate. Conversely, Model (2) provides no conclusive evidence for an incumbency effect related

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[11]Note that I merely report results for SPD vote share here, as the F statistics for the excluded instruments suggested that weather conditions are a too weak predictor for the variables relevant in the CDU/CSU models. Indeed, these models provided similar results like the SPD models but generated implausible goodness-of-fit statistics.

to the national level, although the effect points into the hypothesized direction: rising turnout decreases SPD second vote share at the district level if the SPD runs as party in government incumbents. However, this effect is not significant at conventional levels. These results have to be taken with a grain of salt, however, as the low F statistic on the excluded instruments for Model (2) indicates that finite-sample bias may play a role here (see again Model (4) in Table 1). It has been shown that when valid but generally weak instruments are used, even little correlation between instruments and the error term can induce serious bias in the estimates (Bound, Jaeger and Baker, 1995).

What do the provided estimates imply substantively? So far, the effects have been only interpreted qualitatively but not in terms of size. In fact, the estimates from the IV regression models suggest very large effects. For example, take the turnout coefficient in the SPD vote share model in Table 3: It takes the value of −0.84. As both turnout and vote share are measured on the same 0-1 scale, this implies that a 1% plus in turnout reduces the SPD vote share by about 0.8%. The estimated effects of turnout on CDU/CSU and FDP vote shares were even larger in size, but not technically implausible. The potential effect of turnout on vote share has logical bounds. At the one extreme, a change in turnout from 1% to 2% can increase or decrease a party's vote share by a maximum of 50%. At the other extreme, a change from 99% turnout to complete turnout can raise a party's vote share by no more than 1%, so even if the interests of non-voters are diametrical to those of voters, complete turnout would not change much in the result. This means that the relationship between turnout and vote share is necessarily non-linear, a fact which I disregarded in the analysis, as the empirical bounds of turnout are far narrower than the theoretical bounds. Further, I did not statistically account for the multiparty setting. Party vote shares are not independent of each other, and models have been suggested to ensure that predicted vote shares add up to 1 in a given race (e.g., Katz and King, 1999; Tomz, Tucker and Wittenberg, 2002). To check whether the simple strategy to model vote shares separately produced implausible results, I computed the sums of predicted vote shares in each district and year. The mean predicted sum of vote shares was 1.00, the 5% quantile at 0.98 and the 95% quantile at 1.03, which indicates that the models did not produce technically implausible results.

6. CONCLUSION

In this paper, I tried to overcome a serious methodological problem in existing studies on electoral consequences of changes in turnout – the now and then unconvincing treatment of the endogeneity issue. Simple regressions of party vote shares on turnout rates are a weak base for making causal claims about how electoral outcomes are affected by turnout rates. It is well imaginable that unpopular governments or new parties drive previous non-voters to the urns, or that the lack of any contentious campaign fails to mobilize previous voters. In such cases one would argue that (expectations about) electoral outcomes affect turnout levels. The question addressed in this paper targeted at the reversed effect: Given that voters and non-voters differ in their political preferences, what are the consequences of a change in overall turnout levels that are exogenous to political preferences? One can think of many factors that influence the costs of voting unconditional to such preferences like, e.g., weather conditions themselves, but also the closeness of an election or general costs for information. By identifying and employing an exogenous instrument as proposed by Hansford and Gomez (2010), it is possible to identify such genuine turnout effects.

Focusing on an extensive district-level data set from German federal elections, I assessed electoral consequences of turnout in a multi-party setting. The classical partisan hypothesis—left-wing parties profit from a marginal increase in turnout, while right-wing parties are harmed—could not be confirmed. Instead, I found that Social Democrats and the Liberals, which can be located in quite different ideological camps with differing voter bases, are mostly harmed. In contrast, the Conservatives profit most. Further, the effect on fringe parties' vote share is also positive. Finally, I did not find evidence for the opposition hypothesis.

The identification strategy I employed certainly involves some limitations. First of all, the results entirely hinge on the assumption of weather as an adequate instrument for exogenous variation in turnout which I try to isolate. I provided some limited evidence why the instrument is appropriate, but the fact that the presented results contradict a set of previous findings raise some doubts about the validity of the method. Another shortcoming stems from the level of analysis. Just like any other aggregate level study, the attempt to uncover the causal impact comes at the cost that micro-level explanations for the identified effects remain largely hidden.

Bearing these limitations in mind, the application of Hansford and Gomez' (2010) strategy in a multiparty system adds a valuable perspective to the scholarly debate. Comparative studies of turnout have revealed that turnout is generally higher under proportional representation

(e.g., Powell, 1982; Jackman, 1987; Blais and Carty, 1990; Jackman and Miller, 1995; Selb, 2009). As has been noted above, however, the higher turnout, the smaller the potential for an effect on electoral outcomes, so we would expect differing (and effectively weaker) empirical effects of turnout on electoral outcomes a priori. On the other hand, institutional barriers like the five percent threshold shape costs of voting for certain voter subgroups, too. It is open to further research to implement rigid identification strategies of turnout effects to further disentangle the impact of turnout on electoral outcomes in a variety of settings and for all kinds of parties and voter groups.

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Appendix A SUPPLEMENTARY INFORMATION

Table A1: Postal turnout at German Federal elections

Year	Total	Percent of total votes
1969	2.381.860	7.1
1972	2.722.424	7.2
1976	4.099.212	10.7
1980	4.991.942	13.0
1983	4.135.816	10.5
1987	4.247.949	11.1
1990	4.435.770	9.4
1994	6.389.047	13.4
1998	8.016.122	16.0
2002	8.765.762	18.0
2005	8.969.355	18.7
2009	9.421.406	21.4
2013	10.758.677	24.3

Note: Postal voting was not possible at the 1949 and 1953 elections. Source: Bundeswahlleiter (2014)

Table A2: District-level vote share at German Federal Elections, 1953-2013, (reduced form relationships)

	Dependent variable:					
	SPD		CDU/CSU		FDP	
	1949-87	1994-2013	1949-87	1994-2013	1949-87	1994-2013
	(1)	(2)	(3)	(4)	(5)	(6)
Rain (mm)	0.002***	0.001***	−0.002***	−0.001***	0.0002	0.0004***
	(0.0003)	(0.0002)	(0.0004)	(0.0003)	(0.0002)	(0.0001)
Temperature (°C)	−0.01***	0.002**	0.01***	−0.004***	0.001*	0.0001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0005)	(0.0003)
Mean previous turnout t-1,2,3	−0.12***	0.50***	0.03	−0.53***	−0.27***	0.21***
	(0.03)	(0.05)	(0.05)	(0.06)	(0.02)	(0.02)
Election fixed effects	✓	✓	✓	✓	✓	✓
District fixed effects	✓	✓	✓	✓	✓	✓
Observations	2,446	1,841	2,446	1,841	2,446	1,841
R^2	0.94	0.96	0.86	0.92	0.74	0.93
Adjusted R^2	0.93	0.95	0.84	0.90	0.70	0.91
Residual Std. Error	0.03	0.02	0.04	0.03	0.02	0.01
F Statistic	113.92***	95.07***	46.94***	50.62***	21.75***	56.21***

Note: *p<0.05; **p<0.01; ***p<0.001

Figure A1: Position of weather stations (black crosses) and electoral districts (red crosses), 1949-2013.
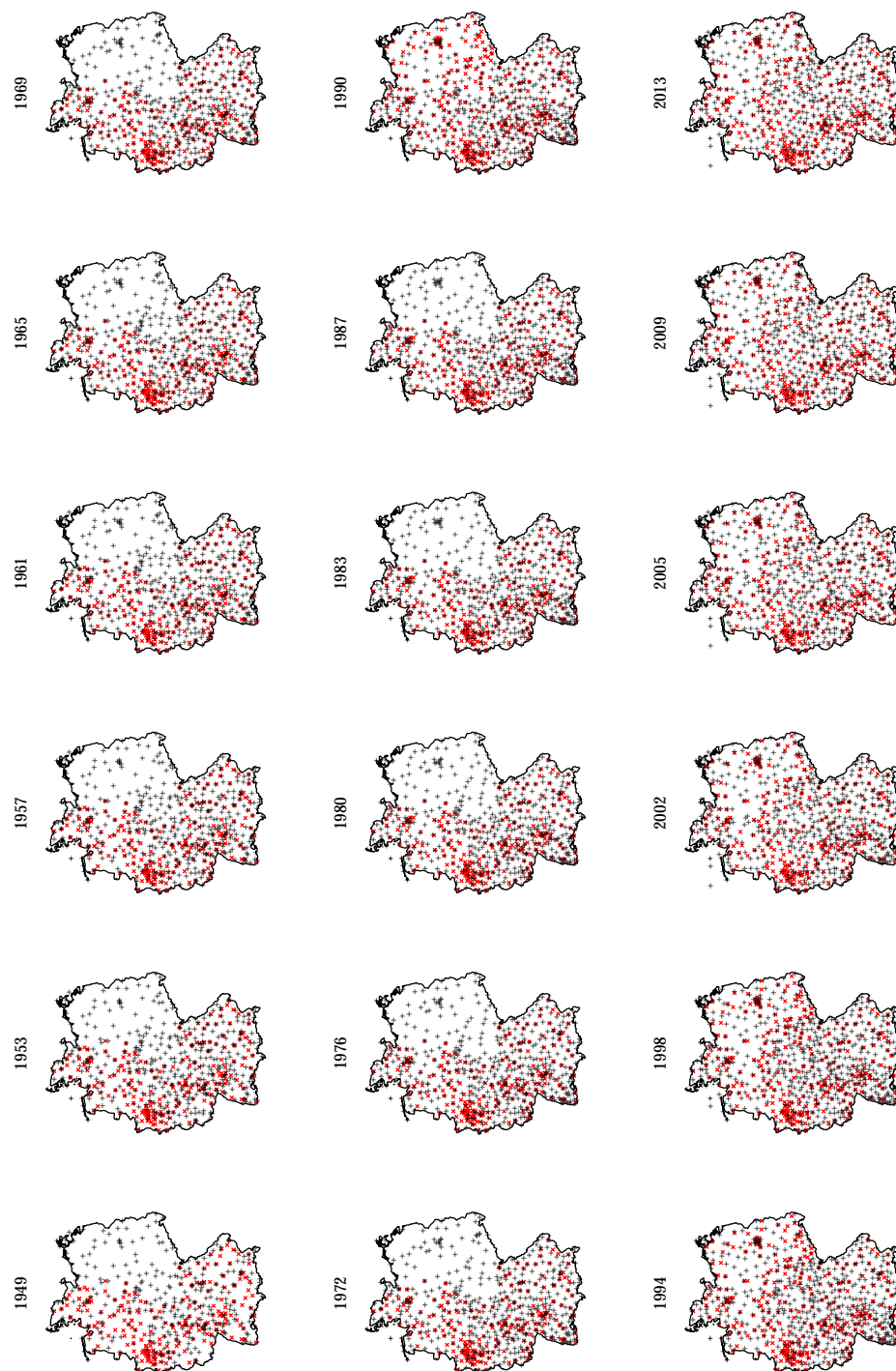
Figure A2: Inverse distance weighted weather interpolation results: deviation of temperature at election day from three day pre-election average, 1949-2013. Dark blue colors = below average, dark red colors = above average.
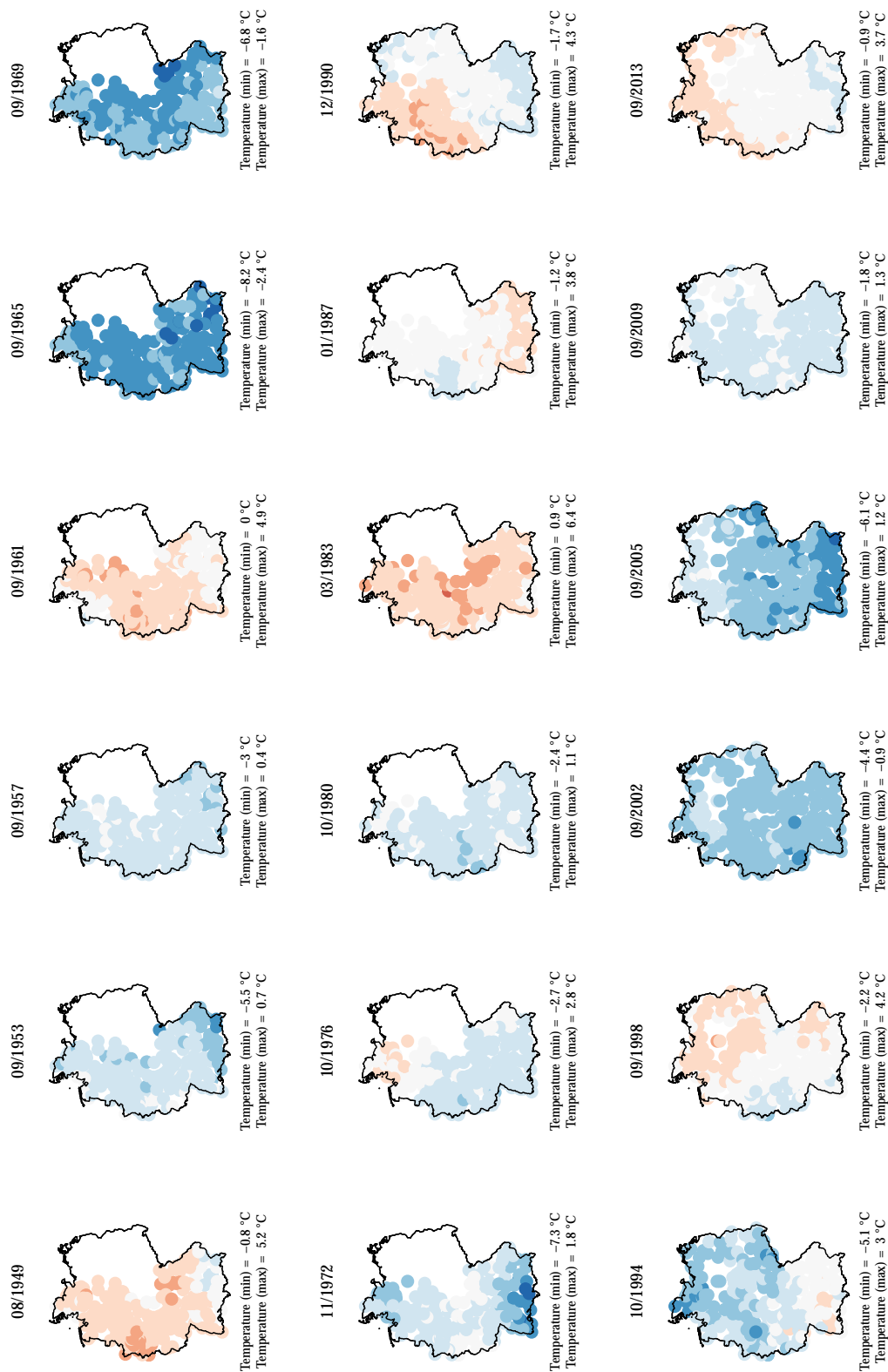
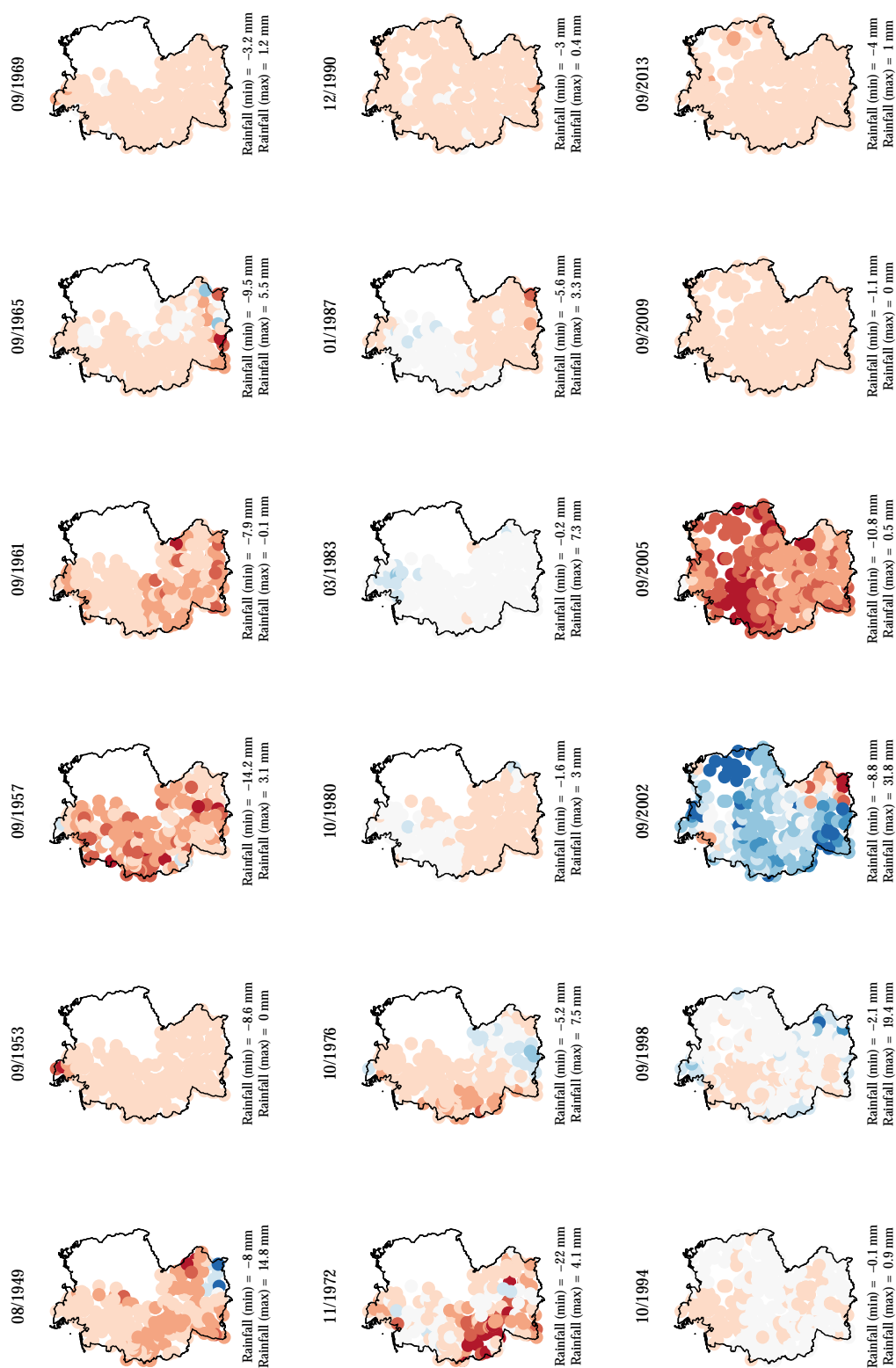Figure A3: Inverse distance weighted weather interpolation results: deviation of precipitation at election day from three day pre-election average, 1949-2013. Dark red colors = below average, dark blue colors = above average.

Figure A4: District-level turnout, 1949-2009. Dark green colors = high turnout, light green colors = low turnout.
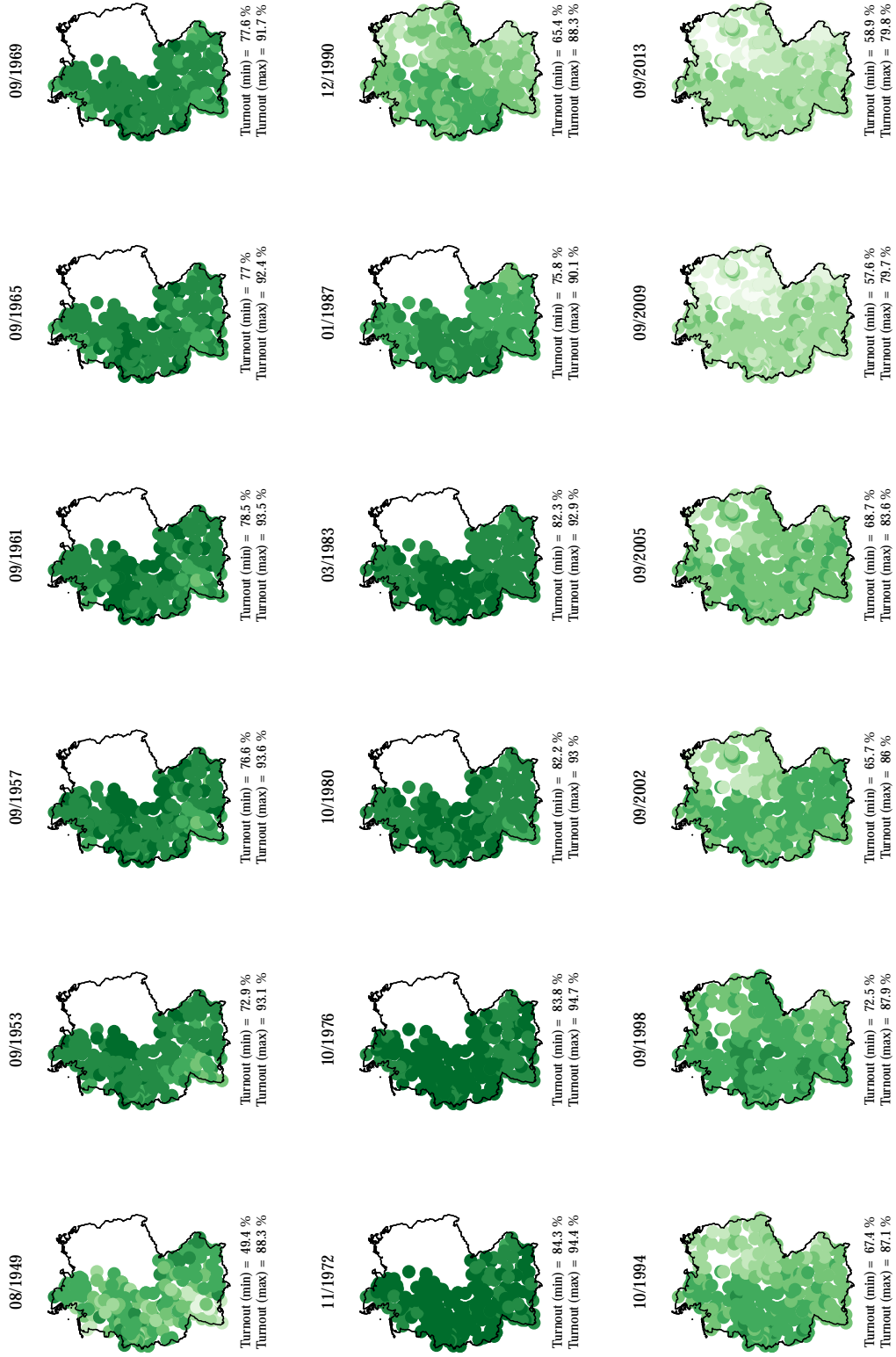
Figure A5: District-level second vote shares for SPD versus turnout
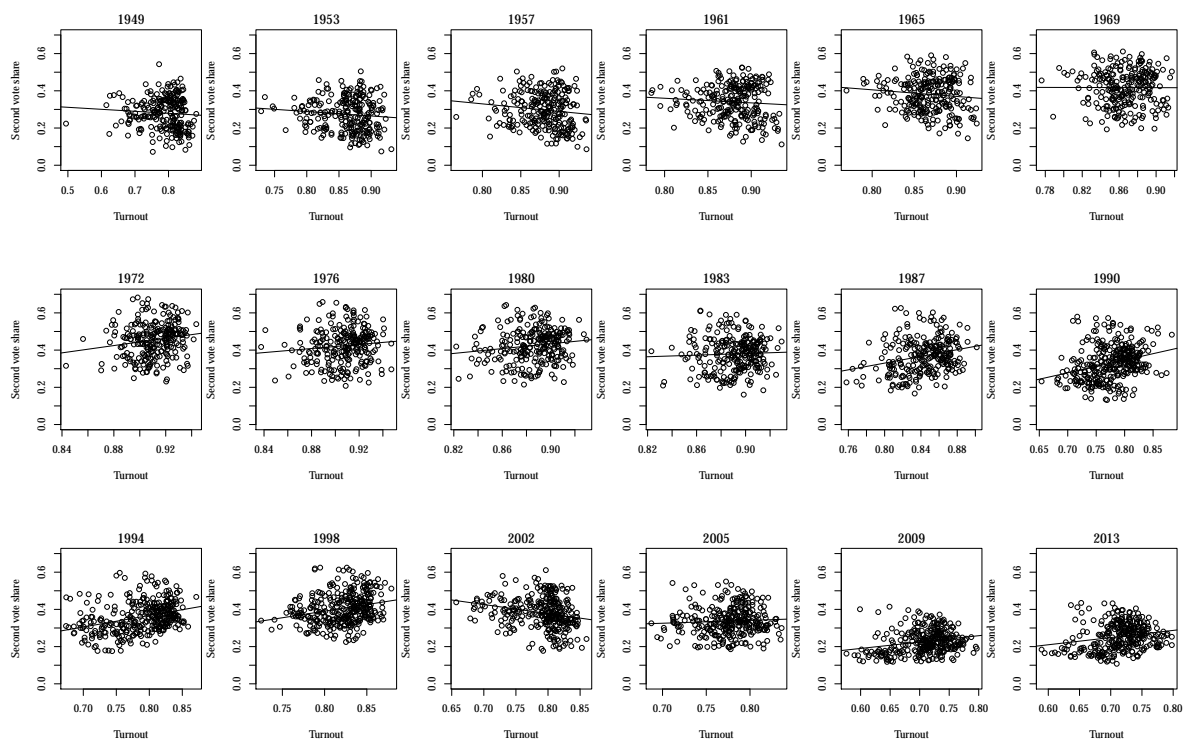
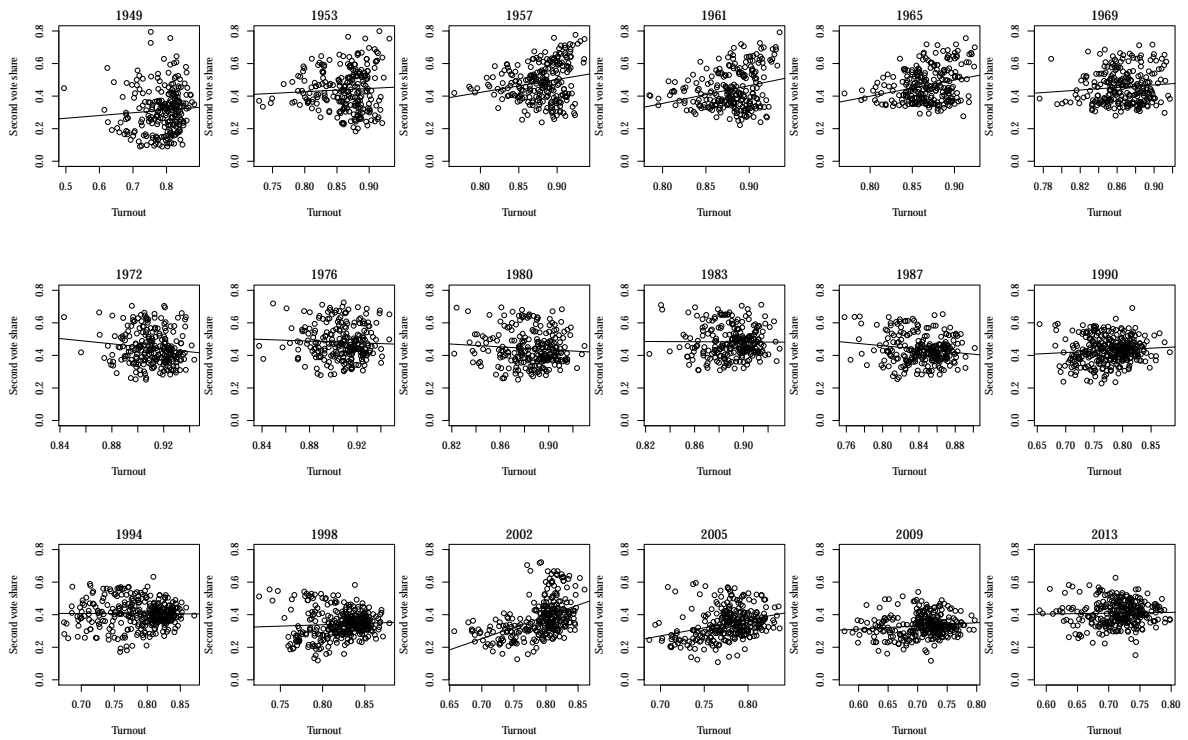Figure A6: District-level second vote shares for CDU/CSU versus turnout

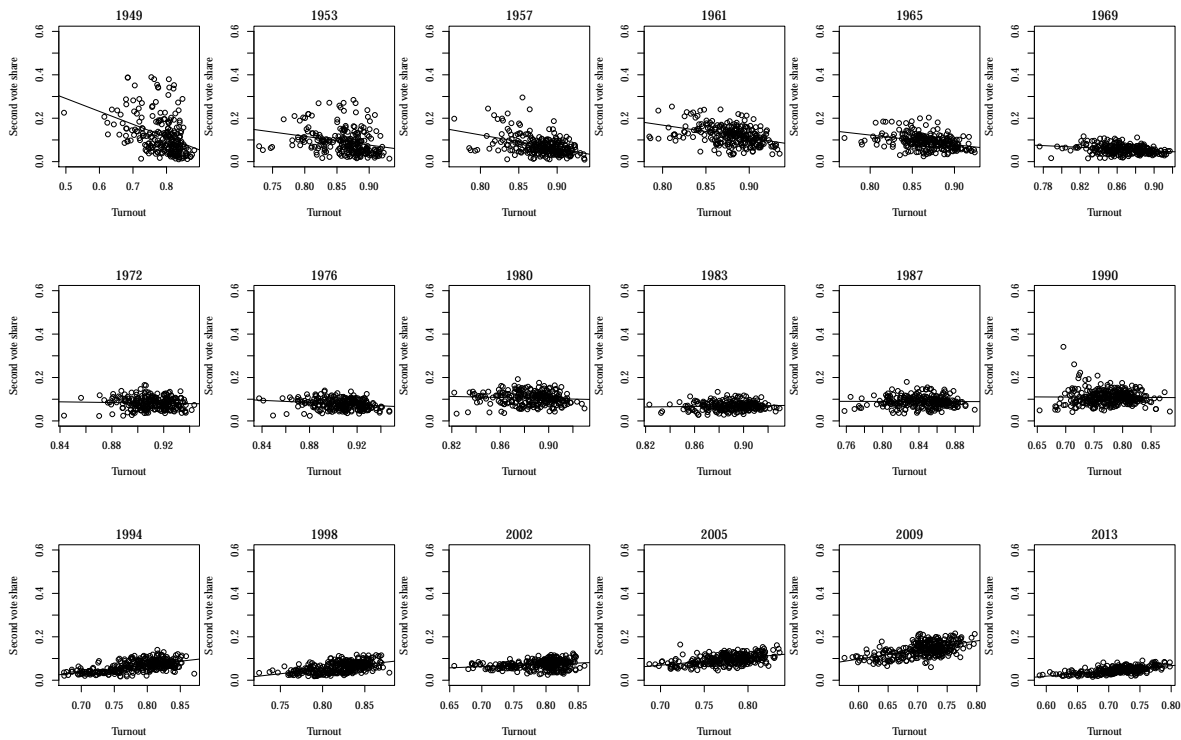Figure A7: District-level second vote shares for FDP versus turnout

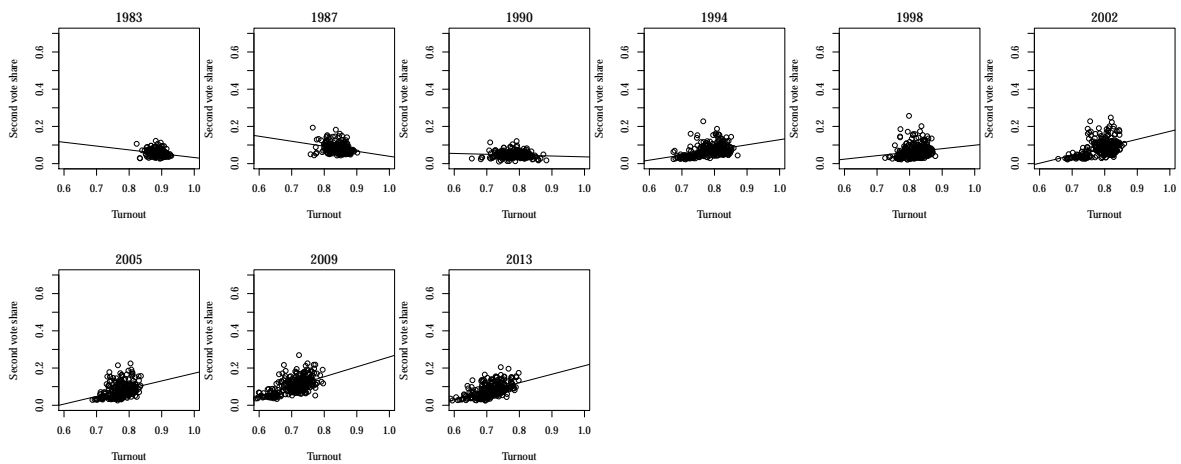Figure A8: District-level second vote shares for Bündnis 90/Die Grünen versus turnout

Figure A9: District-level second vote shares for Die Linke versus turnout
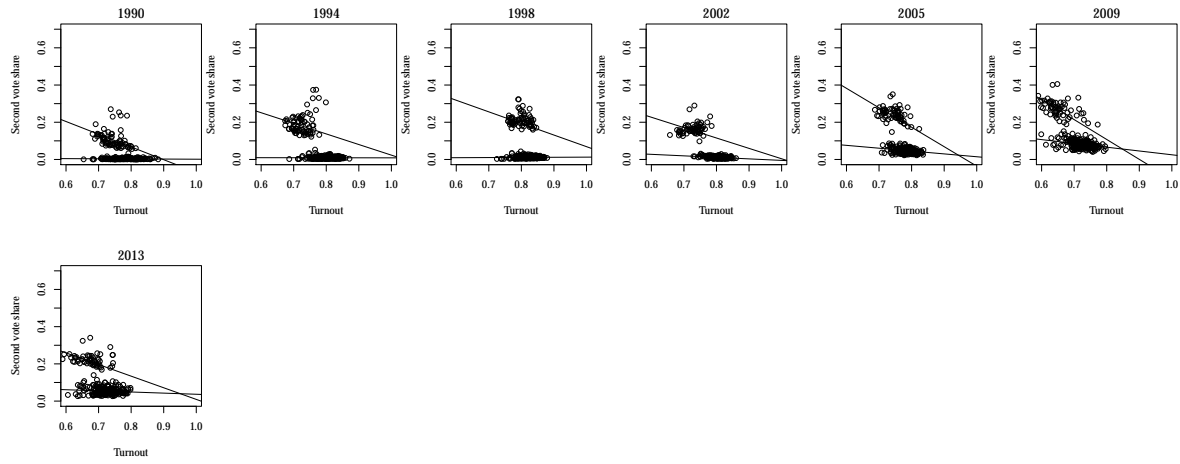

Figure A10: District-level second vote shares for other parties versus turnout