

Arnold, Felix

Working Paper

Turnout and closeness: Evidence from 60 years of Bavarian mayoral elections

DIW Discussion Papers, No. 1462

Provided in Cooperation with:

German Institute for Economic Research (DIW Berlin)

Suggested Citation: Arnold, Felix (2015) : Turnout and closeness: Evidence from 60 years of Bavarian mayoral elections, DIW Discussion Papers, No. 1462, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin

This Version is available at:

<https://hdl.handle.net/10419/108733>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

1462

Discussion
Papers

Turnout and Closeness

Evidence from 60 Years of Bavarian Mayoral Elections

Opinions expressed in this paper are those of the author(s) and do not necessarily reflect views of the institute.

IMPRESSUM

© DIW Berlin, 2015

DIW Berlin
German Institute for Economic Research
Mohrenstr. 58
10117 Berlin

Tel. +49 (30) 897 89-0
Fax +49 (30) 897 89-200
<http://www.diw.de>

ISSN electronic edition 1619-4535

Papers can be downloaded free of charge from the DIW Berlin website:
<http://www.diw.de/discussionpapers>

Discussion Papers of DIW Berlin are indexed in RePEc and SSRN:
<http://ideas.repec.org/s/diw/diwwpp.html>
<http://www.ssrn.com/link/DIW-Berlin-German-Inst-Econ-Res.html>

Turnout and Closeness:

Evidence From 60 Years Of Bavarian Mayoral Elections

Felix Arnold*

This Version: March 19, 2015

Abstract

One prediction of the calculus of voting is that electoral closeness positively affects turnout via a higher probability of one vote being decisive. I test this theory with data on all mayoral elections in the German state of Bavaria between 1946 and 2009. Importantly, I use constitutionally prescribed two-round elections to measure electoral closeness and thereby improve on existing work that mostly uses *ex-post* measures that are prone to endogeneity. The results suggest that electoral closeness matters: A one standard deviation increase in closeness increases turnout by 1.68 percentage points, which corresponds to $\frac{1}{6}$ of a standard deviation in this variable. I also evaluate how other factors like electorate size or rain on election day affect turnout differentially depending on the closeness of the race.

Keywords: Turnout, Closeness, Mayoral Elections,
Bavaria, Two-Round Ballot

JEL Classification: D72, H70

*DIW Berlin and FU Berlin

1 Introduction

The well-known calculus of voting ([Downs, 1957](#); [Riker and Ordeshook, 1968](#)) postulates that the probability of influencing the electoral outcome is an important determinant in the turnout decision. It predicts that electoral participation should increase in the closeness of the race. Put differently, when "more is at stake," people have an extra incentive to go to the polls.

However, it is not straightforward to measure electoral closeness in empirical applications. How do people know whether the election is competitive or not? Several approaches are used in the literature. Most existing studies rely on *ex-post* realized closeness and assume rational expectations of the voters. Apart from making a strong assumption, additional endogeneity concerns arise. If vote shares appear on the right hand side and turnout on the left hand side of the empirical model, the total number of votes cast appears on both sides of the equation. Turnout and *ex-post* closeness may, therefore, be spuriously correlated ([Cox, 1988](#)). As a consequence, other researchers employ *ex-ante* historic closeness measures from previous elections to avoid these issues. However, elections are not necessarily comparable across time, especially if the set of candidates changes. The longer the electoral period, the less useful is the information from a previous election. A third approach therefore relies on pre-election opinion polls to gauge voters' perception of electoral closeness. However, these data are typically only available for large-scale federal elections. It is unclear whether electoral closeness exists in this context at all, because even a razor-thin victory in a large electorate may translate into vote margins of tens of thousands of votes between winner and runner up.

In this paper, a different approach is used. I employ two-round elections to identify closeness effects. Mayoral elections in the German state of Bavaria provide an ideal institutional setting: According to the local constitution in Bavaria, if no mayoral candidate is able to get an absolute majority of the vote in the first round, a second (runoff) election is held two weeks later with the two leading candidates from the first round. Now, closeness of the first round

can be taken as a proxy for closeness of the second round. This measure, which I call *Revealed Closeness*, avoids the drawbacks of other commonly used measures in the literature. *Revealed Closeness* is predetermined and recent at the same time, whereas other *ex-ante* (*ex-post*) measures only fulfill the first (second) criterion. Another advantage of Bavarian mayoral elections lies in the small size of the electorate. Municipalities in Bavaria can have as few as 17 eligible voters. The largest city in the data still has fewer than 40,000 eligible voters. Thus, I can evaluate closeness effects in a setting where the probability of being the decisive voter is non-negligible, which is rarely the case in large-scale federal elections.

Using data on all mayoral elections in 2031 Bavarian municipalities between 1946 and 2009, I find that closeness does indeed matter for electoral participation: A one standard deviation increase in closeness increases turnout by 1.68 percentage points, which corresponds to $\frac{1}{6}$ of a standard deviation in this variable. Importantly, I show that *Revealed Closeness*, which makes use of two-round elections, yields approximately the same results as the common *ex-post* measures employed in the literature so far. Due to the panel structure of the data, I can also evaluate a historical *ex-ante* measure of closeness. I contribute to the literature by offering a first comparison of three differently calculated indicators (*ex-ante*, *ex-post*, two-round) for electoral closeness. Importantly, this comparison is conducted within one institutional framework.

Heterogeneous effects of other electoral stimuli, depending on closeness, are also identified. For example, rain on election day reduces turnout *on average*, but not if the election is close. Furthermore, the negative effect of constituency size on turnout is also mitigated by closeness. These findings suggest that electoral closeness works as an important mediator. Other determinants of turnout can thus be thought of as second rank – they matter only if the race is not close. Implications for election campaigns are in contrast to conventional wisdom: Usually, candidates running in several constituencies concentrate their mobilization efforts on close races. My findings suggest, however, that electoral stimuli work best in uncompetitive races and question whether they have an effect in close races at all.

The remainder of this paper is organized as follows: Section 2 shortly presents the theoretical background. Section 3 reviews the empirical literature on turnout and electoral closeness. The institutional setting of Bavarian mayoral elections and the data are described in Section 4. Section 5 holds descriptive statistics and introduces the empirical strategy. Results are presented in Section 6. Finally, Section 7 concludes.

2 Theoretical Considerations

Why should electoral closeness incite people to turn out to vote? The calculus of voting developed by [Downs \(1957\)](#) and [Riker and Ordeshook \(1968\)](#) contends that individuals compare the benefits and costs of voting in a rational choice manner.¹ Let the net benefit of voting be described by the following expression:

$$Y = \pi B + D - K \tag{1}$$

Three factors determine Y , the net benefit of voting: πB is the expected individual benefit of voting which depends on the outcome of the election. It is comprised of π , the probability that a single vote will be decisive, and B , the specific benefits that materialize if the preferred candidate wins and takes office. D is a payoff that realizes independent of the electoral outcome. It is often called the "civic duty" component of the calculus of voting. K are the (opportunity) costs of going to the polls.

An individual decides to cast a ballot if the benefits outweigh the costs of voting, i.e. if $Y > 0$. Where does electoral closeness affect the turnout decision? The answer is that individuals will have a different perception of the parameter π in close races. If one's preferred candidate wins (or loses) for sure, π is 0, and a single vote does not change that. As a consequence, πB reduces to zero and does not influence the turnout decision any more. However, if the race is close, one vote can be decisive and $\pi \in (0, 1]$. Vice versa,

¹For a summary of economic theories on voter turnout, see [Dhillon and Peralta \(2002\)](#).

abstaining could lead to a marginal loss of one’s preferred candidate.² Therefore, close races offer the possibility of discontinuously getting the additional benefit B , which motivates people to turn out to vote. Put differently, the potential pivotalness of a single vote increases in the closeness of the race. Let closeness be denoted by c . Then we have

$$\frac{\partial \pi}{\partial c} > 0. \tag{2}$$

As closeness positively impacts π , and π itself has a positive effect on the turnout decision, closeness and turnout are positively related. Thus,

$$Y = \pi(c)B + D - K \tag{3}$$

and

$$\frac{\partial Y}{\partial c} = \frac{\partial Y}{\partial \pi} \frac{\partial \pi}{\partial c} = B \frac{\partial \pi}{\partial c} > 0. \tag{4}$$

Ceteris paribus, electoral closeness increases turnout by affecting the probability of a single vote being pivotal.

3 Empirical Literature

The interplay of closeness and turnout is a longstanding subject of debate in economics and political science.³ The empirical focus is mostly on higher

²Some argue that even in close elections, the probability of being pivotal is essentially zero. As [Schwartz \(1987\)](#) put it, "saying that closeness increases the probability of being pivotal [...] is like saying that tall men are more likely than short men to bump their heads on the moon." I provide two answers to this objection. First, constituency size can be *extremely* small in Bavarian mayoral elections. Some municipalities have no more than 20 eligible voters. While closeness may play no role in state-wide ballots, it can make a difference in small Bavarian municipalities. Second, there is ample evidence that individuals have difficulties in handling small probabilities and hence overestimate the likelihood of their vote being decisive ([Fehr-Duda and Epper, 2012](#); [Kahneman and Tversky, 1979](#)). Closeness thus increases turnout depending on the *perceived* probability of being pivotal, not the *actual* probability of being pivotal.

³A specific branch of the literature deals with the partisan effects of voter turnout. [Hansford and Gomez \(2010\)](#) use election day rain as an instrument for turnout and find that higher turnout helps the Democrats in US presidential elections. In a similar fashion, [Gomez, Hansford, and Krause \(2007\)](#) estimate that one inch of rain reduces turnout in a

level elections. [Endersby, Galatas, and Rackaway \(2002\)](#) find that closeness positively impacts turnout in the 1993 / 1997 Canadian federal elections, controlling for campaign expenditures. The same effect is established for the 1982 US House election by [Cox and Munger \(1989\)](#). [Shachar and Nalebuff \(1999\)](#) develop a structural model to evaluate feedback effects between closeness, turnout and mobilization efforts of political leaders. They estimate that a one percent increase in electoral closeness increases turnout by 0.34 percent. In Germany, a small positive closeness effect is found for the federal elections from 1983 to 1994 ([Kirchgässner and Zu Himmern, 1997](#)). However, the robustness of the effect seems to be confined to West Germany. [Grofman, Collet, and Griffin \(1998\)](#) argue that in US Senate and House elections turnout is not maximized at maximal closeness (i.e. the 50-50 split of the vote), but at a Republican share greater than 50 percent. According to the authors, this happens because Republican partisans are generally more likely to vote. For Swiss referendums between 1981 and 1999, mobilization effort is a better predictor of turnout than expected closeness ([Kirchgässner and Schulz, 2005](#)). All these studies use an *ex-post* measure of electoral closeness. For a review and meta-analysis of all empirical studies explaining voter turnout, see [Geys \(2006\)](#).

A more direct test of the people’s reaction to the parameter π in the calculus of voting is provided by [Tukiainen and Lyytikäinen \(2013\)](#). Using exogenous variation in pivotal probabilities that occur at population thresholds where council size changes discontinuously, the authors show that turnout is higher just above the thresholds where the probability of being pivotal increases and conclude that “voters are rational.” [Andersen, Fiva, and Natvik \(2014\)](#) find that in Norway, people are more likely to vote when more is at stake in the election. Due to topography-determined exogenous hydropower income of some municipalities, they can evaluate how people respond to changes in the size of the parameter B in the calculus of voting. According to their

county by roughly 0.8 percent. Related, one inch above normal rain gives the Republican candidate an extra 2.5 percent of the vote. For Germany, [Arnold and Freier \(2015\)](#) find that social democrats profit from higher turnout levels. Conservatives, on the contrary, seem to suffer under higher electoral participation.

estimates, a change in hydropower income from minimum to maximum increases turnout by six percentage points. [Fraga and Hersh \(2010\)](#) provide a first estimate of the interaction between closeness and inclement weather on election day using county data for US Presidential elections. In the calculus of voting, rain works as an exogenously imposed cost on the act of voting, that is, it is equivalent to an increase in the parameter K . They find that rain negatively impacts turnout on average, but this effect is mitigated in close elections. Closeness is calculated both with an *ex-ante* as well as an *ex-post* measure.

There is a small and recent literature that also uses two-round elections to identify closeness effects ([De Paola and Scoppa, 2014](#); [Fauvelle-Aymar and François, 2006](#); [Garmann, 2014](#); [Indridason, 2008](#); [Simonovits, 2012](#)).⁴ I contribute to this literature and extend it by offering two innovations: First, the long panel data allow to credibly evaluate measures of lagged closeness and provide sufficient variation to include electorate fixed effects into the model. Second, the use of precipitation data is still quite rare in turnout applications. I offer a first estimate of the interaction effect between electoral closeness and inclement weather on election day for an election outside the United States.⁵

⁴Two-round elections are also used to measure so-called bandwagon effects ([Ade and Freier, 2013](#); [Kiss and Simonovits, 2014](#)) or to study the formation of electoral pacts ([Blais and Indridason, 2007](#)).

⁵The data on Bavarian mayoral elections employed in this paper have been used beforehand. [Freier \(2011\)](#) estimates party incumbency effects in the order of 38-40 percentage points in the probability of winning the next mayoral election. In a related paper, [Freier and Thomasius \(2012\)](#) find that more qualified candidates receive higher vote shares. Furthermore, social-democratic mayors seem to reduce local taxes, while conservative mayors increase taxes ([Freier and Odendahl, 2012](#)). [Schild \(2013\)](#) asks whether female mayors allocate municipal budgets to different categories than their male counterparts and finds no significant differences. All these studies rely on Regression Discontinuity Designs (RDD) to estimate causal effects. On the validity of RDD in electoral contexts, see [Eggers, Fowler, Hainmueller, Hall, and Snyder \(2015\)](#), who also use the data on Bavarian mayoral elections.

4 Institutional Setting and Data

Bavaria is Germany's largest state by area and has about 12.6 million inhabitants (as of June 2014). The governing structure is organized into several administrative layers: In total, there are 2056 municipalities (including 25 county-free cities), 96 counties, and 7 administrative regions. Hence, municipalities constitute the smallest organizational unit of government. They are governed by a mayor (executive branch) and a town council (legislative branch). The mayor is also a full member of the town council and serves as its president. Once elected, the mayor is the highest representative of the municipality and executes decisions taken by the council. Larger municipalities have full-time mayors that are employed as public servants. Smaller municipalities (with less than 5000 inhabitants) often have honorary mayors.⁶

Since the end of World War II, each Bavarian municipality directly elects its mayor. Each citizen above the age of 18 is allowed to vote. Running as a candidate is possible from age 21 onwards. To win the election in the first round, an absolute majority of votes is necessary. If no candidate is able to gather more than 50 percent of the votes, then a runoff election is held two weeks after the first election. The two leading candidates from the first round advance to the second round. Whoever gathers a majority of votes in the runoff election is the newly elected mayor. A mayoral term lasts six years.⁷ Around 85 percent of the elections are held in March or the beginning of April. The remaining 15 percent are distributed relatively evenly over the year.⁸

I have data on all Bavarian mayoral elections between 1946 and 2009. With 27015 observations in total and 2031 municipalities,⁹ this makes about 13

⁶More detailed information on tasks and status of the mayor can be found in the Bavarian municipal code (*Gemeindeordnung, GO*), articles 34-39, accessible via www.gesetze-bayern.de.

⁷The detailed electoral rules are laid down in the Bavarian electoral law for municipalities and counties (*Gemeinde- und Landkreiswahlgesetz, GLKrWG*), articles 39-52, accessible via www.gesetze-bayern.de.

⁸The "official" election date is in March. However, if an incumbent resigns or retires before the end of the electoral period, early elections can be called.

⁹Mayoral election results for the 25 county-free cities are missing.

elections per municipality on average. The data are from the state statistical office and include a variety of information. For example, I know all candidates' names, gender, profession and party affiliation. Furthermore, information on the exact election day, the number of eligible voters, the number of voters who turned out and individual candidate vote shares are available. I also know the status of the mayor (full-time vs. honorary) and whether a runoff election was held or not.

I combine these mayoral election data with precipitation data from 559 weather stations in Bavaria. These daily time series data are recorded and published by the German Weather Service (*Deutscher Wetterdienst, DWD*). As I know geographic locations of municipalities and weather stations as well as the exact election dates, I can tell exactly how much it rained on election day in a given municipality (which is assigned to the nearest weather station). Figure 1 in the appendix shows a map of Bavaria with all weather stations marked by blue dots.

5 Descriptives and Empirical Strategy

Before looking at the data, one note of caution is in order. To this day, the literature has not yet agreed on one commonly used measure of electoral closeness.¹⁰ Most authors use variations of vote margins between winner and runner-up.¹¹ The disadvantage of this measure is its interpretability. When vote margins are introduced as closeness proxy in a regression framework, signs are reversed. Higher closeness is equivalent to *smaller* vote margins and vice versa. To ease readability, I use a variation of the vote margin as

¹⁰See Endersby, Galatas, and Rackaway (2002) for development of a competitiveness index and a comparison of different closeness indicators in Canadian federal elections. See Kayser and Lindstaedt (2015) for a cross-nationally applicable measure of electoral competitiveness.

¹¹In a methodological note, Cox (1988) warns that vote margins – when introduced as explanatory variables in a regression framework – are spuriously correlated with the dependent variable turnout. He suggests to use raw vote margins instead. Note that his criticism does not apply to my approach, because I use vote margins from the first round and turnout from the second round. My closeness measure is thus predetermined and not endogenous to turnout.

an indicator for closeness:

$$Closeness = 1 - (vs_1 - vs_2) \tag{5}$$

where vs_i is the vote share of the candidate finishing i^{th} place. With this definition, the closeness variable is bounded between 0 and 1 and has a positive sign. A value of 1 indicates maximum closeness: There is a tie for first and second place. A value of 0, on the contrary, signals that the election was not close at all. Either the first place candidate was able to garner all the votes, or there was simply no contender.

Descriptive statistics of all variables used in the analysis can be found in Tables 2, 3 and 4 in the appendix. I distinguish between three different types of elections: Table 2 contains information on "uncontested elections," i.e. elections with low competition where one candidate is able to gather more than 50 percent of the vote in the first round. Most elections are uncontested. Table 3 holds the same statistics for "contested elections." These are first round elections where no single candidate is able to receive an absolute majority of votes. Finally, Table 4 shows descriptive statistics for runoff elections. These elections automatically follow contested elections and only the two leading candidates from the first round are allowed to run in the second round.

Several differences emerge between the different samples. Turnout is lower in runoff elections, indicating voter fatigue and dissatisfaction when one's preferred candidate does not reach the second round. Nevertheless, the overall turnout levels – at about 80 percent – are quite high compared to state or federal elections. Closeness is highest in contested elections and lowest in uncontested elections, as one would expect. The distributions of turnout and closeness in the three different samples are visualized in Figure 2 in the appendix. Elections are more likely to be contested when electorate size is larger and when more candidates decide to run. Surprisingly, elections for honorary mayor positions are contested more often than the ones for full-time mayor positions. The maximum number of eligible voters is 38461 and hence

quite small. This reflects the fact that mayoral elections in the 25 county-free cities, which constitute the largest cities, are not recorded in the dataset. Females are more likely to run in contested elections, although their overall share of the candidate pool is never larger than 15 percent. The well-known lack of women in politics (Ferreira and Gyourko, 2014; Lawless and Pearson, 2008) is strikingly visible in Bavarian mayoral elections.¹²

Given that weather is essentially random, it is not surprising that the rain variables do not show substantial differences in the various subsamples. In Table 2, rain on election day amounts to 1.9 millimeters on average. However, this includes all election days with no rain at all, which constitute almost 60 percent of the sample. Conditional on some rain at all, average rainfall on election day rises to $\frac{1.868}{0.585} = 3.193$ millimeters.¹³ The quality and accuracy of the weather data are captured by the distance to the nearest weather station. As the grid of weather stations is quite dense in Bavaria (see Figure 1), there is no municipality located further away than 14 kilometers from the next station. Average distance is below 5 kilometers.¹⁴

Due to the panel structure of the data and the special institutional setting where some (but not all) elections have a second (runoff) round, I can evaluate three different measures of closeness and compare them:

Lagged Closeness takes closeness from the preceding regular election as the crucial measure. As this is lagged by six years or one electoral period, it is known to the voters on election day (it is *ex-ante*). However, it contains information on an election with possibly completely different circumstances / political constellations than the current election.

¹²Related, Freier and Thomasius (2012) find that female candidates in Bavaria suffer an electoral disadvantage of roughly five percent in vote share.

¹³As most elections take place in (relatively) rainy March, the variation in rain across time and space is quite high.

¹⁴Note that the number of observations is somewhat smaller for the rain variables. This is due to the fact that some weather stations were inaugurated only later in the sample period. In principle, I could match uncovered early elections to weather stations further away and retain all observations. However, this comes at the cost of bringing more noise into the weather variables. Given that precipitation (and especially rain showers) can be quite local, I decided against the matching over longer distances.

Actual Closeness takes on the value of the *ex-post* realized closeness of the current election. As this is generally unknown on election day, one has to assume rational expectations of the voters if this measure is supposed to influence their decision to turn out or not.

Revealed Closeness makes use of two-round elections. Closeness of the first round is taken as a signal for competitiveness of the second round two weeks later. This measure is superior to the two previous ones: It is recent (contrary to *Lagged Closeness*) and predetermined (contrary to *Actual Closeness*) at the same time.

The basic empirical model looks as follows:

$$T_{it} = \alpha + \beta C_{it} + X_{it}'\omega + \theta_i + \epsilon_{it}. \quad (6)$$

The dependent variable T_{it} is turnout in municipality i at date t . I define turnout as the number of voters that go to the polls divided by the number of eligible voters. C_{it} is the closeness of the election, according to the three different concepts introduced above and calculated as in Equation 5. For actual and lagged closeness, I use the sample of uncontested elections. To evaluate the effect of revealed closeness on turnout, I use the sample of runoff elections and add closeness from contested elections two weeks prior. The vector of control variables X includes a third order time trend, a third order polynomial in the number of eligible voters, a dummy for concurrent elections, dummies for female candidates and honorary mayor positions as well as the lagged dependent variable (to account for "usual" levels of electoral participation). I also add dummies for the number of candidates. Fixed effects for each municipality i are included in θ_i , where $i = 1, 2, \dots, 2031$. Standard errors are robust to heteroscedasticity.

6 Results

6.1 Main Results

Table 1 shows regressions of turnout on the three different measures of electoral closeness.

Column (1) holds the results for *Lagged Closeness* using the sample of uncontested elections. One can see that lagged closeness exerts a small *negative* impact on turnout, which is unexpected and stands in contrast to the theoretical considerations introduced above. I argue, however, that this measure is confounded with incumbency effects that materialize over time. Assume that the last election was very close (i.e. a high value of *Lagged Closeness*). It is quite likely that this last election was a hard-fought race for an open seat. Then one of the candidates won and took office. In the current election, he is the incumbent and profits from substantial incumbency advantages, as shown in Freier (2011). Therefore, the race is not close and people abstain from voting. Thus, a high value of *Lagged Closeness* is associated with low levels of turnout today due to incumbency effects that materialize between the two elections. In a setting like Bavaria, where incumbency effects are important in magnitude,¹⁵ measures like *Lagged Closeness* are of limited value.

Column (2) presents results for *Actual Closeness*. Here, the coefficient is in line with theoretical expectations. If closeness switches from 0 to 1 (i.e. from minimum to maximum), turnout increases by 5.3 percentage points. Another way to look at the coefficient is the following: A one standard deviation increase in *Actual Closeness* (0.325) leads to a turnout rate that is $0.053 \cdot 0.325 \approx 1.72$ percentage points higher, which roughly corresponds to a $\frac{1}{5}$ standard deviation increase in this variable.

Finally, column (3) shows results for the measure of *Revealed Closeness*, which makes use of two-round elections. Also here, the coefficient of interest is positive and significant, as anticipated. It is also four to five times as

¹⁵Freier (2011) estimates that incumbency status increases the probability of winning the next election by 38-40 percentage points.

Table 1: Main Results

	(1)	(2)	(3)
	Turnout	Turnout	Turnout
Sample	<i>Uncontested Elections</i>	<i>Runoff Elections</i>	
Lagged Closeness	-0.012*** (0.001)		
Actual Closeness		0.053*** (0.002)	
Revealed Closeness			0.234*** (0.020)
Turnout in Preceding Election	0.213*** (0.011)	0.188*** (0.010)	0.865*** (0.042)
Concurrent Election	0.067*** (0.006)	0.066*** (0.007)	0.071*** (0.024)
Female Candidate(s)	-0.000 (0.002)	-0.000 (0.002)	0.001 (0.005)
Honorary Mayor	0.002 (0.002)	0.003 (0.002)	0.004 (0.005)
Two Candidates	0.057*** (0.001)	0.025*** (0.002)	
Three Candidates	0.067*** (0.002)	0.036*** (0.002)	0.004 (0.009)
Four Candidates	0.071*** (0.004)	0.040*** (0.004)	-0.001 (0.010)
Five Candidates	0.065*** (0.008)	0.034*** (0.008)	-0.014 (0.010)
Six Candidates	0.083*** (0.011)	0.052*** (0.010)	0.001 (0.012)
Seven Candidates	0.103*** (0.011)	0.073*** (0.008)	0.007 (0.012)
Constant	0.690*** (0.011)	0.701*** (0.010)	-0.147*** (0.045)
Municipal Fixed Effects	yes	yes	yes
Third Order Electorate Size Polynomial	yes	yes	yes
Third Order Time Trend	yes	yes	yes
N	20582	20582	1859
R ²	0.64	0.65	0.83

Notes: Standard errors robust to heteroscedasticity. Significance Levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The data cover all mayoral elections in 2031 Bavarian municipalities from 1946-2009.

large as in column (2). However, one has to keep in mind that *Revealed Closeness* only varies between 0.5 and 1, because it is calculated from the

contested election two weeks prior where no single candidate was able to garner more than 50 percent of the vote. Putting the size of the coefficient into perspective, a one standard deviation increase in *Revealed Closeness* (0.072) leads to a turnout rate that is $0.234 \cdot 0.072 \approx 1.68$ percentage points higher. This corresponds to roughly $\frac{1}{6}$ of a standard deviation in this variable.

Figure 3 in the appendix shows the slope coefficients of lagged, actual and revealed closeness in the turnout equation and thereby visualizes the findings from Table 1.

The coefficients of the control variables also merit a short discussion. Turnout in the preceding election has a large and significant impact on current turnout in all three specifications. Given that the preceding election happened six years ago in columns (1) and (2), it is not surprising that the coefficient is much larger in column (3), where the preceding election was much more recent, namely two weeks ago. If another election (federal, state or European level) is held on the same day as the mayoral election, turnout is approximately seven percentage points higher, as captured by the dummy variable *Concurrent Election*. Statistically, it does not seem to make a difference for electoral participation whether female candidates run for office or not. The same holds true for the status of the mayor: Races for honorary and full-time positions show turnout rates that are not statistically different from each other.¹⁶

The dummies for the number of candidates show the expected signs. More candidates lead to higher turnout rates, *ceteris paribus*. As discussed in the theory section, this effect can be due to higher aggregate mobilization efforts or to a higher likelihood of finding a candidate on the ballot sheet that is close to one's own political views. In runoff elections (column (3)), only two candidates remain. The number of candidates in the first round does not seem to have an impact on turnout levels in the second round.

¹⁶As mayor status depends on municipal size and I already control for the number of eligible voters, this finding is not too surprising.

All models include fixed effects for each municipality, a third order polynomial to control for electorate size and a third order time trend to capture structural developments in turnout rates over time. The coefficients are not reported in detail, but some remarks are in order.

Turnout and electorate size are negatively related.¹⁷ In line with theory, turnout is lower in larger municipalities where the probability of being pivotal is close to zero. Figure 4 in the appendix graphically shows the negative slope. Furthermore, turnout rates are trending downwards over time.¹⁸ This trend – visualized in Figure 5 in the appendix – is consistent with evidence from other developed democracies like the US (see for example [Gentzkow \(2006\)](#)). Interestingly, electoral closeness seems to have increased over time, at least in uncontested elections. This finding is lacking a theoretical explanation so far. The R^2 of the regressions is quite high and lies between 0.64-0.83, highlighting the large explanatory power of the right hand side variables.¹⁹

6.2 Heterogeneous Effects

It is worthwhile to take a closer look at other variables that affect the costs and benefits of voting. I have already shown that electorate size negatively affects turnout by reducing the probability of one vote being decisive, i.e. by reducing π in the calculus of voting. Rain on election day is a factor that increases the costs of voting ($K \uparrow$) and should therefore negatively influence turnout. In what follows, I test if voters react differently to larger electorate sizes or rain on election day when the race is closer.

I therefore estimate the following interaction specification

$$T_{it} = \alpha + \beta C_{it} + \gamma V_{it} + \delta R_{it} + \rho C_{it} V_{it} + \psi C_{it} R_{it} + X'_{it} \omega + \theta_i + \epsilon_{it} \quad (7)$$

¹⁷To be more specific, the coefficient of the linear term of *Voters* is negative, the square is positive and the cube is again negative.

¹⁸Also here, the linear term of the *Year* variable is negative, the square is positive, and the cube is again negative.

¹⁹Dropping the lagged dependent variable decreases the R^2 by 10-15 percent, depending on the specification.

where V_{it} is the number of eligible voters, R_{it} is rain in millimeters and ρ and ψ are coefficients of interaction effects of these two variables with the closeness variable. All other variables and parameters are described in Equation 6 and all controls from the baseline regression are included.

Table 5 in the appendix holds the results. In columns (1) - (3), I interact the three closeness measures with the number of eligible voters in the municipality. Columns (4) - (6) show analogous results when closeness is interacted with the amount of rain on election day (measured in millimeters). The interacted variables are always included linearly, too.

As evident from columns (2) and (3) in Table 5, constituency size (as measured by the variable *Voters*) has a negative impact on turnout, but this effect is mitigated in close elections, as shown by the positive sign of the interaction term. This holds for the measures of actual and revealed closeness, whereas the coefficient of *Lagged Closeness* again has the opposite sign. The regressions with the rain variables in columns (4) - (6) also reveal some interesting insights. First, rain on election day reduces turnout, albeit at a small scale.²⁰ The coefficient in column (5) implies that 10 millimeters of rain reduce turnout by one percentage point.²¹²² However, given the maximum amount of precipitation recorded on election day (84.3 millimeters), it becomes clear that weather can be a non-negligible factor. Importantly, I control for location-specific general precipitation patterns by including the average amount of rain that usually falls on election day in a municipality into the model. Rain levels above (or below) that level cannot be anticipated by the voters and hence act as a random cost (benefit) on the act of voting.

²⁰Election days with no rain at all also have lower turnout levels, as can be seen by the negative coefficient of the *No Rain* dummy. This puzzling result could be due to an omitted variable: If days with no rain at all are especially sunny and warm, opportunity costs of voting might again go up because people want to make use of the good weather. Although data on temperatures and hours of sunshine are available, the grid of weather stations recording these data is much looser than the grid recording the precipitation data. In order to prevent the inclusion of noisy data, I focus on the rain variables.

²¹This effect is of similar magnitude as the effects reported by [Arnold and Freier \(2015\)](#) for municipal and state elections in the German state of North-Rhine Westphalia.

²²I also experimented with a quadratic specification of the rain variable, but the square term never reached conventional levels of statistical significance.

Again, the negative effect of rain is mitigated when closeness is higher, as indicated by the positive signs of the interaction terms in columns (5) and (6).

These results suggest that the competitive context of an election plays an important role. On rainy days, people vote less *on average*, but not if the race is close. Larger electorates have lower turnout rates in uncompetitive environments, but the number of voters does not matter as much when some candidates have equal chances of winning. My findings show that electoral closeness is an important mediator when it comes to the functioning of electoral stimuli. Figure 6 in the appendix shows the different slope coefficients of electorate size and rain in uncompetitive vs. competitive environments and thereby visualizes the findings from Table 5.

6.3 Robustness

Until now, all models have been estimated with municipal-level fixed effects. Hence, the closeness effects were largely identified from the within variation in the data. The results remain entirely robust without the municipal fixed effects. Including county or administrative region fixed effects does not change the qualitative or quantitative results either. Furthermore, I clustered the standard errors at these higher levels. The statistical significance of the findings was never affected (all results available upon request).

6.4 Attenuation Bias and IV Strategy

Using *Revealed Closeness* addresses the endogeneity issues that would otherwise arise when relying on *Actual Closeness* only. Garmann (2014), however, argues that also first-round competition measures voters' expectation of electoral closeness only with an error, thereby creating an errors-in-variables problem. To get rid of potential remaining attenuation bias, he suggests to use an IV strategy where closeness of the second round is instrumented with closeness from the first round. As a further robustness check, I provide such estimates in Table 6 in the appendix. *Revealed Closeness* is a strong predictor

of *Actual Closeness*. An F-Statistic of more than 100 indicates that the instrument is highly relevant. The effect of instrumented closeness on turnout is consistent with the main findings in Table 1, albeit being somewhat larger.

7 Discussion

In this paper, I examine whether turnout is higher in close elections. Using an *ex-ante*, an *ex-post* and a two-round measure of electoral closeness, I find that closeness does indeed matter: If the election is very competitive, people go to the polls at a higher rate. This is a surprising result, given the *actual* probability of influencing the outcome with one's own vote: In all 27015 Bavarian mayoral elections between 1946 and 2009, there are only 33 cases where one vote would have changed the outcome. This corresponds to a probability of being pivotal in the order of $\frac{33}{27015} = 0.0012 \approx 0.12$ percent. A tentative explanation for the positive closeness effect is that voters' turnout decision is based on the *perceived* probability of being pivotal, not the *actual* probability. Likewise, one could interpret voting in relatively close elections as a type of insurance against the worst case: Even though the probability of being pivotal is close to zero, voters want to avoid the trouble of not having voted and realizing that their vote would have changed the outcome after all.

Furthermore, I provide evidence that other electoral stimuli, like electorate size and rain showers on election day, affect turnout differently depending on the competitive context of the election. In this sense, closeness works as a mediator, making other costs of voting less important in the turnout decision. Implications for campaigners and candidates are straightforward: If rain impacts turnout only conditional on (non-)closeness, it is quite likely that other classic mobilization tactics like get-out-to-vote campaigns or advertisements work better or worse depending on the closeness of the race. If the competitive context is "first order," election campaigns should take this into account.

My results also have implications for the literature on electoral closeness. First, I show that the two measures *ex-post Actual Closeness* and *ex-ante*

Revealed Closeness display comparable effects on turnout. Therefore, the many studies relying only on ex-post *Actual Closeness* – due to data limitations and lack of two-round elections – do not make a mistake. However, the results also show that historical measures of closeness dating back to a previous election (*Lagged Closeness*) are potentially confounded with incumbency effects and therefore biased. Of course, this interpretation of the findings is based on the assumption that *Revealed Closeness* identifies the true effect of electoral closeness on turnout.

Appendix

Table 2: Summary statistics: Uncontested Elections

Variable	Mean	Std. Dev.	Min.	Max.	N
Turnout	0.813	0.091	0.222	1	22813
Closeness	0.394	0.325	0	1	22813
Voters	2086.371	2639.56	17	38461	22813
Number of Candidates	1.632	0.756	1	7	22813
Concurrent Election	0.009	0.095	0	1	22813
Female Candidate(s)	0.037	0.189	0	1	22813
Honorary Mayor	0.262	0.44	0	1	21079
No Rain	0.585	0.493	0	1	18791
Rain in mm	1.868	4.128	0	84.3	18791
Day Station Average Rain in mm	2.254	1.021	0.1	11.743	18791
Distance to Nearest Weather Station in km	4.835	2.324	0.025	13.899	22813
Altitude in m	464.891	170.589	107	1832	18791

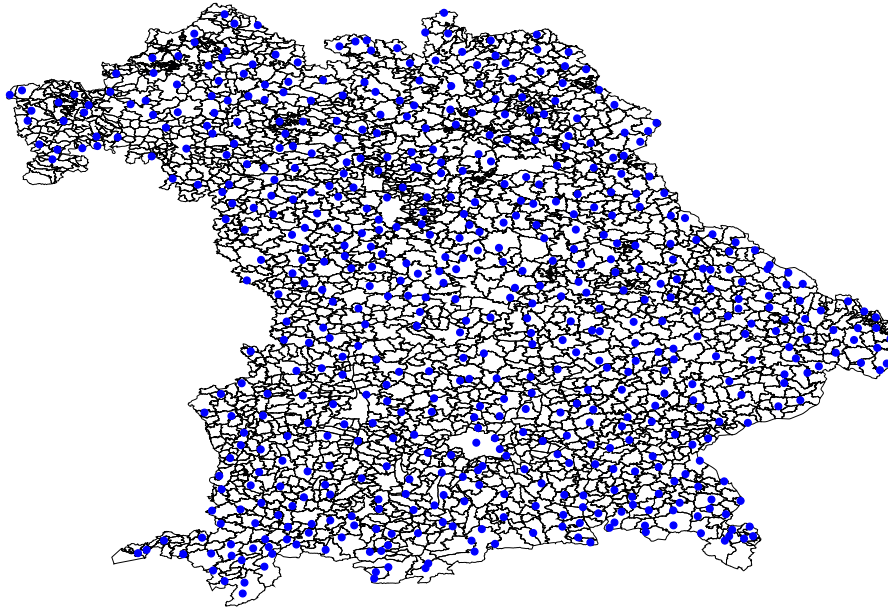
Table 3: Summary statistics: Contested Elections

Variable	Mean	Std. Dev.	Min.	Max.	N
Turnout	0.808	0.089	0.423	1	2284
Closeness	0.904	0.072	0.515	1	2284
Voters	3518.558	4023.755	20	34694	2284
Number of Candidates	3.105	0.858	1	7	2284
Concurrent Election	0.014	0.118	0	1	2284
Female Candidate(s)	0.145	0.353	0	1	2284
Honorary Mayor	0.483	0.5	0	1	2284
No Rain	0.636	0.481	0	1	1870
Rain in mm	1.585	3.778	0	32.8	1870
Day Station Average Rain in mm	2.171	0.895	0	8.18	1870
Distance to Nearest Weather Station in km	4.761	2.432	0.025	13.899	2284
Altitude in m	455.498	161.768	110	1832	1870

Table 4: Summary statistics: Runoff Elections

Variable	Mean	Std. Dev.	Min.	Max.	N
Turnout	0.758	0.106	0.351	0.974	1892
Closeness	0.867	0.106	0.198	1	1892
Voters	3988.797	4228.991	144	34658	1892
Number of Candidates	1.999	0.023	1	2	1892
Concurrent Election	0.005	0.069	0	1	1892
Female Candidate(s)	0.078	0.268	0	1	1892
Honorary Mayor	0.483	0.5	0	1	1873
No Rain	0.588	0.492	0	1	1657
Rain in mm	2.386	4.716	0	39.9	1657
Day Station Average Rain in mm	2.239	0.943	0.05	8.898	1657
Distance to Nearest Weather Station in km	4.768	2.469	0.025	13.899	1892
Altitude in m	455.879	163.552	110	1832	1657

Figure 1: Grid of Weather Stations in Bavaria



Notes: This map presents the spatial distribution of all 559 weather stations in Bavaria. The black lines depict the borders of all 2056 municipalities. Each blue dot stands for a weather station.

Figure 2: Distributions of Turnout and Closeness

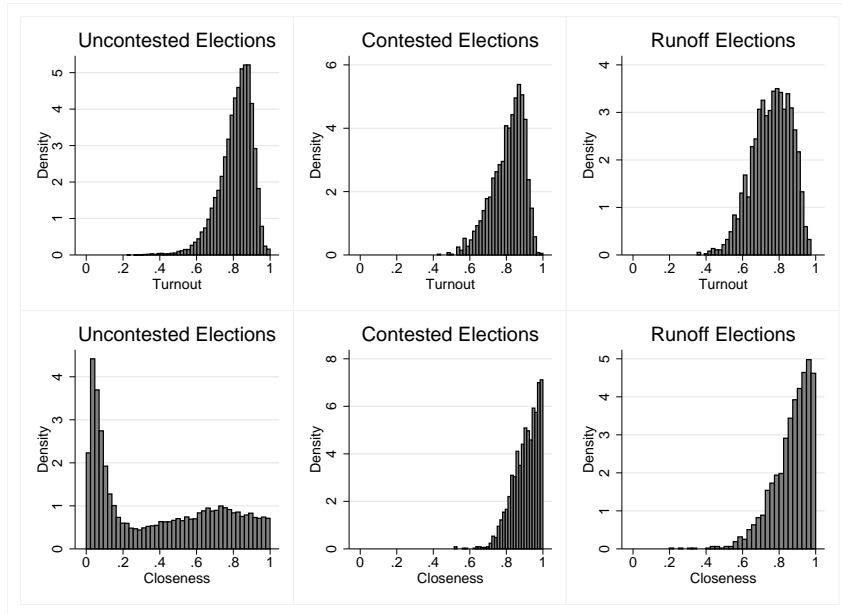


Figure 3: Turnout and Closeness

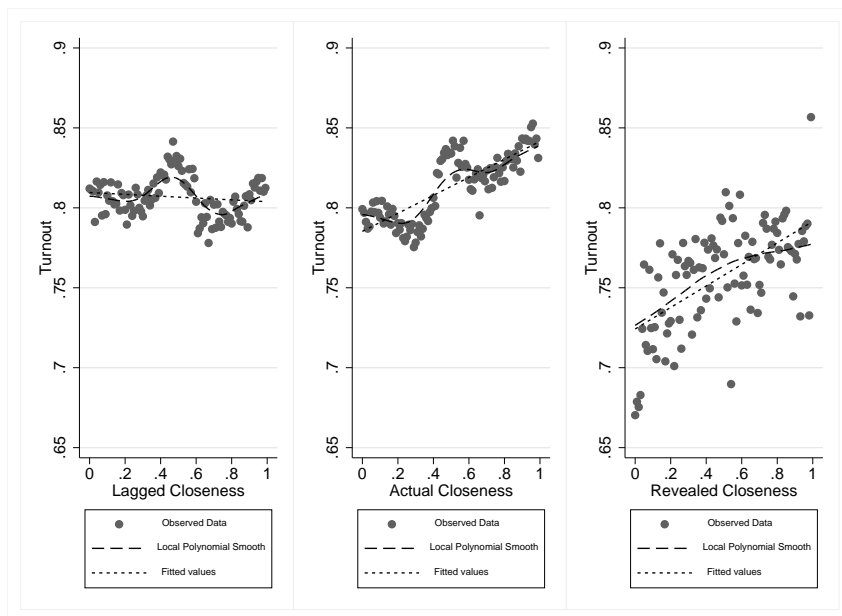


Figure 4: Turnout and Electorate Size

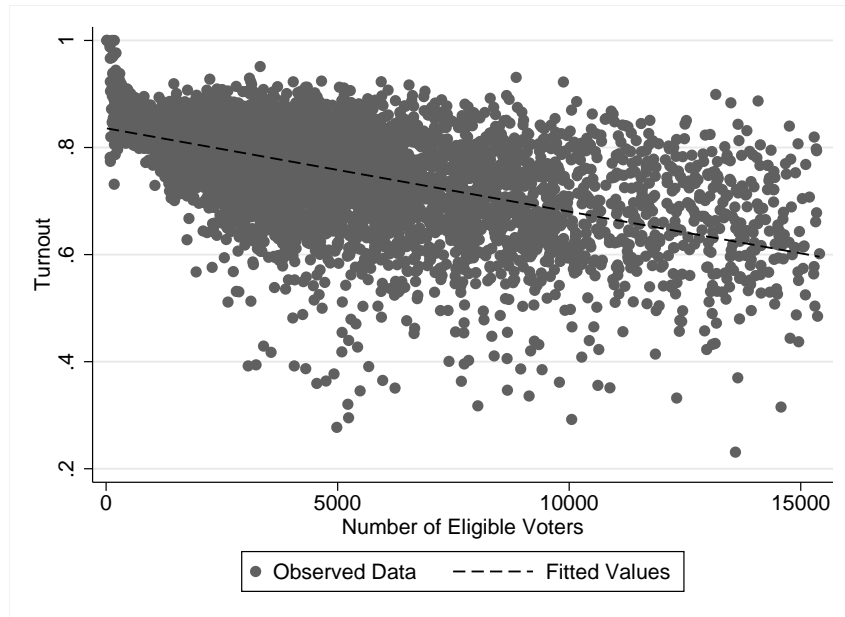
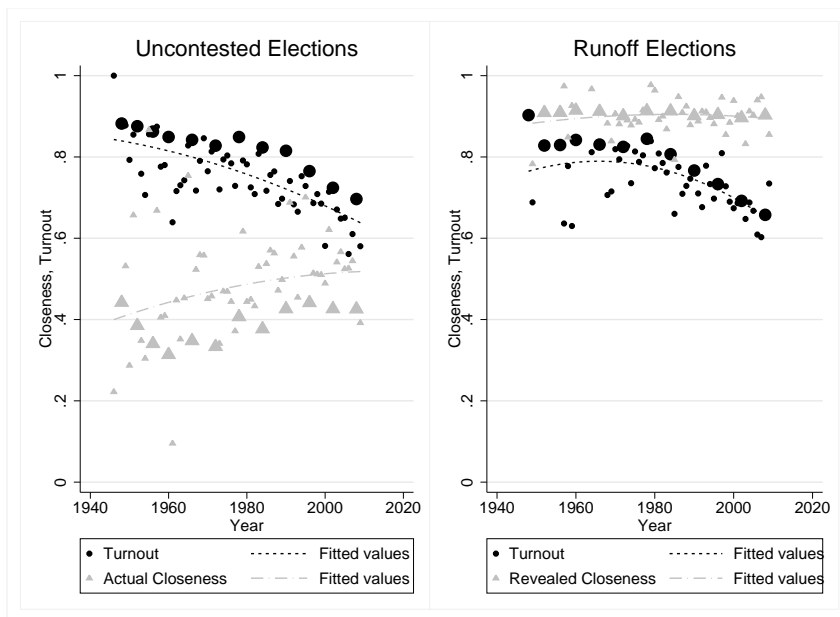


Figure 5: Turnout and Closeness Over Time



Notes: Bold circles and triangles represent years in which a major election took place (roughly 2000 municipalities), while the smaller circles and triangles represent years which do not belong to the usual election cycles (generally less than 100 observations). The fit lines are generated using equal weighting of all years.

Table 5: Heterogeneous Effects: Electorate Size and Weather

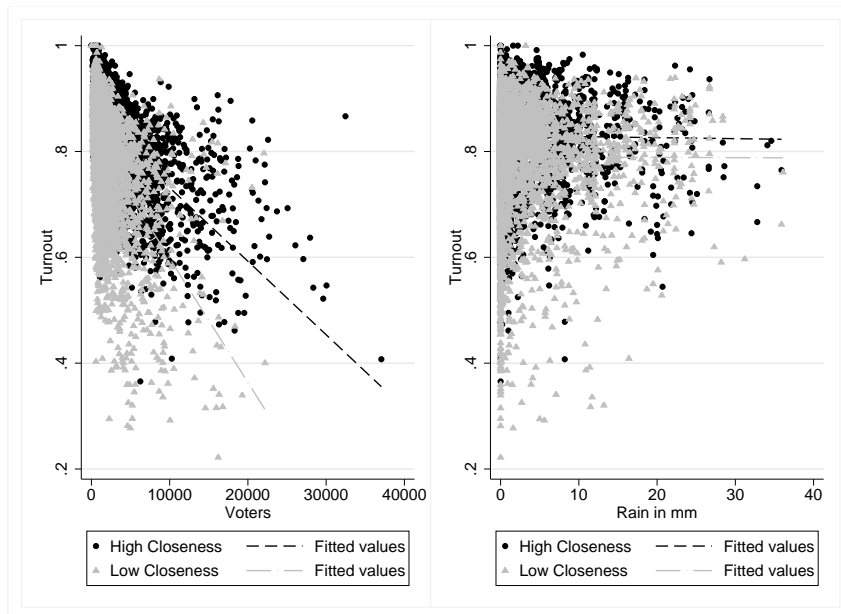
	(1)	(2)	(3)	(4)	(5)	(6)
	Turnout	Turnout	Turnout	Turnout	Turnout	Turnout
Sample	<i>Uncontested Elections</i>		<i>Runoff Elections</i>		<i>Uncontested Elections</i>	
					<i>Runoff Elections</i>	
Lagged Closeness	-0.007*** (0.002)			-0.011*** (0.002)		
Actual Closeness		0.037*** (0.003)			0.051*** (0.003)	
Revealed Closeness			0.214*** (0.020)			0.222*** (0.021)
Turnout in Preceding Election	0.217*** (0.011)	0.190*** (0.010)	0.856*** (0.041)	0.195*** (0.013)	0.175*** (0.011)	0.842*** (0.045)
Voters	-0.157*** (0.016)	-0.199*** (0.016)	-0.111** (0.045)	-0.172*** (0.017)	-0.175*** (0.017)	-0.022 (0.047)
No Rain				-0.004*** (0.001)	-0.003*** (0.001)	0.002 (0.004)
Rain in mm				-0.000* (0.000)	-0.001*** (0.000)	-0.011*** (0.004)
Day Station Average Rain in mm				-0.003*** (0.000)	-0.003*** (0.001)	0.003 (0.001)
Constant	0.456*** (0.010)	0.500*** (0.010)	-0.197*** (0.027)	0.485*** (0.012)	0.519*** (0.011)	-0.204*** (0.029)
<i>Interaction Effects</i>						
Lagged Closeness * Voters	-0.026*** (0.009)					
Actual Closeness * Voters		0.068*** (0.010)				
Revealed Closeness * Voters			0.073*** (0.017)			
Lagged Closeness * Rain				0.000 (0.000)		
Actual Closeness * Rain					0.001*** (0.000)	
Revealed Closeness * Rain						0.013*** (0.004)
All Controls from Baseline Regression	yes	yes	yes	yes	yes	yes
N	20582	20582	1859	17386	17386	1632
R ²	0.64	0.65	0.83	0.64	0.65	0.83

Notes: Standard errors robust to heteroscedasticity. Significance Levels: * p < 0.10, ** p < 0.05, *** p < 0.01. The data cover all mayoral elections in 2031 Bavarian municipalities from 1946-2009. The coefficient of *Voters* has been multiplied by 10⁴ to ease readability.

Table 6: IV Estimation

Dependent Variable	(1) (First Stage) Actual Closeness	(2) (Second Stage) Turnout
Revealed Closeness	0.622*** (0.059)	
Actual Closeness		0.375*** (0.039)
Constant	0.231*** (0.079)	
All Controls from Baseline Regression	yes	yes
First Stage F-Statistic (p-Value)	109.72 0.00	- -
N	1244	1244
R ²	0.19	0.72

Figure 6: Heterogeneous Effects: Electorate Size and Weather



Notes: This graph visualizes the interaction between electorate size and turnout (left panel) as well as rain and turnout (right panel) depending on closeness. Municipalities belong to the high / low closeness group if they rank above / below the 75 / 25 percent quantile of the closeness variable.

References

- ADE, F., AND R. FREIER (2013): “Divided government versus incumbency externality effect - Quasi-experimental evidence on multiple voting decisions,” *European Economic Review*, 64, 1–20.
- ANDERSEN, J. J., J. H. FIVA, AND G. J. NATVIK (2014): “Voting when the stakes are high,” *Journal of Public Economics*, 110, 157–166.
- ARNOLD, F., AND R. FREIER (2015): “The Partisan Effects of Voter Turnout: How Conservatives Profit from Rainy Election Days,” *mimeo, DIW Berlin*.
- BLAIS, A., AND I. H. INDRIDASON (2007): “Making candidates count: the logic of electoral alliances in two-round legislative elections,” *Journal of Politics*, 69(1), 193–205.
- COX, G. W. (1988): “Closeness and turnout: A methodological note,” *The Journal of Politics*, 50(03), 768–775.
- COX, G. W., AND M. C. MUNGER (1989): “Closeness, expenditures, and turnout in the 1982 US House elections,” *The American Political Science Review*, 83(1), 217–231.
- DE PAOLA, M., AND V. SCOPPA (2014): “The impact of closeness on electoral participation exploiting the Italian double ballot system,” *Public Choice*, 160, 467–479.
- DHILLON, A., AND S. PERALTA (2002): “Economic theories of voter turnout,” *The Economic Journal*, 112(480), F332–F352.
- DOWNES, A. (1957): *An economic theory of democracy*. Harper and Row, New York.
- EGGERS, A. C., A. FOWLER, J. HAINMUELLER, A. B. HALL, AND J. M. SNYDER (2015): “On the validity of the regression discontinuity design for estimating electoral effects: New evidence from over 40,000 close races,” *American Journal of Political Science*, 59(1), 259–274.
- ENDERSBY, J. W., S. E. GALATAS, AND C. B. RACKAWAY (2002): “Closeness counts in Canada: Voter participation in the 1993 and 1997 federal elections,” *The Journal of Politics*, 64(02), 610–631.
- FAUVELLE-AYMAR, C., AND A. FRANÇOIS (2006): “The impact of closeness on turnout: An empirical relation based on a study of a two-round ballot,” *Public Choice*, 127(3-4), 461–483.

- FEHR-DUDA, H., AND T. EPPER (2012): “Probability and risk: Foundations and economic implications of probability-dependent risk preferences,” *Annual Review of Economics*, 4(1), 567–593.
- FERREIRA, F., AND J. GYOURKO (2014): “Does gender matter for political leadership? The case of US mayors,” *Journal of Public Economics*, 112, 24–39.
- FRAGA, B., AND E. HERSH (2010): “Voting costs and voter turnout in competitive elections,” *Quarterly Journal of Political Science*, 5(4), 339–356.
- FREIER, R. (2011): “Incumbency as the major advantage: The electoral advantage for parties of incumbent mayors,” Discussion paper, DIW Discussion Paper 1147.
- FREIER, R., AND C. ODENDAHL (2012): “Do parties matter? Estimating the effect of political power in multi-party systems,” Discussion paper, DIW Discussion Paper 1205.
- FREIER, R., AND S. THOMASIU (2012): “Voters prefer more qualified mayors, but does it matter for public finances? Evidence for Germany,” Discussion paper, DIW Discussion Paper 1262.
- GARMANN, S. (2014): “A note on electoral competition and turnout in run-off electoral systems: Taking into account both endogeneity and attenuation bias,” *Electoral Studies*, (34), 261–265.
- GENTZKOW, M. (2006): “Television and voter turnout,” *The Quarterly Journal of Economics*, 121(3), 931–972.
- GEYS, B. (2006): “Explaining voter turnout: A review of aggregate-level research,” *Electoral Studies*, 25(4), 637–663.
- GOMEZ, B. T., T. G. HANSFORD, AND G. A. KRAUSE (2007): “The Republicans should pray for rain: Weather, turnout, and voting in US presidential elections,” *Journal of Politics*, 69(3), 649–663.
- GROFMAN, B., C. COLLET, AND R. GRIFFIN (1998): “Analyzing the turnout-competition link with aggregate cross-sectional data,” *Public Choice*, 95(3-4), 233–246.
- HANSFORD, T. G., AND B. T. GOMEZ (2010): “Estimating the electoral effects of voter turnout,” *American Political Science Review*, 104(02), 268–288.
- INDRIDASON, I. H. (2008): “Competition & turnout: the majority run-off as a natural experiment,” *Electoral Studies*, 27(4), 699–710.
- KAHNEMAN, D., AND A. TVERSKY (1979): “Prospect theory: An analysis of decision under risk,” *Econometrica*, 47(2), 263–292.

- KAYSER, M. A., AND R. LINDSTAEDT (2015): “A Cross-National Measure of Electoral Competitiveness,” *Political Analysis*, pp. 1–12.
- KIRCHGÄSSNER, G., AND T. SCHULZ (2005): “Expected closeness or mobilisation: why do voters go to the polls?: Empirical results for Switzerland, 1981-1999,” Discussion paper, CESifo working papers, No. 1387.
- KIRCHGÄSSNER, G., AND A. M. ZU HIMMERN (1997): “Expected closeness and turnout: An empirical analysis for the German General Elections, 1983–1994,” *Public Choice*, 91(1), 3–25.
- KISS, Á., AND G. SIMONOVITS (2014): “Identifying the bandwagon effect in two-round elections,” *Public Choice*, 160, 327–344.
- LAWLESS, J. L., AND K. PEARSON (2008): “The primary reason for women’s underrepresentation? Reevaluating the conventional wisdom,” *The Journal of Politics*, 70(1), 67–82.
- RIKER, W. H., AND P. C. ORDESHOOK (1968): “A Theory of the Calculus of Voting,” *The American Political Science Review*, 62(1), 25–42.
- SCHILD, C.-J. (2013): “Do female mayors make a difference? Evidence from Bavaria,” Discussion paper, IWQW Discussion Paper 2013/07.
- SCHWARTZ, T. (1987): “Your vote counts on account of the way it is counted: An institutional solution to the paradox of not voting,” *Public Choice*, 54(2), 101–121.
- SHACHAR, R., AND B. NALEBUFF (1999): “Follow the leader: Theory and evidence on political participation,” *American Economic Review*, 89(3), 525–547.
- SIMONOVITS, G. (2012): “Competition and turnout revisited: The importance of measuring expected closeness accurately,” *Electoral studies*, 31(2), 364–371.
- TUKIAINEN, J., AND T. LYYTIKÄINEN (2013): “Voters are rational,” Discussion paper, VATT Working Paper 50.