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## Conference Paper

# Power Politics: Electoral Cycles in German Electricity Prices

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# Power Politics: Electoral Cycles in German Electricity Prices\*

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## Abstract

We provide evidence that German public energy providers, over which municipality-level politicians hold substantial sway, systematically adjust the pricing of electric energy in response to local electoral cycles. In the run-up to elections, electricity prices set by these public utilities systematically decrease compared to the prices set by privatized utilities which are unconnected to local politicians. In the three years after an election, public utilities set relatively higher prices than private energy providers. This pattern is in line with both, an artificial reduction in prices before an election that needs to be countermanded by future price increases, and an artificial postponement of market-driven price increases until after the election is over. To establish these results, we make use of a unique and novel dataset that covers the universe of German electricity prices between 2003 and 2013. Identification of the electoral cycle in electricity prices is facilitated by the rich variation in municipal elections dates and the existence of a comparable group of non-public utilities. Our results suggest that government-controlled firms may represent a viable alternative to – often unavailable – standard public-finance instruments for local politicians to influence their popularity before elections.

*Keywords:* Regulated industries, local government, political business cycles, political connectedness, public utilities, energy markets, government ownership of firms.

*JEL classification:* D72, D73, H44, H72, H76, K23, L33, L94.

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# 1 Introduction

Since the seminal contributions by Nordhaus (1975), and MacRae (1977) to the literature of political business cycles, we are familiar with the notion of politicians attempting to manipulate economic outcomes in the run-up to elections – for instance by increasing public spending or granting tax reductions – to increase their chances at the ballot box. While this theory has been empirically put to test in numerous studies (e.g. Alesina, Roubini, and Cohen (1997), Mitchell and Willett (2006), Schneider (2010), and Dubois (2016) for an overview), the literature so far has mainly concentrated on the behavior of politicians at the federal or the state level. As a consequence, only little is known about electoral cycles at the municipal level, even though local office holders should have incentives to strategically affect the regional economy as well.

Of course one may argue that local politicians simply fail to satisfy a necessary condition for creating electoral cycles: the political power to actually alter economic conditions in any meaningful way. After all, mayors and county commissioners are not known for having control over stimulus packages, the federal tax code or interest rates, and in most developed countries they face strict budgetary rules that limit their ability to create debt. On the other hand, the literature on political connectedness makes the point that the ability to manipulate economic outcomes does not depend on statutory authority alone, but also on social relationships that create a more informal opportunity to achieve one’s goals.<sup>1</sup> As an example, Bertrand, Kramarz, Schoar, and Thesmar (2007) document that French firms destroy fewer jobs in election years if they are run by CEOs who are politically or socially connected with the head of the respective local government. The authors argue that the seeds for these networks are planted during higher education, as the vast majority of business and political leaders attend the same very limited set of elite schools, the so-called *Grandes Ecoles*. In a recent study, Englmaier and Stowasser (2017) find that German savings banks – whose management is connected with county-level politicians through membership in the savings bank’s governing board – increase their lending activities in the run-up to elections. They also present evidence that, from the politician’s perspective, local public spending and savings-bank lending appear to be substitutable policy

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<sup>1</sup>Most contributions to the political-connectedness literature such as Fisman (2001), Johnson and Mitton (2003), Ramalho (2004), Sapienza (2004), and Faccio, Masulis, and McConnell (2006) focus on the advantages for *firms* from entertaining close ties with politicians. Yet, the reverse direction of these relationships is being documented by academic work as well, as evidenced by Shleifer and Vishny (1994) who develop the quid-pro-quo argument of favors being traded between (state-owned) corporations and the political sector.

levers to boost economic activity.

In this paper, we make the case that public energy providers may represent yet another alternative to standard public-finance instruments for local politicians to influence the mood of the electorate. We present empirical evidence for substantial distortions in the price-setting behavior of German public utilities, whose boards of directors include municipality-level politicians and, as a rule, are even chaired by the mayor of the respective municipality. In the run-up to elections, electricity prices set by these public utilities systematically decrease compared to the prices set by privatized utilities over which local politicians don't hold sway. In the three years after an election, public utilities set relatively higher prices than private energy providers. This pattern is in line with both, an artificial reduction in prices before an election that needs to be countermanded by future price increases, and an artificial postponement of "natural" (e.g. market driven) price increases until after the election is over. These effects are robust to various alternative specifications. In ongoing follow-up work, we test for effect heterogeneity with respect to electoral-competition (expecting a positive gradient), product-market competition (expecting a negative gradient) and the financial health of the respective utility (expecting a positive gradient) and we investigate the economic consequences of this pricing behavior for the affected energy providers.

Our identification strategy relies on the fact that we should only observe politically motivated pricing in election years, only in municipalities in which elections are held at this point in time, and – importantly – only for politically connected public utilities. The identification of electoral effects is greatly facilitated by a high degree of variation in electoral timing: Municipal elections in Germany are synchronized at the state level but not across states and in general are held in different years than state elections. Hence, we are able to exploit both intertemporal variation, as utilities are repeatedly treated with an election over the course of time, and cross-sectional variation, as in any given year some utilities are treated and others are not. Econometrically, we conduct difference-in-difference (DD) as well as triple-difference (DDD) estimation embedded in a fixed-effects panel data setup.

To test our hypotheses, we use a unique and novel, largely hand-collected dataset that combines detailed information on German municipal elections, firm-level balance sheet data, as well as unusually detailed, proprietary firm-level, and market-level data covering the universe of German electricity prices between 2003–2013 that was provided to us by *verivox GmbH*, one

of Germany's leading consumer agencies.

Our paper relates to several strands of literature. Next to the aforementioned literatures on political business cycles and on political connectedness, it adds to the understanding of the role of government-controlled firms. Caprio Jr. and Martinez Peria (2000), Barth, Caprio Jr., and Levine (2001), and La Porta, Lopez de Silanes, and Shleifer (2002) find that politicians use public banks to further their own political objectives and that government ownership in banks is associated with increased risk of banking crises, reduced financial development, and subpar economic growth, respectively. In related work, Khwaja and Mian (2005) find that politically connected firms in Pakistan have easier access to credit but that this preferential treatment is only granted by government banks. Carvalho (2014) documents that Brazilian firms eligible for government-bank lending expand employment in politically contested regions prior to elections by shifting employment from other regions.

We also add to the literature on regulated industries, particularly the energy sector. The approach of modeling the regulatory process as a strategic interaction between the regulator and the regulated industry dates back to Stigler (1971) and was later refined by Paltzman (1976). In a theoretical model, Moita and Paiva (2013) show that this interaction may produce electoral price cycles, even if voters are assumed to be rational. They also conduct a correlation study of Brazilian national longitudinal data that provides suggestive – yet unidentified – evidence for cyclical patterns in energy prices. Analyzing data from U.S. gubernational data, Doyle, Maria, Lange, and Lazarova (2016) show that compliance cost minimization of power plants (measured by spending on water pollution abatement) reacts to changes in expected regulatory enforcement. Boylan (2016) use U.S. data to study whether ownership type influences the vulnerability to disruptions of electricity service due to extreme weather events and finds that public utilities' inefficiencies are more important in causing power outages than investor-owned utilities' disincentives to spend on maintenance.

The remainder of the paper is structured as follows. In Section 2, we describe the institutional background, in particular the German electricity sector and the German electoral system at the municipal level. Our main hypothesis and testable predictions are discussed in Section 3, whereas Sections 4 and 5 introduce our data and methodology, respectively. Section 6 presents our main empirical results and Section 7 gauges their robustness. Section 8 concludes.

## 2 Institutional background

This section provides the institutional details relevant for evaluating the identification strategy. We lay out the case for why public energy providers are a prime example of politically controlled firms and how the German electoral system allows to cleanly estimate effects of municipal elections on electricity prices.

### 2.1 German electoral system

Germany has a federal system with four layers of government: the federal state, 16 states (Bundesländer), 401 counties, and 11,091 municipalities. Each layer has specific powers and responsibilities as well as separate legislative bodies, which are elected in regular intervals: every four years at the federal level, every four to five years at the state level, and every four to six years at the county and municipality levels. Since control over public energy providers is exerted by municipality-level governments (see Section 2.2 below), we focus on the latter class of elections.

Each municipality has its own legislative body (the “local council”) as well as an elected mayor. While elections of these local parliaments are synchronized at the state level, they provide a great deal of variation in electoral timing across states. For one, municipality-election dates generally deviate from dates of federal or state elections, i.e., as a rule they are not held in the same year. Moreover, municipality-election dates, in general, differ across states; thereby neatly dispersing electoral events over several years. Variation is further increased by the fact that the intervals between elections are not the same for all states: While in most cases elections are held every five years, legislative periods are shorter for Bremen and Hamburg (four years) and longer for Bavaria (six years). In all states, the electoral system is one of proportional representation.

### 2.2 German electricity sector

In this paper, we focus on the provision of electrical energy to private households. In Germany, the market for electricity was liberalized in 1998 (for an overview, see e.g., Feudel (2013)) with the aim of establishing an efficient, competitive electricity market in Germany.<sup>2</sup>

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<sup>2</sup>In particular, the German “Energiewirtschaftsgesetz” of 1998 implemented the respective “EU Directive on the Internal Electricity Market” (Directive 96/92/EC).

Prior to the liberalization in 1998, private households were supplied electricity by a small number of (large) national suppliers and roughly 900–1000 local providers, which were owned by the respective local municipalities and enjoyed local monopolies. That is, competition among providers was ruled out. Starting in 1998, consumers were free to source electricity from any electricity provider, and any provider was free to supply electricity private household anywhere in Germany.<sup>3</sup> Today, Germany is partitioned into approximately 900 *designated local areas (DLA)* (“Grundversorgungsgebiete”), where each has a *designated local provider (DLP)* (“Grundversorger”). By law, it is the respective DLP’s responsibility to ensure that every private household in the respective DLA at any time has access to electricity. Every three years, the operator of the respective local grid (“Netzbetreiber”) assigns the roles of DLPs to the providers who serves the majority of households in their respective DLA. In particular, each DLP is obliged to connect any new household in its DLA to the grid and supply it with electricity. That is, until the respective household states that it wants to switch to another tariff of the DLP or to an alternative provider (which it is free to do), the household remains in the DLP’s *basic tariff* (“Grundversorgerungstarif”). Importantly, this implies that by switching to an alternative provider, households do not face the risk of being cut off from energy supply: Even if their provider were to go bankrupt, their DLP would be obliged to provide electricity without interruption of service (and that is indeed what happens in practice). Hence, it would seem that, for households, barriers to switch supplier, would be rather low. However, as is discussed below, there is substantial inertia.

Importantly, while the majority of DLPs has been privatized, a substantial number is still owned by the respective local municipality and primarily serve a small regional area. For these (local) public energy providers, municipalities have the formal right to send political representatives of their local council into the board of directors of the respective utility. On top of that, the chairman of this body is, as a rule, the municipality’s mayor.

Liberalization first led to declining prices (for roughly two years). However, it also led to a concentration process, where, mainly through mergers, the number of national electricity producers dropped from eight to four, who produce (sell) roughly 85% (50%) of electricity in Germany. The approximately 900 smaller providers mainly source electricity from the national

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<sup>3</sup>By law, the owners (respectively operators) of electricity grids were obliged to grant access to established providers and new entrants alike at a “reasonable fee”).

providers or through the German energy exchange. As a consequence of this concentration process (and hikes in taxes and fees), since 2001 German electricity prices have been steadily rising (and, by now, have been reaching levels considerably higher than prior to liberalization).

Despite the fact that, since the liberalization of the German residential electricity market, households are, in principle, free to choose any provider, DLPs still hold considerable sway over the market, as in practice, consumers are rather reluctant to switch. For example, in 2011, approximately 45% of German households were enrolled in the basic tariff of their designated local provider (see e.g., Deutscher Bundestag (2011)). An additional approximately 40% of households are enrolled in some other tariff offered by their DLP.

### 3 Main hypothesis and testable predictions

The main hypothesis this paper seeks to test is whether local politicians influence public energy providers to set lower electricity prices – or, alternatively, to postpone price increases – in the run-up to elections in hopes of swaying their prospects at the ballot box. The opportunities and incentives for doing so certainly exist. To begin with, the institutional environment described in section 4.1 creates the *ability* to influence energy prices since it installs municipal politicians as members and even chairs of the board of directors of public utilities.

The question remains if there is also an *incentive* for politicians to induce artificially lower electricity prices to tip the electoral scales in their favor. We argue that there is a number of reasons why this may indeed be the case: As established in the literature (see, for example, Smart and Sturm (2007)), politicians care about re-election, and (perceived) economic conditions are an important determinant for the prospects of winning another term (see Peltzman (1987), Wolfers (2007), and Englmaier and Stowasser (2017)). Given the local focus of municipal energy providers, politicians can target the benefits of their actions to consumers who will almost certainly live – and vote – in the region represented by the incumbent, and it is safe to assume that constituents will be more satisfied when they are not troubled by high energy bills.

The final argument in favor of our main hypothesis concerns the timing of price distortions. If politicians truly exploit their ability to sway the operations of their local utility, we should expect a concentration of such behavior in times when it helps them most. Assuming that voters are myopic, political gain is maximal when the incumbent’s fate is on the line: in the run-up



to elections. Price decreases should not happen too far in advance as this would represent premature flexing of political muscle. Similarly, the election effect should not be permanent, since incentives to allure voters will instantly vanish once the polls are closed. Hence, it is reasonable to assume that politically motivated pricing be focussed on election seasons.

Taken together, these assumptions imply our first testable prediction.

**Prediction 1: Election effect on electricity prices.** *In the run-up to municipal elections, public utilities systematically set lower electricity prices.*

If the political meddling leads to a deviation from profit-maximizing firm behavior, it will not be sustainable from the utility's perspective to keep prices low after the election is over. While it is possible that post-election prices will simply return to their steady state level, we expect that utilities will have to compensate for overly generous election tariffs by larger price increases if they are operating close to their budget constraint. The same prediction would hold if – instead of actively lowering prices before elections – politicians induce public energy providers to postpone eventual price increases until after votes have been cast. Given these arguments, our second testable prediction follows immediately.

**Prediction 2: Electoral cycle in electricity prices.** *In the wake of municipal elections, the reduction in electricity prices is quickly reversed. Whether post-election prices will be set even higher than counterfactual prices to compensate for election-induced inefficiencies remains an empirical question.*

Our next two predictions are about the heterogeneity of the electoral effect on energy prices. First, we argue that election effects should be more pronounced in districts with fierce electoral competition. The assumption underlying this prediction is that politically motivated pricing will be costly for the public utility and ultimately harm the politician's reputation. As a consequence, incumbents may not make much use of this distorting instrument unless they genuinely fear for their re-election. Second, while the incentives of politicians are influenced by electoral competition, the actions of energy providers are constrained by product-market competition. In this vein, we hypothesize that politically induced price effects increase with the local market power of the respective public utility.

**Prediction 3: Effect heterogeneity I – The role of electoral competition.** *The electoral price cycle is stronger in municipalities with closely contested elections.*

**Prediction 4: Effect heterogeneity II – The role of product-market competition.** *The electoral price cycle is weaker in municipalities with high levels of product-market competition.*

Whether our predictions are verified by empirical testing, is investigated in section 6. Before turning to this analysis, however, we continue with the description of our data.

## 4 Data

### 4.1 Energy-sector data

We use a unique and novel dataset on the German energy sector that covers the universe of electricity tariffs offered by energy providers in Germany between 2003 and 2013. This unusually detailed, proprietary firm-level, and market-level data was provided to us by *verivox GmbH*, one of Germany’s leading consumer agencies. The observational unit of analysis is the so-called *parcel of land (PAOLA)*, the smallest regional unit defined by *verivox*, which roughly corresponds to ZIP codes. In a PAOLA, all households are supplied with electricity by the same DLP. As a consequence, a DLP serves an area that usually consists of various PAOLAs. We observe detailed information on the relevant energy market (the number of customers, the number of competitors, the number of offered tariffs, and their relative price distribution), on the designated energy provider (most importantly, whether they are public or private utilities), and on the individual tariffs. Our data covers 17,575 unique PAOLAs (of which 5,384 were supplied by a public DLP) and the total number of PAOLA-year observations amounts to 301,384.

### 4.2 Election data

A database that combines information on German municipal elections in any comprehensive way does not exist. Even at the state level, the collection of county-election data is the clear exception. For this reason, we created a unique dataset by collecting all necessary information ourselves. To this end, we contacted regional statistical offices, the respective counties, and historical archives all over Germany. As a result of this labor intensive project, we have collected

**Figure 1.** *Municipal elections between 2001 and 2014*

Baden-Württemberg	25.05.2014	07.06.2009	13.06.2004
Bavaria	16.03.2014	02.03.2008	03.03.2002
Berlin	18.09.2011	17.09.2006	21.10.2001
Brandenburg	25.05.2013	28.09.2008	26.10.2003
Bremen	22.05.2011	13.05.2007	25.05.2003
Hamburg	20.02.2011	24.02.2008	29.02.2004
Hesse	27.03.2011	26.03.2006	18.03.2001
Mecklenburg-Western Pomerania	25.05.2014	07.06.2009	13.06.2004
Lower Saxony	11.09.2011	10.09.2006	09.09.2001
North Rhine-Westfalia	25.05.2014	30.09.2009	26.10.2004
Rhineland-Palatinate	25.05.2014	07.06.2009	13.06.2004
Saarland	25.05.2014	07.06.2009	13.06.2004
Saxony	25.05.2014	07.06.2009	13.06.2004
Saxony-Anhalt	25.05.2014	07.06.2009	13.06.2004
Schleswig-Holstein	26.05.2013	25.05.2008	02.03.2003
Thuringia	25.05.2014	07.06.2009	13.06.2004

data for over 11,000 German municipalities spanning the years 2001–2014. During this time span, each PAOLA experienced three municipal election (for an overview of elections covered by our data, see Figure 1. Our dataset contains information on election dates, election results, the names and party affiliations of incumbents and election winners, and whether there was a change in power.

## 5 Methodology

### 5.1 Identification

Our strategy to identify effects of elections on electricity prices of public utilities relies on the fact that we should only observe politically motivated pricing before municipal elections, only in municipalities in which elections are held at this point in time, and only for politically connected energy providers. Identification is facilitated by a high degree of variation in electoral timing and the existence of a comparable group of privatized energy companies. Furthermore, given the statutory nature of legislative elections at the county level, for which early elections are de-facto non-existent, we need not worry about any endogeneity in the timing of the key re-

gressor. Econometrically, we conduct difference-in-difference (DD) and triple-difference (DDD) estimation embedded in a fixed-effects panel setup.

*Testing Prediction 1: Election effect on electricity prices*

To test whether public utilities set lower electricity prices in the run-up to elections, we use the following empirical specification:

$$P_{iust} = \beta_1 ELEC_{st}^M \times U_u + \gamma_1 ELEC_{st}^M + f_1(U_u, \mathbf{S}'_s, \mathbf{T}'_t) \boldsymbol{\delta}_1 + \mathbf{X}'_{iust} \boldsymbol{\lambda}_1 + \epsilon_{1iust}. \quad (1)$$

where  $P_{iust}$  is a measure of electricity prices set by the local utility of PAOLA  $i$ , which is of utility type  $u$  (public versus private), operating in state  $s$  at time  $t$ . The parameter of interest,  $\beta_1$ , estimates the effect of municipal elections – which are indicated by the election dummy variable  $ELEC_{st}^M$  – on electricity prices of public utilities.

To ensure identification of  $\beta_1$ , we control for function  $f_1 = U_u \times \mathbf{S}'_s \times \mathbf{T}'_t + U_u \times \mathbf{S}'_s + U_u \times \mathbf{T}'_t + \mathbf{S}'_s \times \mathbf{T}'_t + U_u + \mathbf{S}'_s + \mathbf{T}'_t$  that fully interacts the following fixed effects:  $\mathbf{S}_s$  denotes a full vector of state effects to control for secular pricing differences across states. Similarly, time effects,  $\mathbf{T}_t$ , are included to capture any national trends or year shocks. In addition, utility-type effects,  $U_u$ , are needed to control for perpetual differences between public and private utilities.  $U_u$  is defined as a dummy variable that takes on the value of one if the provider is a public utility. We interact the election dummy with the utility-type indicator such that  $ELEC_{st}^M \times U_u$  switches on if  $P_{iust}$  measures electricity prices a public utilities during an election season.

Finally,  $\mathbf{X}_{iust}$  is a vector of utility- and municipality-specific variables that may directly influence the outcome variable. The inclusion of these covariates should considerably improve the predictability of  $X_{iust}$ , which will reduce the sample variance of the estimates. Moreover, it addresses potential bias from omitted variables.

Estimation of Equation (1) ensures that both cross-sectional and time-series variation are exploited. The former compares the same utilities across time, as each utility will be subject to recurring election “treatments”. The latter contrasts different utilities at a given time, as county elections dates vary across states. Furthermore, the comparison group of privatized utilities permits a better representation of counterfactual prices in the absence of elections because politicians have no institutional sway over these firms. Consequently, the DD estimate for  $\beta_1$  captures the difference between election-induced price deviations of public utilities (which are expected to be negative) and election-induced price deviations of private utilities (which

are expected to be zero).

### *Testing Prediction 2: Electoral cycle in electricity prices*

To study a complete electoral cycle, we also estimate the effect of elections on electricity prices in post-election years, replacing the election indicator,  $ELEC_{st}^M$ , in equation 1, with post-election indicators,  $ELEC_{st-\tau}^M$ . For the analysis we separately estimate each equation with  $\tau = (1, 2, 3, 4)$ , such that the respective election dummy indicates whether there was an election in state  $s$ ,  $\tau$  years ago. With an average interval between elections of five years, we do not use higher values of  $\tau$  as this would blur the line between post-election periods of the current and pre-election periods of the next campaign. The empirical model takes the following form:

$$P_{iust} = \beta_2 ELEC_{st-\tau}^M \times U_u + \gamma_2 ELEC_{st-\tau}^M + f_2(U_u, \mathbf{S}'_s, \mathbf{T}'_t) \boldsymbol{\delta}_2 + \mathbf{X}'_{iust} \boldsymbol{\lambda}_2 + \epsilon_{2iust}. \quad (2)$$

### *Testing Predictions 3 and 4: Effect heterogeneity*

The tests for the two predictions about the heterogeneity of the electoral effect on electricity prices follow the same pattern and can be implemented with the following DDD model:

$$\begin{aligned} P_{iust} = & \beta_3 ELEC_{st}^M \times U_u \times H_{iust} + \dots & (3) \\ & + \phi_3 U_u \times H_{iust} + \psi_3 U_u \times ELEC_{st}^M + \xi_3 H_{iust} \times ELEC_{st}^M + \dots \\ & + \gamma_3 ELEC_{st}^M + \zeta_3 H_{iust} + f_3(U_u, \mathbf{S}'_s, \mathbf{T}'_t) \boldsymbol{\delta}_3 + \mathbf{X}'_{iust} \boldsymbol{\lambda}_3 + \epsilon_{3iust}, \end{aligned}$$

where  $H_{iust}$  is the respective heterogeneity variable of interest: For Prediction 3, it measures electoral competition in the municipality and for Prediction 4 it measures the degree of product-market competition faced by the utility. The third line of model 3 contains the aforementioned controls as well as the saturated function of fixed effects. Line 2 contains the full set of first-order interactions which are necessary to identify the causal effect of interest in line 1 that is captured by the DDD estimate of  $\beta_3$ .

## **5.2 Main empirical specification**

All results presented in Section 6 are estimates from the entire<sup>4</sup> (unbalanced) panel sample to which we apply the following empirical specification: Regressions 1–3 are fitted with OLS

<sup>4</sup>For robustness, Section 7.4 repeats the analysis for a large battery of alternative sample compositions, to make sure that our results are not driven by an oddly selected sample.

and – to gauge the stability of results to the inclusion of PAOLA fixed effects – the within estimator (FE). Electricity prices,  $P_{ibst}$ , are measured by means of a standardized electricity bill for a representative household consuming 4,000 kWh per annum.<sup>5</sup> All monetary values are measured in real 2010 EUR. Section 7.1 explores the robustness of our results to varying definitions of these key variables.

In our main specification, we control for full sets of bank-type, state, and time fixed effects, and all interactions among them. While we believe this approach to be the most rigorous way of controlling for fixed effects, Section 7.2 additionally explores the robustness of our results to lower levels of fixed-effects saturation.

Standard errors for all regressions are clustered at the PAOLA level. For robustness, we cluster at higher levels of variation (up to the state level) and correct standard errors for potential bias arising from the low number of clusters (defined by the 16 states in our sample) by applying the wild cluster bootstrap-t procedure suggested by Cameron, Gelbach, and Miller (2008) in Section 7.3.

## 6 Results

### 6.1 Prediction 1: Election effect on electricity prices

The empirical tests of Prediction 1 are summarized in Table 1 which contains OLS and FE estimates of the key parameters from Regression 1.

Results in column (A) suggest that in the run-up to municipal elections the average public energy provider experiences a 3.58 EUR decrease in electricity prices. This estimate is statistically significant at the 1% level. While the absolute size of the decrease may appear small at first sight, note that about 80% of the highly regulated electricity price in Germany consists of fixed elements, such as apportionments and taxes, that are outside the energy provider’s control and that go directly to the government and regulatory agencies. This is why the effect size is better gauged in relation to the utility’s contribution margin – an exercise we are able to undertake in Section 7.1 for a subsample of observations for which we have data on all price components.

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<sup>5</sup>Note, that this standardized way of measuring electricity prices – which take the form of two-part tariffs – is typical for consumer markets for energy. While a consumption of 4,000 kWh is the default value provided by *verivox* upon entering their webpage, consumers are free to change this value according to their expected needs.

**Table 1.** *Results for Prediction 1: Election effect on electricity prices*

Dependent variable: Electricity prices (real values)				
Explanatory variables	Regression coefficients			
	(Robust standard errors in brackets)			
	(A)	(B)	(C)	(D)
<i>Key regressors: Interaction effect</i>				
- $ELEC_{st}^M \times U_u$	-3.58*** (0.17)	-3.58** (1.43)	-3.45*** (0.17)	-3.45** (1.39)
<i>Main effects:</i>				
- $ELEC_{st}^M$	3.25*** (0.08)	3.25** (1.53)	3.25*** (0.81)	3.25** (1.53)
- $U_u$	-10.10*** (0.34)	-10.10** (3.48)	-24.9*** (3.10)	-24.9*** (5.09)
<i>Fixed effects</i>				
- State FE	X	X	X	X
- Time FE	X	X	X	X
- Utility-type FE	X	X	X	X
- Interactions of S×T×U FE	X	X	X	X
N	299,831	299,831	299,831	299,831
(Adjusted) R <sup>2</sup>	0.946	0.946	0.965	0.965
Estimator	OLS	OLS	FE	FE
Level of standard-error clustering	Paola	State	Paola	State

*Notes:* Results are for the main empirical specification (see section 5.2). Depicted are estimates for  $\beta_1$ .  $ELEC_{st}^M$  stands for municipal elections and  $U_u$  denotes a public utility. R<sup>2</sup> is adjusted for all specifications with PAOLA FE. Standard errors are either clustered at the PAOLA level or at the state level and are stated in parantheses. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, the 5%, and the 1% level, respectively.

The highest level of variation in our data is at the state level, which is why it is the most conservative choice for standard-error clustering. Given that our number of clusters (16 German states) falls way short of the magic number of 42 as proposed by Angrist and Pischke (2009) to allow for reliable statistical inference, our main specification clusters standard errors at the PAOLA level. However, to demonstrate that our results remain statistically significant when clustering at the state level, we present the corresponding results in column (B) of Table 1. In Section 7.3, we perform additional robustness checks that cluster standard errors at intermediate regional levels (such as the municipality or the county) and that applies the wild cluster bootstrap-t procedure suggested by Cameron, Gelbach, and Miller (2008) to correct for the low number of state clusters.

Given the panel structure of our data, we are able to account for the possibility of individual-specific effects being correlated with any of our regressors. Even though we are not particularly worried about correlated effects, columns (C) and (D) of Table 1 presents results when fitting Regression 1 with the FE estimator that only relies on variation over time. The parameter of

interest is marginally smaller – a 3.45 EUR instead of a 3.58 EUR decrease in prices – and still precisely estimated, even when clustering at the state level. We take this as encouraging evidence that our results survive, even when identification is based on within variation alone.

## 6.2 Prediction 2: Electoral cycle in electricity prices

Results for electricity prices over an entire electoral cycle are displayed in Table 2, with each column representing a separate regression for which  $\tau$  is accordingly varied in equation 2. Let us start with results from OLS without PAOLA fixed effects (columns (A) through (E)): The effect for the year preceding the election year is depicted in column (A) and corresponds to the election effect presented in Section 6.1. The four post-election years are tackled in columns (C), (D) and (E), respectively. As expected, the pre-election reduction in electricity prices is immediately reversed after the election. In fact, public utilities appear to set relatively higher prices than private energy providers (controlling for baseline differences between both provider types) in the three years after an election. This pattern is in line with both, an artificial reduction in prices before an election that needs to be offset by future price increases, and an artificial postponement of “natural” (e.g. market driven) price increases until after the election is over. Four years after the election, public utilities once again set lower prices than their privatized counterparts, which – with an average interval between elections of five years – simply indicates the beginning of the next electoral cycle. Results when controlling for PAOLA fixed effects are presented in columns (F) through (J) and follow the same pattern.

To provide a visual representation of the electoral price cycle, we plot the effects, municipal elections have on electricity prices of public utilities in the five years surrounding said election, into Figure 2. The solid line depicts the same OLS point estimates as those in the first row of Table 2. The dashed lines indicate 90% confidence intervals when clustering standard errors at the PAOLA level. The dotted lines indicate 90% confidence intervals when clustering standard errors at the state level. The resulting picture provides, once more, evidence for the political nature of the decrease in electricity prices, as public providers exclusively adjust their priced downward (relative to privatized utilities) in the run-up to elections. Note that – in contrast to the election effect above – the evidence for the post-election price increases by public energy providers is no longer statistically significant at conventional levels when clustering standard

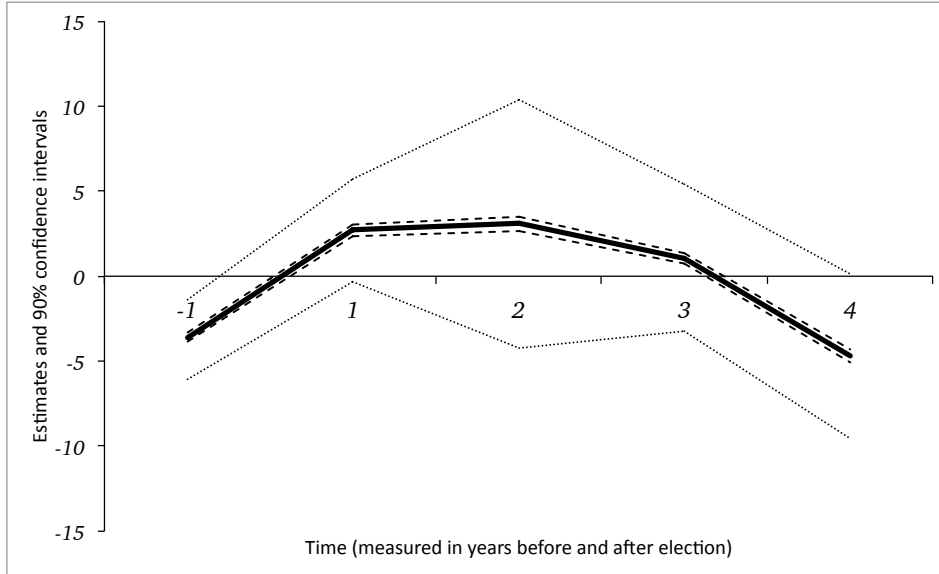


**Table 2. Results for Prediction 2: Electoral cycle in electricity prices**

Explanatory variables	Regression coefficients (Robust standard errors in brackets)									
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
<i>Key regressor: Interaction effect</i>										
- $ELLEC_{st-\tau}^M \times U_u$	-3.58*** (0.17)	2.70*** (0.21)	3.09*** (0.27)	1.08*** (0.19)	-4.70*** (0.23)	-3.45*** (0.17)	3.90*** (0.19)	4.38*** (0.26)	0.72*** (0.19)	-4.02*** (0.23)
<i>Main effects:</i>										
- $ELLEC_{st-\tau}^M$	3.25*** (0.08)	-3.10*** (0.13)	-0.11 (0.15)	-2.44*** (0.12)	3.23*** (0.13)	3.25*** (0.08)	-3.71*** (0.13)	-0.30** (0.15)	-2.37*** (0.12)	2.88*** (0.13)
- $U_u$	-10.10*** (0.34)	-11.32*** (0.34)	-11.41*** (0.33)	-11.07*** (0.33)	-9.96*** (0.34)	-24.94*** (3.10)	-26.39*** (3.10)	-26.51*** (3.10)	-25.93*** (3.11)	-24.91*** (3.10)
<i>Fixed effects</i>										
- State FE	X	X	X	X	X	X	X	X	X	X
- Time FE	X	X	X	X	X	X	X	X	X	X
- Utility-type FE	X	X	X	X	X	X	X	X	X	X
- Interactions of S×T×U FE	X	X	X	X	X	X	X	X	X	X
N	299,831	299,831	299,831	299,831	299,831	299,831	299,831	299,831	299,831	299,831
(Adjusted) R <sup>2</sup>	0.946	0.946	0.946	0.946	0.946	0.965	0.965	0.965	0.965	0.965
Year relative to election	$\tau = -1$	$\tau = +1$	$\tau = +2$	$\tau = +3$	$\tau = +4$	$\tau = -1$	$\tau = +1$	$\tau = +2$	$\tau = +3$	$\tau = +4$
Estimator	OLS	OLS	OLS	OLS	OLS	FE	FE	FE	FE	FE

*Notes:* Results are for the main empirical specification (see section 5.2). Depicted are estimates for  $\beta_2$ .  $ELLEC_{st-\tau}^M$  stands for municipal elections, where  $\tau < 0$  indicates pre-election years, and  $\tau > 0$  indicates post-election years.  $U_u$  denotes a public utility. R<sup>2</sup> is adjusted for all specifications with PAOLA FE. Standard errors are either clustered at the PAOLA level or at the state level and are stated in parantheses. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, the 5%, and the 1% level, respectively.

**Figure 2.** Results for Prediction 2: Electoral cycle in electricity prices



*Notes:* Results are for the main empirical specification (see Section 5.2). The solid line depicts OLS estimates of  $\beta_2$  when using pre- and post-election indicators  $ELEC_{st-\tau}^M$ . Dashed lines indicate 90% confidence intervals when clustering standard errors at the PAOLA level. Dotted lines indicate 90% confidence intervals when clustering standard errors at the state level (16 states). Time is measured on the abscissa.

errors at the state level. Recall, however, that these results should be interpreted with a grain of salt because the number of 16 states falls short of the number of clusters necessary for robust inference. For this reason, we correct standard errors for potential bias arising from the low number of clusters by applying the wild cluster bootstrap-t procedure suggested by Cameron, Gelbach, and Miller (2008) in Section 7.3.

### 6.3 Prediction 3: The role of electoral competition

**Work in progress.** Data collection of municipal elections results (covering the years 2001–2014 for 11,091 individual municipalities) completed. Our data allows to construct measures of electoral contestedness, incumbent entrenchment, incumbent tenure, and incumbent power. This data is being currently matched to our data, and will be ready for analysis by mid March 2017.)

### 6.4 Prediction 4: The role of product-market competition

**Work in progress.** Data collection of regional market composition completed. Our data allows to construct measures of product-market competition (based on the number of competitors per relevant market, the number of alternative products (tariffs) per relevant market, the

number of customers per relevant market, the complete price distributions of available tariffs per relevant market and Herfindahl indexes). This data is being currently matched to our data, and will be ready for analysis by the beginning of March 2017.)

## 7 Robustness

As mentioned above, results presented in Section 6 are based on the main empirical specification being applied to an unbalanced sample that makes use of the maximum information available. To ensure that conclusions are not driven by these choices, we perform a large battery of robustness checks to gauge the immunity of our main results to varying the set of control variables, the degree of fixed-effects saturations, the mode of statistical inference, the definition of key variables, and the sample composition.

### 7.1 Alternative definitions of variables

**Work completed.** Effects are robust to various specifications, such as log-linearization and using a variety of alternative measures for electricity prices and utility profitability. **To be written down.**

### 7.2 Alternative FE saturations

**Work completed.** Effects are robust to all degrees of fixed-effect saturation and the additional inclusion of municipality or county fixed effects. **To be written down.**

### 7.3 Alternative modes of statistical interference

**Work completed.** Effects are robust to alternative assumptions on the error structure, including spatial clustering at the PAOLA, the municipality and the county level, multi-level clustering, and the wild cluster bootstrap-t procedure suggested by Cameron, Gelbach, and Miller (2008) to correct for a low number of (state) clusters. **To be written down.**

### 7.4 Alternative sample composition

**Work in progress.**

## 8 Conclusion

Municipality-level politicians hold substantial sway over the decision-making of German public energy providers. In this paper, we provide evidence for substantial distortions in the price-setting behavior of these utilities that closely track the electoral cycle: In the run-up to elections, their electricity prices systematically decrease compared to the prices set by privatized utilities (over which local politicians cannot exercise control). However, in the three years following an election, public utilities set relatively higher prices than private energy providers. These effects are robust to various alternative specifications.

Our results augment the literature on political business cycles by expanding its focus beyond the behavior of politicians at the federal or the state level. While municipality-level politicians do not control stimulus packages, large parts of the tax code, or the interest rates and while they are oftentimes constrained by strict budgetary rules, they can still affect vital business decisions that may stimulate the regional economy and foster electoral cycles at the municipal level.

In order to identify our results we use the universe of German electricity prices between 2003–2013 and combine them with detailed municipality-level election data (exploiting the staggered timing of German municipal elections). Our econometric identification strategy rests on the hypothesis that we should only observe politically motivated pricing in election years, only in municipalities in which elections are held at this point in time, and – importantly – only for politically connected public utilities. Given the high degree of variation in electoral timing and our ten-year price-data panel we are able to exploit both intertemporal variation, as utilities are repeatedly treated with an election over the course of time, and cross-sectional variation, as in any given year some utilities are treated and others are not.

Beyond establishing the above described electoral price cycle, ongoing work is devoted to analyze whether the presence and extent of electoral pricing cycles varies with the financial health of the respective public-utility provider. Moreover, we are collecting additional data to explore economically relevant consequences of political energy-price cycles.

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