Pain at the Pump, Pain at the Polls? Global Evidence on Election Timing, State Capacity, and Gasoline Prices

Online Appendix

Matthew D. Fails
Department of Political Science
Oakland University
371 Varner Drive
Rochester, Michigan 48309
USA
fails@oakland.edu

Contents

1. Robustness to alternative measures of *State Capacity*

2. Examination of non-linear marginal effects

3. Additional robustness analyses for main regression results

4. Distribution of key variable *Election Proximity*

5. Assessing the Role of Election Uncertainty for the Empirical Results

6. Main estimation sample details

7. Descriptive statistics for main estimation sample

1. Robustness to alternative measures of *State Capacity*

This section demonstrates that the main regression results are robust to using two alternative measures of *State Capacity*, namely a measure of *Administrative State Capacity* and *Fiscal State Capacity*, both of which are measured through country-expert assessments and reported in the Varieties of Democracy project (Coppedge et al. 2023).

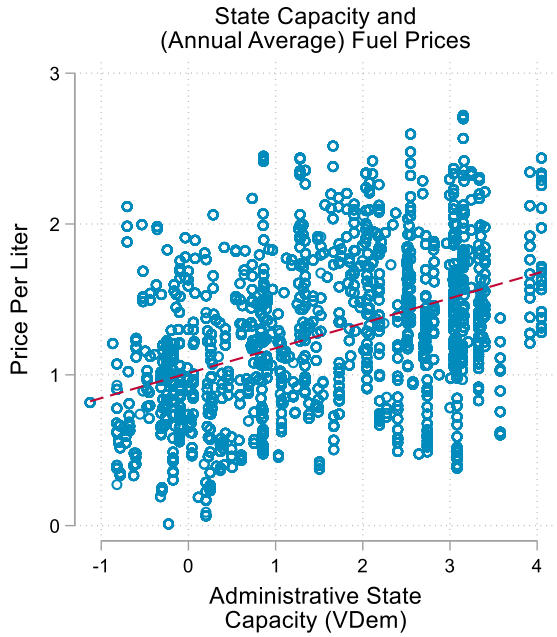
Administrative State Capacity focuses on "impartial and rule-following administration," specifically whether public officials are rigorous and impartial in the performance of their duties. Low values reflect assessments that public administration is arbitrary and discriminatory. As Knutsen and Kolvani (2022)[1] note, using this to measure capacity assumes that effective implementation of policies depends on bureaucracies following codified procedures and acting impersonally.

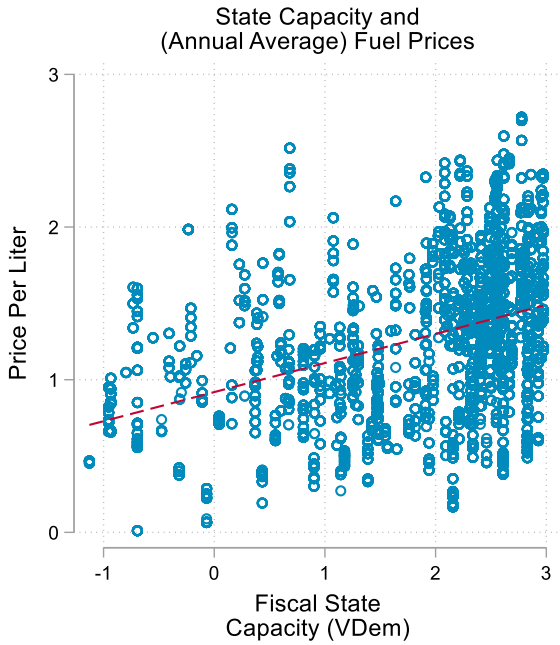
The second measure is *Fiscal State Capacity.* Low values indicate that states are either unable to raise revenues or rely on external sources of revenue they do not control directly. High values, by contrast, indicate that states possess the capacity to extract taxes on economic transactions. Though more narrow in scope, this measure captures a theoretically important dimension of capacity, as the development and administration of more comprehensive social programs requires first and foremost an ability to generate sufficient revenues.

I first replicate Figure 1 from the manuscript with each of these alternative measures. These figures present simple scatterplots of the (annual average) of gasoline prices per liter and annual measures of state capacity. Each shows a positive relationship between capacity and prices; low capacity regimes tend to be characterized by low prices, whereas high capacity regimes have higher gasoline prices.

[1] Knutsen, Carl Henrik, and Palina Kolvani. 2022. "Fighting the Disease or Manipulating the Data? Democracy, State Capacity, and the COVID-19 Pandemic." *Varieties of Democracy Institute Working Paper 2022: 127.* Available from https://v-dem.net/media/publications/Working_Paper_127_final.pdf

Figures A1 and A2





Second, I re-estimate the main two-way fixed effects regressions using each of these *State Capacity* alternatives. The results are presented in the table below.

Table A1: Two-Way Fixed Effect Regressions, Alternative State Capacity Measures

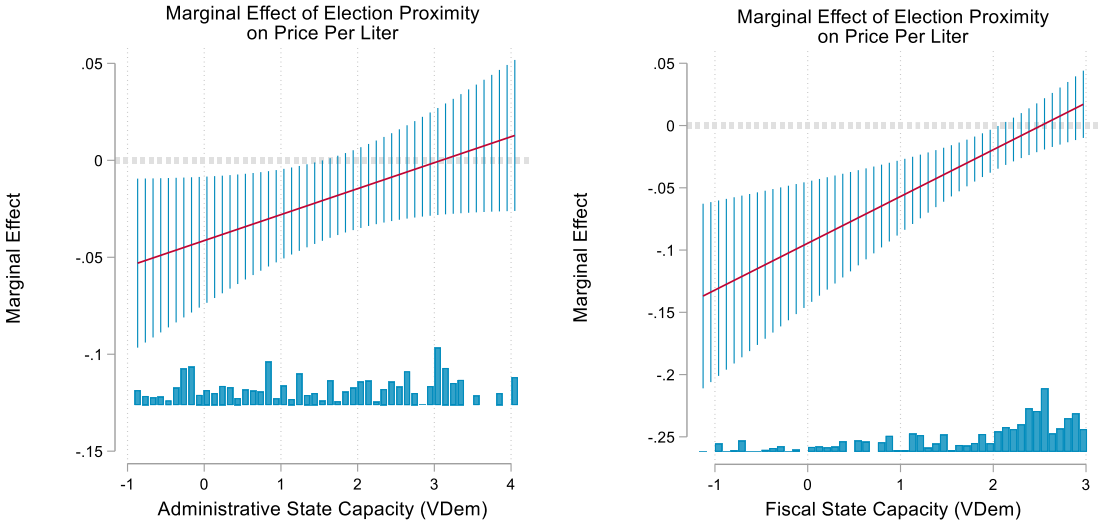
	(1)	(2)
Election Proximity	-0.041**	-0.095***
	(0.017)	(0.025)
Administrative State Capacity	0.037	
	(0.087)	
Election Proximity *x* Administrative State Capacity	0.013*	
	(0.007)	
Fiscal State Capacity		0.009
		(0.107)
Election Proximity *x* Fiscal State Capacity		0.038***
		(0.012)
(log) GDP per capita	-0.157	-0.242
	(0.195)	(0.180)
(log) Oil income per capita	-0.006	-0.003
	(0.023)	(0.025)
Electoral Democracy Index	2.126***	2.257***
	(0.659)	(0.687)
Observations	12669	12461

NOTE: Dependent variable is measure of gasoline price per liter. Standard errors clustered on countries in parentheses. Sample is democratic regimes, observed monthly from 1990-2015. Country and year-month fixed effects and constant also included. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The coefficient estimates, including for the interaction term, are consistently signed and statistically significant, just as in the main results reported in the manuscript.

Finally, I plot the marginal effects plots from each regression. Each is consistent with the evidence reported earlier, namely that *Election Proximity* has a negative effect on *price per liter* when *State Capacity* is low, and that the effect is meaningful across a wide share of the observed data and values of the moderating variable.

<u>Figures A3 and A4</u>



2. Examination of non-linear marginal effects

I follow Hainmueller, Mummuulo, and Xu's (2019)[2] approach to assess the potential for non-linear interaction effects. Specifically, each figure reports the linear interaction effect and the results of their binning estimator. I include this exercise for the main measure of *State Capacity* used in the manuscript (Hanson and Sigman 2021), as well as the two Varieties of Democracy alternatives discussed above. In the first two, the reported *p*-value is above 0.05, and thus fails to reject the null that the linear effect and three-bin version are the same. The *p*-value when using the measure of *Fiscal State Capacity* is 0.02, suggesting a non-linear interaction effect in this model. However, the distribution of the moderating variable is considerably more skewed than the alternatives and the lowest tercile of observations has the expected negative marginal effect.

[2] Hainmueller, Jens, Jonathan Mummulo, and Yiqinq Xu. 2019. "How Much Should We Trust Estimates from Multiplicative Interaction Models? Simple Tools to Improve Empirical Practice." *Political Analysis* 27(2): 163-192.

Figure A5

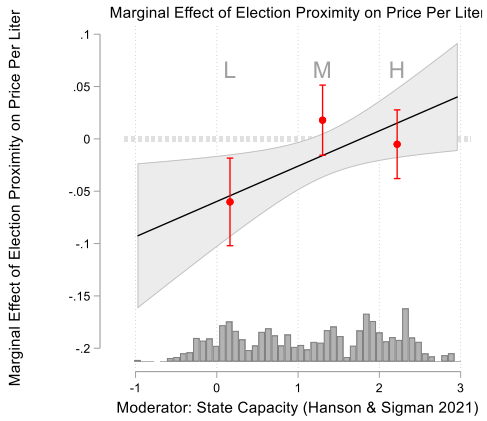


Figure A6

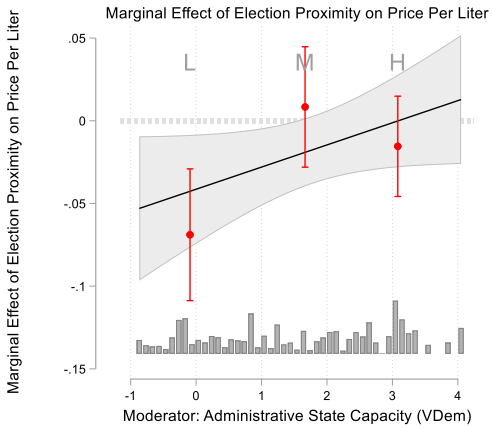
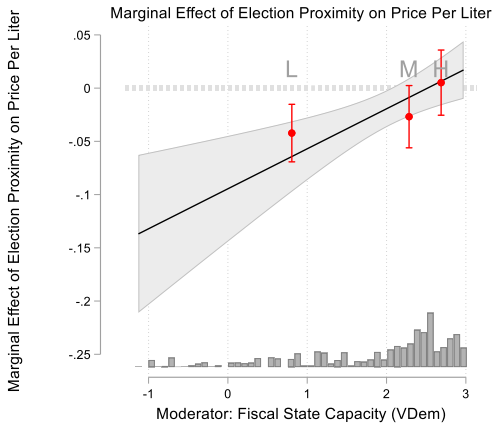


Figure A7



3. Additional robustness analyses for main regression results

Table A2 (below) reports the results of additional robustness analyses, drawing on the baseline model reported in the manuscript in Table 1, Model 3. Specifically, this appendix table examines the sensitivity of the main results to additional measurement and modeling choices. Model 1 controls for *Net Oil & Gas Exports* with data from Ross and Mahdavi (2017). Model 2 substitutes Ross, Mahdavi, and Hazlett's (2017) "price-gap" measure, which compares the pump price to a baseline price estimate, as the dependent variable. Model 3 replaces the measure of *oil income per capita* with a measure of *proven oil reserves* (in billions of barrels). Since the latter of these measures is available over a longer time span, the temporal domain of this sample extends through the end of 2018.[3] Finally, Model 4 returns to the main regression specification while clustering standard errors on countries and months. In each additional model, the results are consistent with the core findings reported in the manuscript.

Table A2: Two-Way Fixed Effects Regressions, Additional Robustness Analyses

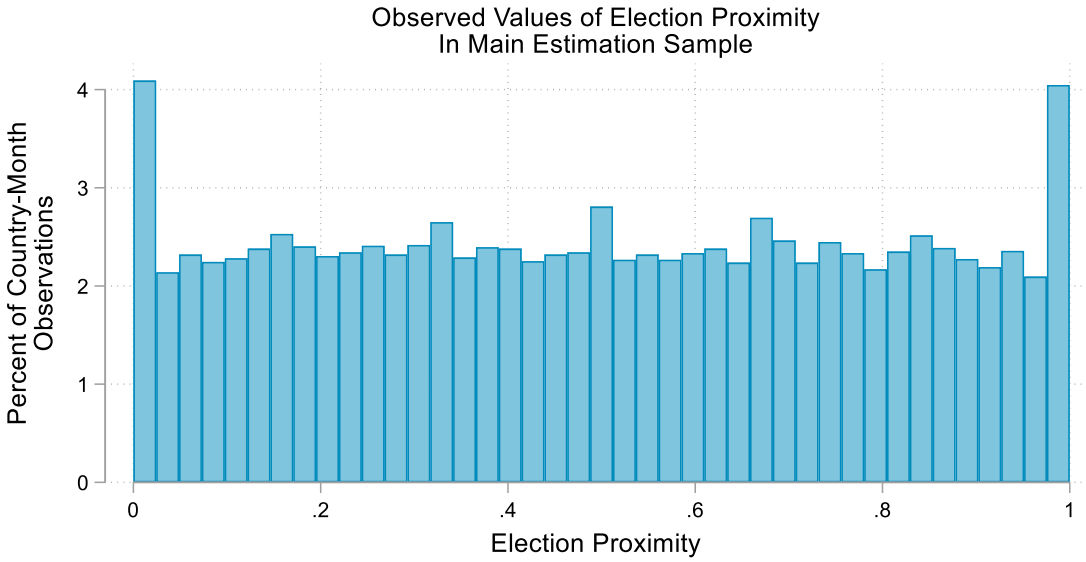
	(1)	(2)	(3)	(4)
Election Proximity	-0.054**	-0.059***	-0.053**	-0.060**
	(0.026)	(0.022)	(0.022)	(0.023)
State Capacity	0.165	0.138	0.136	0.138
	(0.111)	(0.109)	(0.105)	(0.107)
Election Proximity *x* State Capacity	0.030*	0.033**	0.029**	0.034**
	(0.016)	(0.015)	(0.014)	(0.015)
(log) GDP per capita	-0.161	-0.208	-0.199	-0.209
	(0.199)	(0.193)	(0.197)	(0.190)
(log) Oil income per capita	-0.007	-0.007		-0.007
	(0.026)	(0.024)		(0.024)
Electoral Democracy	2.275***	2.181***	2.052***	2.176***
	(0.666)	(0.624)	(0.627)	(0.615)
Net Oil & Gas Exports	-0.000			
	(0.000)			
(log) Proven Oil Reserves			-0.038	
			(0.032)	
Observations	87/11,416	88/12,462	89/12,708	88/12,462

NOTE: Dependent variable is measure of gasoline price per liter, except for Model 2 which uses Ross, Mahdavi, and Hazlett's (2017) "price-gap" measure. Standard errors clustered on countries in parentheses. Model 4 clusters standard errors on countries and year-months. Sample is democratic regimes, observed monthly from 1990-2015, except for Model 3 which includes monthly data through 2018. Country and year-month fixed effects and constant also included. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[3] Additional gasoline price data obtained from globalpetrolprices.com. I follow Ross, Hazlett, and Mahdavi's (2017) approach to convert from prices in local currencies.

4. Distribution of key variable *Election Proximity*

Figure A8: Distribution of *Election Proximity* Values in Main Estimation Sample



NOTE: Election Proximity measured by dividing the current month's position in an election cycle by the number of total months between elections. A value of 0 indicates an election occurred this month, a value of 0.5 indicates the mid-point of an election cycle, and a value of 1.0 indicates the last month of an election cycle.

Figure A8 reports the distribution of values for the main independent variable, *Election Proximity.* Because the length of country's election cycles differs, values of 0.0 and 1.0 (that is, values of *Election Proximity* that correspond to an election month and the last month of an election cycle respectively) are over-represented in the distribution. As described in the paper, I consider only those elections where incumbents were uncertain about their prospects of victory ahead of time (using Hyde and Marinov's [2012] measure *NELDA12).*

5. Assessing the Role of Election Uncertainty for the Empirical Results

There are two main requirements for a country-month to enter the estimation sample: a country must be democratic, according to the Varieties of Democracy criteria (Lürhmann, Lindberg, and Tannenberg, 2017), and the month must be part of a competitive electoral cycle. I define competitive electoral cycles using Hyde and Marinov's (2012) measure that distinguishes elections in terms of whether or not incumbents were confident of victory ahead of time – specifically, their variable *NELDA12*. Incumbents who expect to win the election are unlikely to devote the resources necessary to keeping gasoline prices low. By contrast, this process is much more likely when incumbents are *not* confident of their electoral success, at least amongst regimes which lack the capacity to implement more comprehensive and targeted social policies.

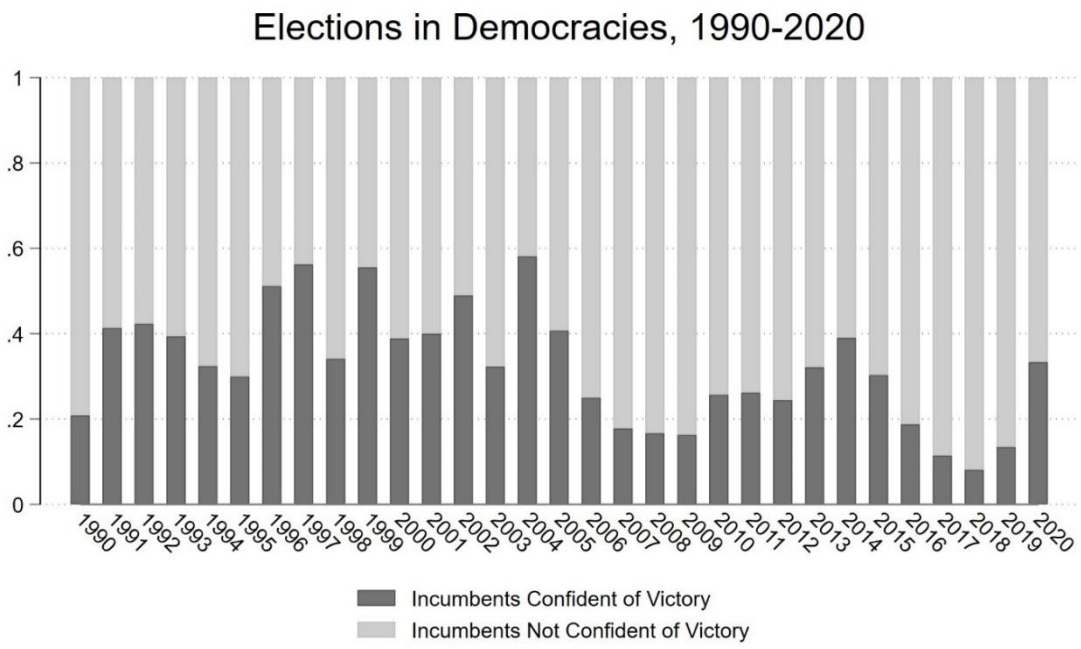
This section of the appendix focuses on the latter of these requirements for constructing the sample, first by examining the descriptive patterns of such electoral cycles in democracies, and second by assessing the importance of this rule for the empirical results presented in the paper. A final sub-section considers the paper's argument in light of the growing number of "electoral autocracies" globally.

i. How often are elections in democracies 'uncertain'?

Lürhmann, Lindberg, and Tannenberg's (2017) criteria ensure that all regimes included in the sample have free and fair elections, but not all free and fair elections present incumbents with equal amounts of uncertainty regarding the outcome. The theory advanced in the paper emphasizes leaders' fear of electoral backlash from rising fuel prices, and thus an increased willingness to control fuel prices as an election nears. Given the emphasis on electoral backlash, the sample includes only those elections where incumbents lacked confidence about the results.

How common are these 'uncertain' elections in democracies? As noted above, I rely on Hyde and Marinov's (2012) measure *NELDA12* to make this determination. Figure A9 visualizes these patterns by examining the yearly share of all democratic elections where incumbents were confident of victory (and the remaining share of elections where they were not confident of victory). For instance, in 1992 incumbents in democracies were confident of victory in more than 40% of elections, and thus these elections are excluded from the sample. The figure demonstrates that occurrence of such elections in democracies was relatively frequent until the early 2000s; between 1990 and 2004, incumbents were confident of victory in more than 41% of elections on average. By contrast, in the years following 2004, this level fell to just slightly more than 25%.

Figure A9



NOTE: Bars report annual share of democratic elections, according to whether or not incumbents were confident of victory ahead of time. Data from Hyde and Marinov (2012).

In the main results presented in the paper, there are 376 electoral cycles where incumbents were not confident of victory (this number reflects some electoral cycles that are dropped from the sample because of missing data on other model covariates). By contrast, if the sample is not restricted to only these uncertain electoral cycles, there would be 531 elections. The next sub-section examines the consequences of this sample composition.

ii. How does the sample composition impact the empirical results?

In this sub-section, I examine the empirical consequences of this sample construction. Specifically, I replicate the three regressions in Table 1 (main paper) but use a sample only of those election cycles where incumbents were confident of victory ahead of time. Theoretically, there is little reason to expect such incumbents to devote the resources to controlling gasoline prices.

Table A5 presents regression results that confirm this. For the sake of comparison, the results reported in columns 1, 3, and 5 are identical to those reported in Table 1. That is, they use only elections where incumbents were not confident of victory ahead of time. The results in columns 2, 4, and 6 use only elections where incumbents were confident of victory ahead of election day. The findings are clear – no matter the covariates included, the key results are only present when incumbents have some uncertainty about the electoral outcome. Only when incumbents fear an electoral backlash does a pending election make controlling fuel prices more likely.

Table A5: Two-Way Fixed Effects Regressions, Across Different Election Samples and measures of *Election Proximity*

Incumbents Confident of Victory Before Election?	(1) *No*	(2) *Yes*	(3) *No*	(4) *Yes*	(5) *No*	(6) *Yes*
Election Proximity	-0.049**	0.026	-0.061***	0.032	-0.060***	0.032
	(0.022)	(0.041)	(0.022)	(0.036)	(0.022)	(0.036)
State Capacity	0.125	0.109	0.172	0.095	0.138	0.102
	(0.098)	(0.097)	(0.115)	(0.107)	(0.109)	(0.108)
Election Proximity *x* State Capacity	0.026*	-0.023	0.035**	-0.024	0.034**	-0.024
	(0.014)	(0.030)	(0.015)	(0.026)	(0.015)	(0.026)
(log) GDP per capita			-0.197	0.414*	-0.209	0.408*
			(0.202)	(0.224)	(0.193)	(0.217)
(log) Oil income per capita			-0.024	-0.057***	-0.007	-0.056***
			(0.027)	(0.012)	(0.024)	(0.013)
Electoral Democracy					2.176***	-0.198
					(0.624)	(0.503)
Countries	91	70	88	63	88	63
Observations	13,319	4,619	12,462	4,224	12,462	4,224

NOTE: Dependent variable is measure of gasoline price per liter. Standard errors clustered on countries in parentheses. Sample is democratic regimes, observed monthly from 1990-2015. Models vary in terms of elections used to construct sample and generate measure of *Election Proximity*. Country and year-month fixed effects and constant also included. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

iii. Do "Electoral Autocracies" behave similarly?

Finally, this sub-section examines a related question concerning the growing number of "electoral autocracies" globally. There is now a large literature examining the frequency and rationale of minimally competitive elections in authoritarian settings.[4] Miller (2020) for instance, reports that 113 countries have held multiparty autocratic elections since the end of World War II, and the share of electoral autocracies globally is more than three times the share of closed autocracies that lack electoral processes. Why are such regimes excluded from the analysis here?

There are both theoretical and empirical rationales for this decision. Theoretically, autocratic elections "help incumbent autocratic rulers manage the range of intra-elite and societal pressures that threaten their survival" (Hanson 2018: 18). Large electoral victories project a sense of the ruling party's inevitability and can dissuade opposition parties from forming or competing. Autocratic elections can also discourage elite defection and solidify patronage networks. While there is empirical evidence that the contestation of autocratic elections is associated with improvements in population health and human development (Miller 2015; Teo 2021)[5], there is little evidence that these result from a spending process that is determined by the proximity of the next election, as hypothesized in this paper. Rather, these outcomes reflect preemptive measures leaders take to ensure that the playing field is sufficiently tilted in their favor when election day eventually arrives.

Empirical evidence is consistent with this argument and represents another reason for excluding electoral autocracies from the sample here. Specifically, Figure A10 replicates Figure A9 above by examining the relative frequency of elections where incumbents were confidence of victory ahead of time, but in electoral authoritarian regimes. The evidence is clear; elections in autocracies are (unsurprisingly) not competitive, with incumbents confident of victory in more than 70% of elections on average throughout the sample (and almost 80% of elections before 2004).

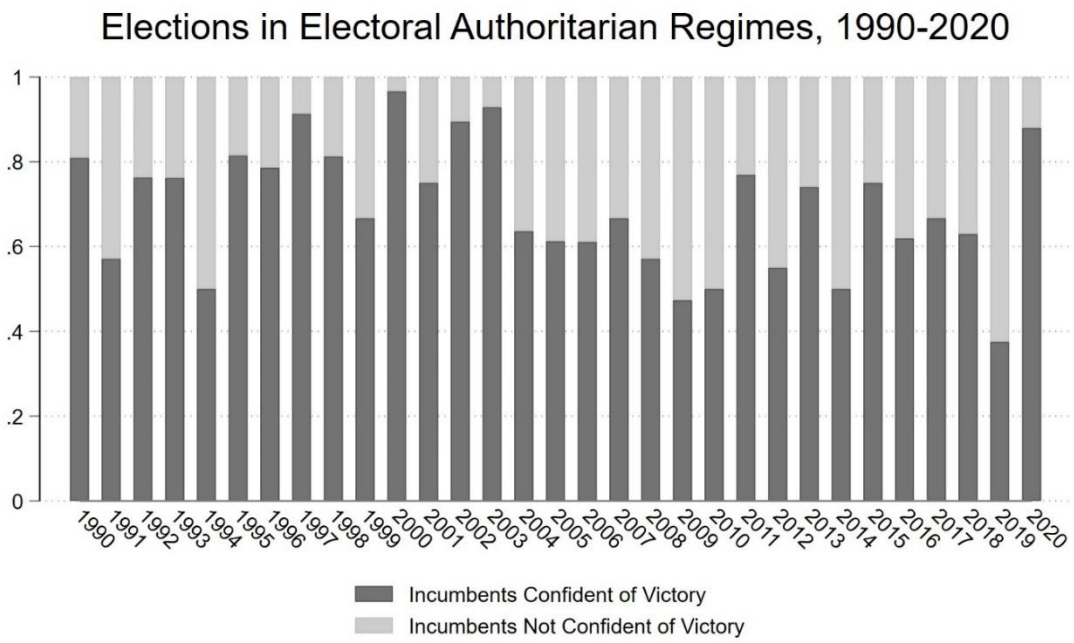
Collectively, this suggest that the relationship between election timing and fuel prices is likely to be very different in democracies than in autocracies. I thus exclude electoral authoritarian regimes from the sample and leave a more focused analysis on those regimes to future scholars.

---

[4] For instance, see Schedler, Andreas. 2013. *The Politics of Uncertainty: Sustaining and Subverting Electoral Authoritarianism*. Oxford University Press; Miller, Michael. 2020. "The Strategic Origins of Electoral Authoritarianism." *British Journal of Political Science* 50(1): 17-44; Hanson, Jonathan K. 2018. "State Capacity and the Resilience of Electoral Authoritarianism: Conceptualizing and Measuring the Institutional Underpinnings of Autocratic Power." *International Political Science Review* 39(1): 17-32.

[5] Miller, Michael. 2015. "Electoral Authoritarianism and Human Development." *Comparative Political Studies* 48(6): 691-727; Teo, Terence K. 2021. "Inequality under Authoritarian Rule." *Government and Opposition* 56(2): 201-225.

Figure A10



NOTE: Bars report annual share of elections according to whether or not incumbents were confident of victory ahead of time. Data from Hyde and Marinov (2012).

6. Main estimation sample details

Table A4: Composition of Main Estimation Sample

Country	Number of Elections in Dataset	Total Monthly Observations in Dataset	Country	Number of Elections in Dataset	Total Monthly Observations in Dataset
Albania	2	69	Malawi	2	101
Argentina	9	218	Mali	3	59
Australia	9	224	Mauritius	6	288
Austria	9	211	Mexico	5	155
Bangladesh	3	116	Moldova	5	142
Belgium	7	264	Mongolia	6	136
Benin	5	114	Nepal	2	60
Bolivia	7	256	Netherlands	8	264
Bosnia and Herzegovina	3	106	New Zealand	8	287
Brazil	5	168	Nicaragua	4	193
Bulgaria	8	158	Niger	2	57
Canada	8	259	Nigeria	2	39
Chile	5	213	North Macedonia	6	30
Colombia	7	109	Norway	6	284
Costa Rica	6	240	Panama	5	213
Croatia	3	50	Papua New Guinea	1	12
Cyprus	3	66	Paraguay	6	241
Czech Republic	9	130	Peru	4	117
Denmark	7	231	Philippines	2	68
Dominican Republic	2	64	Poland	5	119
Ecuador	6	98	Portugal	8	169
El Salvador	7	119	Romania	8	172
Estonia	4	144	Senegal	3	81

Finland	10	250	Serbia	4	83
France	4	155	Sierra Leone	1	58
Georgia	1	12	Slovakia	3	60
Germany	5	188	Slovenia	4	86
Ghana	3	123	South Africa	1	53
Greece	9	263	South Korea	10	238
Guatemala	6	187	Spain	6	216
Guyana	2	105	Sri Lanka	2	73
Honduras	2	86	Suriname	6	246
Hungary	3	123	Sweden	6	252
India	4	122	Switzerland	6	273
Indonesia	7	196	Thailand	2	61
Ireland	5	130	Timor-Leste	3	99
Israel	8	276	Trinidad and Tobago	7	247
Italy	5	178	Tunisia	1	8
Jamaica	1	48	Turkey	4	162
Japan	9	181	Ukraine	3	48
Kenya	1	24	United Kingdom	5	264
Latvia	5	177	United States of America	13	290
Lebanon	1	72	Uruguay	5	295
Liberia	2	36	Venezuela	2	66
Lithuania	6	145	Zambia	4	133
Madagascar	1	17			

7. Descriptive statistics for main estimation sample

Table A5: Descriptive Statistics for Main Estimation Sample

Variable	Obs.	Mean	Standard Deviation	Minimum	Maximum	Source
Price per liter, in USD	13,319	1.27	0.53	0.01	6.07	Martinez-Alvarez et al. (2023)
Election Proximity	13,319	0.50	0.30	0	1	NELDA 6.0 (Hyde and Marinov 2012)
State Capacity	13,319	1.20	0.90	-0.98	2.96	Hanson and Sigman (2021)
Fiscal State Capacity	13,111	1.86	0.99	-1.12	2.97	Varieties of Democracy
Administrative State Capacity	13,319	1.57	1.34	-1.13	4.05	Varieties of Democracy
(log) GDP Per Capita	13,109	9.77	0.95	6.92	11.18	World Bank
(log) Oil Income Per Capita	12,673	3.15	2.95	0	10.25	World Bank
Electoral Democracy	13,319	0.77	0.13	0.5	0.93	Varieties of Democracy
Presidential dummy	13,319	0.40	0.49	0	1	Cruz, Keefer, and Scartascini (2020)
Proportional Representation dummy	13,057	0.79	0.40	0	1	Cruz, Keefer, and Scartascini (2020)
Executive Ideology (Right, Center, Left)	12,639	1.57	1.17	0	3	Cruz, Keefer, and Scartascini (2020)
Regime Corruption	13,319	0.30	0.28	0.00	0.92	Varieties of Democracy
Net Oil & Gas Export Value	11,626	28.79	1483.13	-2188.25	15102.38	Ross and Mahdavi (2014)
Population	12,673	4.20E+07	1.18E+08	4.02E+05	1.27E+09	Varieties of Democracy
Legislative Election Dummy	13,319	0.63	0.48	0	1	NELDA 6.0 (Hyde and Marinov 2012)
(lot) Proven Oil Reserves (bbl)	13,041	0.50	0.94	0	5.20	International Energy Agency
Price-Gap alternative DV measure	13,195	0.69	0.46	-0.74	5.65	Ross, Hazlett, and Mahdavi (2017)