Drought-reliefs and Partisanship

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Introduction

Facts:

- Most countries are organised with several layers of government
- A sizeable share of the central government budget is spent 'locally' → direct spending or transfers
- Money flows influence political races

Broad questions:

- Are citizens in different regions treated differently?
- What are the drivers of geographical distortions?
- Is political alignment important?
- Is there a trade-off between the intensity of needs and the allocation biases?

This paper

Empirical analysis with a (stylised) model that helps us understand and interpret the patterns
We investigate the bias in the allocation of transfers (from central to local), with a focus on:

- political alignment
  - is it enough to be aligned?
- the intensity of citizens' needs
  - is there an interaction between the effect of alignment and how badly citizens need a transfer?
- the type of election (central or local)
  - do we observe the same patterns before local and central elections?

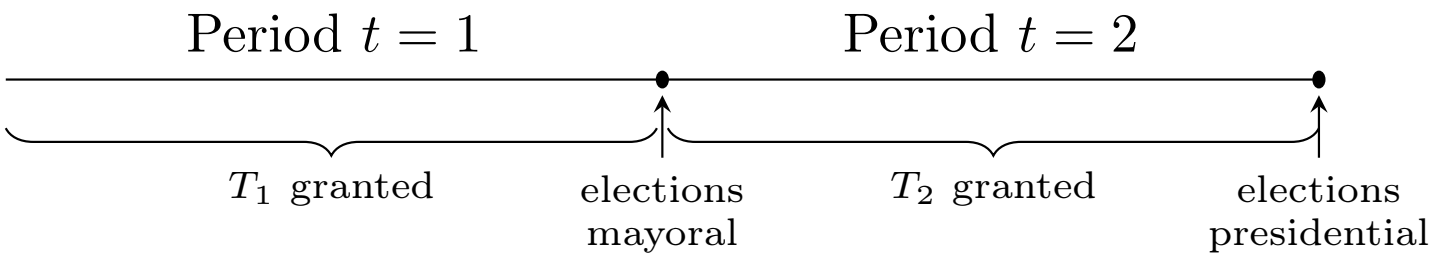
The theoretical framework

- rational agents + symmetric information
- 2 periods $t = \{1, 2\}$
- elections (mayoral and presidential) with 1 incumbent and 1 opponent

The theoretical framework

- At the beginning of each period, each municipality (i) suffers drought of intensity $D_t^i \in \left[\underline{D}, \overline{D}\right]$
- The president grants a discretionary transfer $\overline{T}$ to an arbitrary subset of municipalities, so that $T_t^i = \{0, \overline{T}\}$ is the transfer received by municipality i at period t.
- mayoral elections at the end of $t = 1$; presidential elections at the end of $t = 2$

Figure: Timing



Voting decision

- Voters' utility is weakly positive and concave in consumption.
- Politicians are concerned with their own reelection only.
- Retrospective voting: support the incumbent if current utility is 'large enough'
  1. popularity shock
  2. in each district, *ceteris paribus*, the mayor will support/endorse the incumbent president more if the district has enjoyed a transfer.

▸ Detailed model

Predictions

The president's electoral benefit of granting a transfer is increasing in droughts.

Proposition (Presidential elections)

The president assigns grants to the municipalities that suffered the most severe drought.
The equilibrium allocation is maximising voters' welfare.

Proposition (Mayoral elections)

The president allocates transfers to all districts where the drought is 'sufficiently' severe.
The 'sufficiency' threshold is lower for aligned municipalities.
The equilibrium allocation of transfers is not welfare maximising.

The empirical framework

Empirics:

- Brazil: presidential democracy
- Presidential and mayoral elections
  - the two types of election alternate every 2 years
  - 2000 - 2016
  - Presidential elections: single-district, majoritarian with run-off.
  - Mayoral elections: majoritarian with run-off (plurality rule in smaller municipalities).
  - RDD based on close elections: margin of victory computed at the last mayoral elections.
- drought aid relief transfers (binary variable)

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State of emergency and transfers

In case of (alleged) aridity:

- preliminary Presidential declaration of the state of emergency selects the targeted municipalities.
- a body within the federal Ministry of National Integration (SEDEC) decides, for each targeted municipality, the composition of the aid-relief-package
- we have data on the declaration of emergency (who receives the transfer) but not on the individual package that they are entitled to

Aridity

It allows us to identify transfers that are not entirely justified by a drought emergency.

Monthly data from CRU (U East Anglia) at 0.5 grid-level (55x55 km).

Almost all the economic literature measures droughts through precipitations alone (SPI index).

- Albert et al. (2021) and this paper are possibly the first in economics using the Standardised Precipitation Evapotranspiration Index (▸ SPEI)
- *SPEI* combines information on precipitations and moisture retained in the soil (evapotranspiration).
- *SPEI* superior to SPI (rainfalls) as a proxy of moisture/aridity (Vicente-Serrano et al., 2010).

Main regression

$$\begin{aligned} Aid_{i,b} = \beta_1 LowAridity_{i,b} + \beta_2 LowAridity * Alg_{i,b} + \\ \beta_3 ModerateAridity_{i,b} + \beta_4 ModerateAridity * Alg_{i,b} + \\ \beta_5 SevereAridity_{i,b} + \beta_6 SevereAridity * Alg_{i,b} + \\ \gamma_p MV_{i,t-x} + \theta_p MV_{i,t-x} * Alg_{i,b} + \epsilon_{i,b}. \end{aligned} \tag{1}$$

The Margin of Victory ($MV_{i,t-x}$) is computed at t, based on the electoral results at $t-x$ (last mayoral election), as the (normalised) difference in vote shares:

$$MV_{i,t-x} = \frac{VS^{A}_{i,t-x} - VS^{BR}_{i,t-x}}{VS^{A}_{i,t-x} + VS^{BR}_{i,t-x}} \tag{2}$$

RDD (not accounting for aridity)

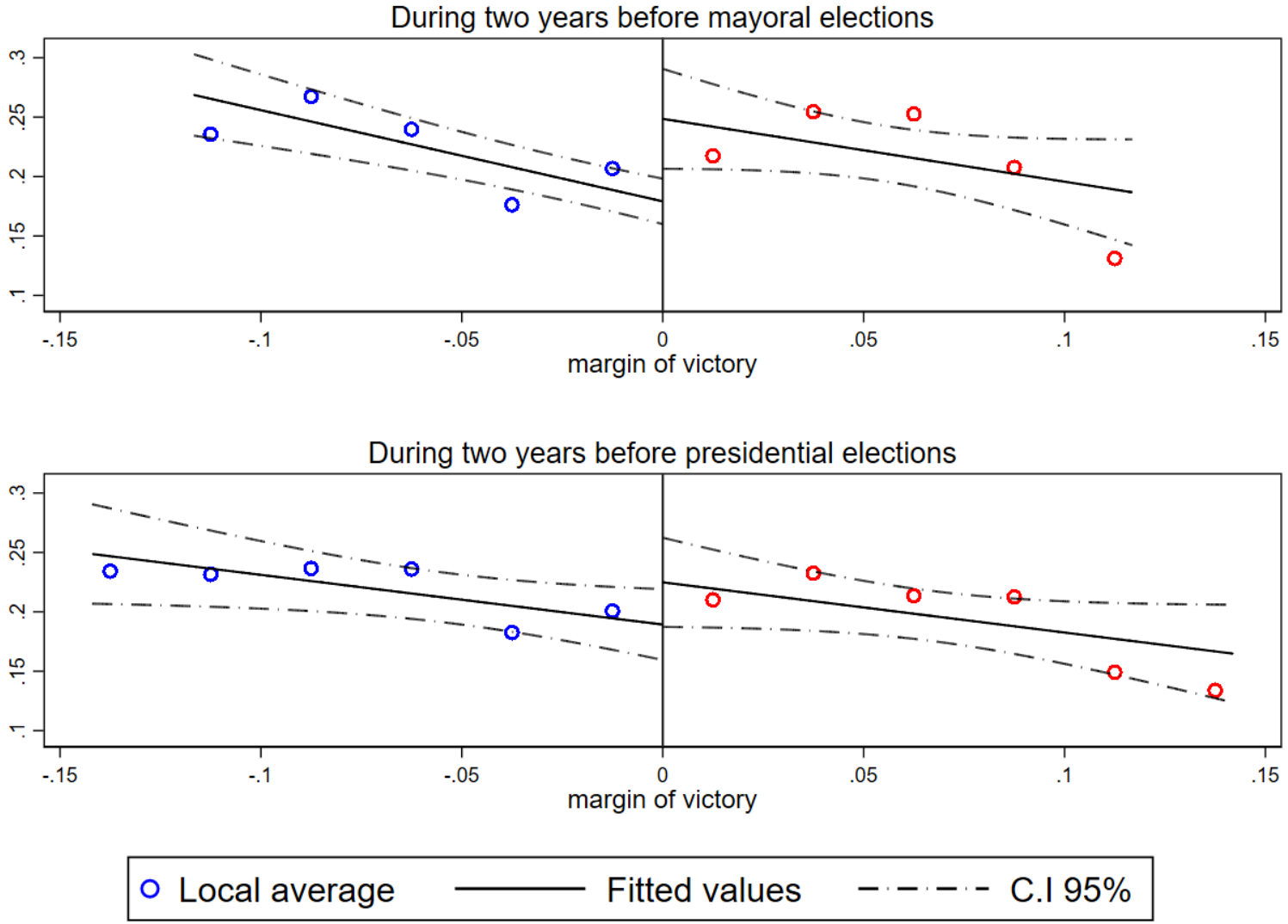
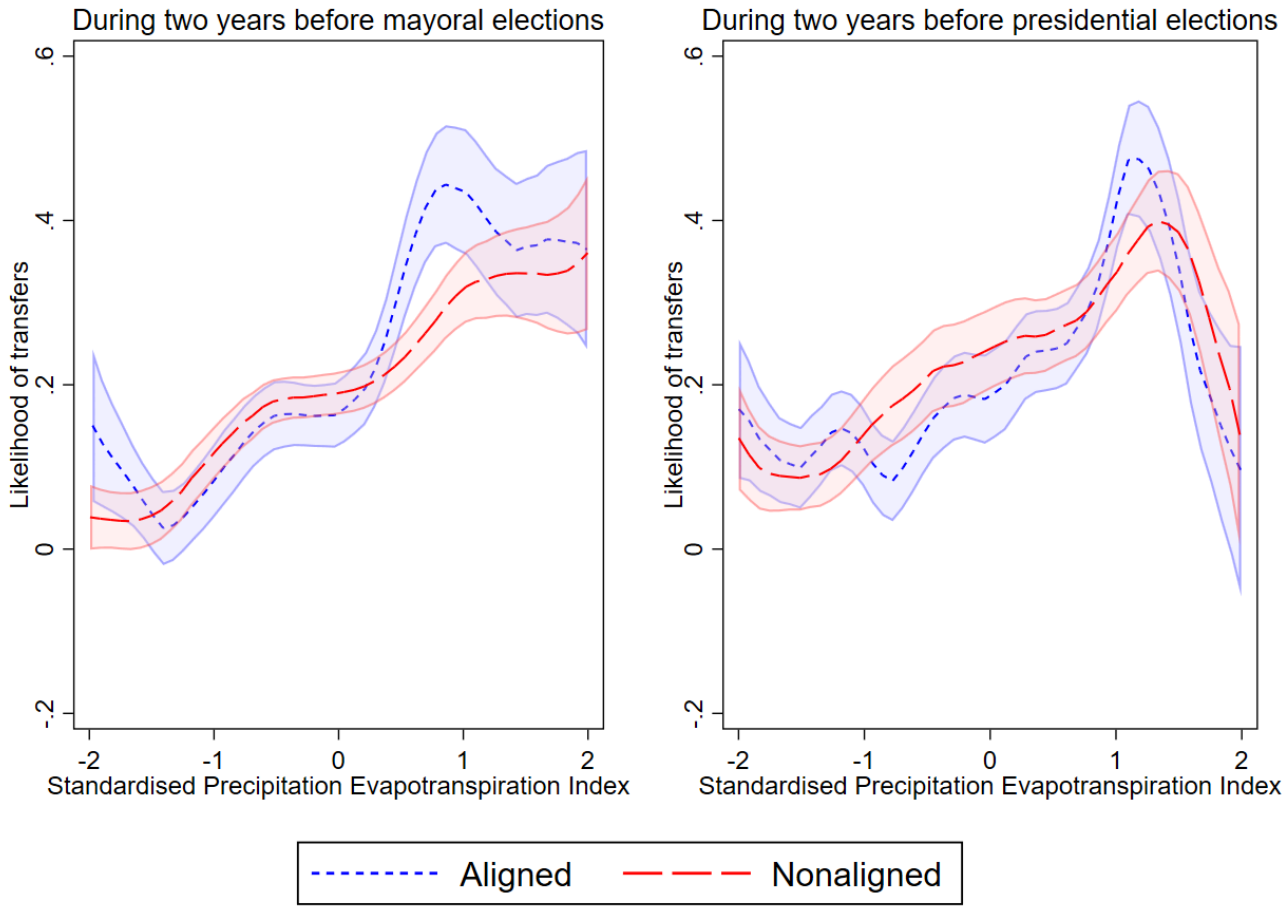
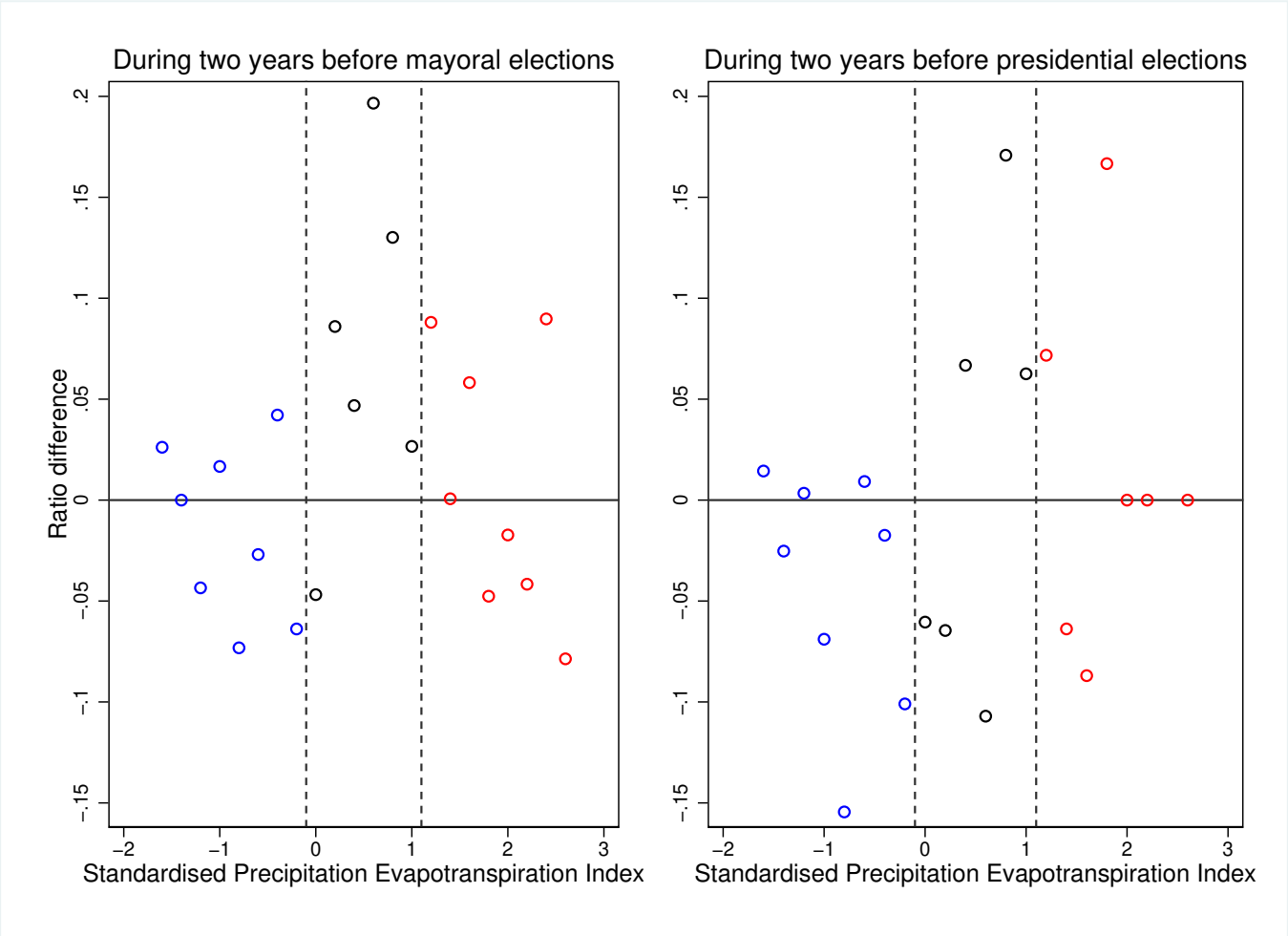


Figure: Kernel plots of the likelihood of receiving transfers



The dashed lines represent local polynomial estimates using a kernel function of the probability of transfers on SPEI. The areas indicate the 95% confidence intervals.

Figure: Share of municipalities that obtained aid-relief: difference between aligned and non-aligned municipalities.



vertical axis: difference between the % aligned municipalities that did and didn't receive aid. Each dot corresponds to a different degree of aridity, measured by the *SPEI*. The two dashed vertical lines delimit the area defined as moderate aridity.

Main results (clustered municipal)

Dep. variable: Aid-relief		**Before mayoral elections**				**Before presidential elections**			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Low	& a	0.149***	0.007	0.017	0.045	0.167***	-0.009	0.128**	0.068
		(0.093 - 0.205)	(-0.060 - 0.074)	(-0.063 - 0.097)	(-0.039 - 0.129)	(0.109 - 0.225)	(-0.081 - 0.064)	(0.022 - 0.234)	(-0.043 - 0.179)
	& non-a	0.111***				0.127***			
		(0.076 - 0.147)				(0.082 - 0.172)			
Mod	& a	0.407***	0.233***	0.230***	0.212***	0.317***	0.174***	0.189***	0.151**
		(0.317 - 0.497)	(0.143 - 0.324)	(0.109 - 0.352)	(0.098 - 0.327)	(0.247 - 0.387)	(0.093 - 0.256)	(0.063 - 0.314)	(0.027 - 0.274)
	& non-a	0.226***	0.106***	0.107***	0.088**	0.322***	0.209***	0.166***	0.164***
		(0.173 - 0.280)	(0.049 - 0.162)	(0.028 - 0.186)	(0.016 - 0.161)	(0.254 - 0.390)	(0.140 - 0.279)	(0.044 - 0.287)	(0.052 - 0.277)
Sev	& a	0.406***	0.235***	0.263***	0.270***	0.423***	0.256***	0.362***	0.312***
		(0.311 - 0.500)	(0.140 - 0.331)	(0.129 - 0.396)	(0.134 - 0.407)	(0.317 - 0.529)	(0.147 - 0.365)	(0.216 - 0.507)	(0.167 - 0.457)
	& non-a	0.340***	0.205***	0.176***	0.192***	0.425***	0.314***	0.277***	0.296***
		(0.259 - 0.421)	(0.124 - 0.286)	(0.062 - 0.289)	(0.080 - 0.303)	(0.318 - 0.532)	(0.215 - 0.413)	(0.128 - 0.425)	(0.159 - 0.432)
Obs		1,507	1,507	1,507	1,507	1,395	1,395	1,395	1,395
R-2		0.279	0.320	0.775	0.795	0.305	0.352	0.681	0.711
Bandwidth		0.117	0.117	0.117	0.117	0.142	0.142	0.142	0.142
Year FE		No	Yes	No	Yes	No	Yes	No	Yes
Munic. FE		No	No	Yes	Yes	No	No	Yes	Yes
F-statistics tests: (aligned = non-aligned)									
(1) Low		1.380	0.043	0.176	1.095	1.210	0.059	5.669	1.458
p-value		0.241	0.836	0.675	0.296	0.272	0.808	0.018	0.228
(2) Mod		12.09	6.398	3.819	3.877	0.012	0.524	0.092	0.034
p-value		0.001	0.012	0.051	0.049	0.914	0.469	0.762	0.854
(3) Sev		1.332	0.300	1.742	1.370	0.001	0.662	0.767	0.029
p-value		0.249	0.584	0.187	0.242	0.980	0.416	0.381	0.865

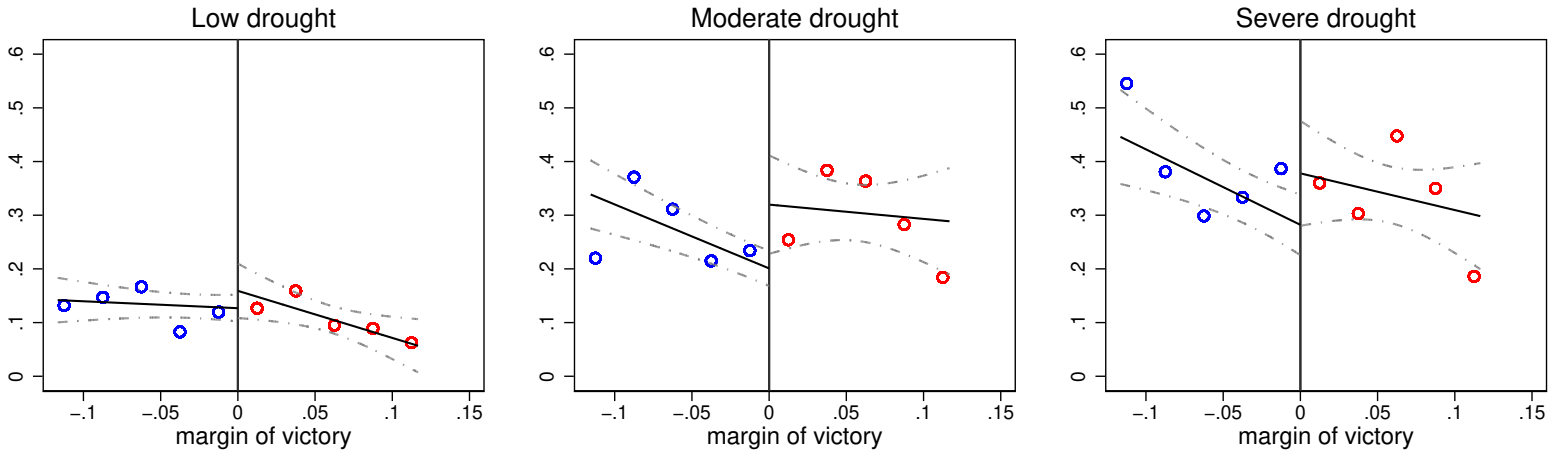
Note: The forcing variable is the margin of victory in the previous mayoral election of the candidate from the party of the incumbent president.
Optimal bandwidth selected according to Calonico et al. (2014). Polynomial order: 1.
95% confidence intervals in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10. Errors were clustered at the municipality level.

Main results - zoom columns (1), (4), (5), (8)

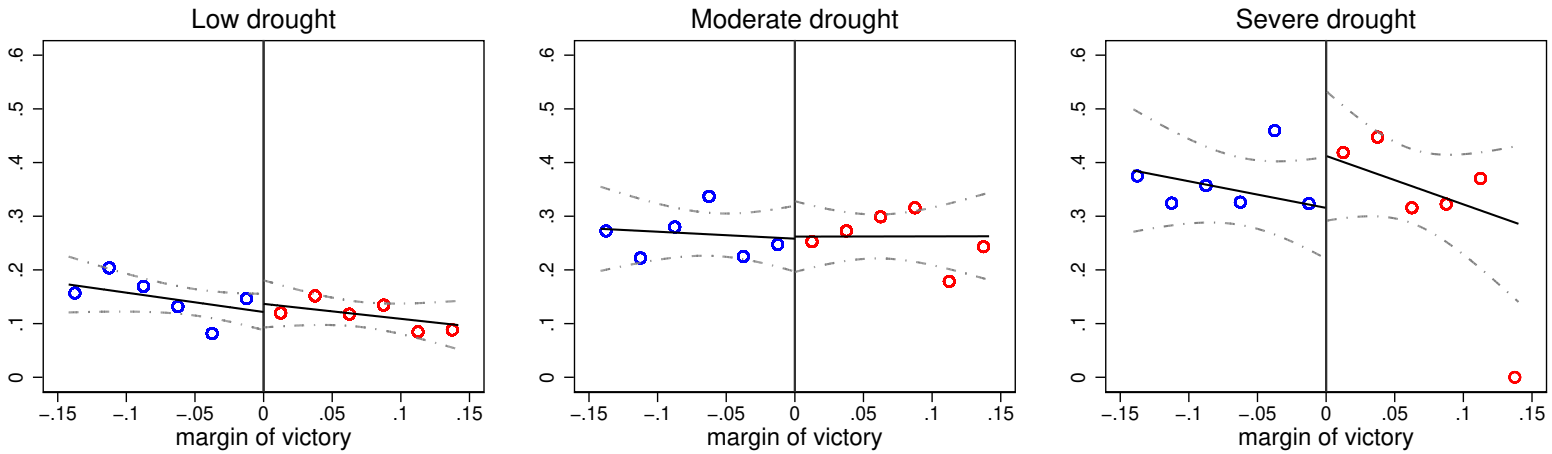
Observations	1,507	1,507	1,395	1,395
R-squared	0.279	0.795	0.305	0.711
Bandwidth	0.117	0.117	0.142	0.142
Year FE	No	Yes	No	Yes
Municipality FE	No	Yes	No	Yes
F-statistics tests: (aligned = non-aligned)				
(1) in Low-Aridity municipalities:	1.380	1.095	1.210	1.458
p-value	0.241	0.296	0.272	0.228
(2) in Moderate-Aridity municipalities:	12.09	3.877	0.012	0.034
p-value	0.001	0.049	0.914	0.854
(3) in Severe-Aridity municipalities:	1.332	1.370	0.001	0.029
p-value	0.249	0.242	0.980	0.865

Main results

During two years before mayoral elections



During two years before presidential elections



Takeaways

- alignment matters in the assignment of transfers **but**:
  - it does so only before mayoral elections
  - it does so only for 'intermediate' levels of droughts ('grey areas') - no distortions for clear-cut cases
- Bonus: SPEI is better than SPI and it should become the standard also in economics

Contribution to the literature

Transfers (distortions and alignment): Brollo and Nannicini (2012); Curto-Grau et al. (2018); Bracco et al. (2015); Tarquinio (2020); Finan and Mazzocco (2021)

- we distinguish types of elections
- we can measure the 'need for transfers' (aridity, in our case)

Also related to:

- Vulnerability and Clientelism: Bobonis et al. (2022)
- Consequences of aridity:
  - using SPI: brad literature, consequences on agriculture, mobility, labour (Rocha and Soares, 2015; Shah and Steinberg, 2017)
  - using SPEI: consequences on agriculture, Albert et al. (2021) (only one using SPEI)

Extra

- We replicate the analysis using the standardised precipitation index (SPI): qualitative results remain broadly unaltered, but SPEI more precise, especially for moderate aridity.

  The difference in precision increases over time (or geographical distance) (‣ SPEI over time)
- identification strategy requires focusing only on close elections, when transfers may matter more ⇒ we provide **non-causal** evidence suggesting that the effects may be weaker when the elections are less tight, **but** results do not disappear entirely.
- Companion paper: Political accountability and alignment in distributive politics (with F. Boffa & E. Grillo)

  More general, theoretical model: introduce voters' heterogeneous accountability. Focus on the sequence of elections (presidential vs local)

Thank you for your attention!

Comments and questions are welcome
(now or ✉ piolatto.uab@gmail.com)

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Model details I

Assumptions on voters' utility: $u_t^i = c(T_t^i - D_t^i)$, with $c' > 0$, $c'' < 0$ and $u(c(-\underline{D})) \geq 0$.

Voters support the incumbent if $u(c_i) > \epsilon_i + \underline{u} - g_i$, with

1. An 'unpopularity shock' $\epsilon_i \sim U\left[-\frac{1}{2\phi}, \frac{1}{2\phi}\right]$: ϵ_i represents a negative shock for the incumbent, for expositional convenience
2. A lower-bound utility $\underline{u}$ (possibly, the expected outside option). We assume $\underline{u} < u(c(-\underline{D})) + \frac{1}{2\phi}$ $\rightarrow$ the incumbent's chance is never zero
3. The mayor's support (*gratitude* g_i) towards the president. *Ceteris paribus*, mayors that received a transfer are more supportive of the incumbent. Only the president assigns the transfer, so gratitude (g_i) is unidirectional. Gratitude is larger among aligned mayors (they can endorse explicitly).

Model details II

The incumbent-president's electoral benefit of granting a transfer is increasing in droughts:

$$\frac{\partial B_i^T}{\partial D} = \phi \left(\frac{\partial u(c(\overline{T} - D_i))}{\partial D} - \frac{\partial u(c(-D_i))}{\partial D} \right) > 0,$$

where the sign is guaranteed by the concavity of c.
Before mayoral elections, for that to be true, we need the extra assumption that transfers matter 'enough' for citizens (i.e. u to be 'sufficiently concave'): $\frac{u'(c(-D_i))}{u'\left(c\left(\overline{T}-D_i\right)\right)} > \Psi \in (1,2)$.

▸ Back

Descriptive statistics

		Before mayoral elections					Before presidential elections				
		obs	% of aid granted	mean (sd)	min	max	obs	% of aid granted	mean (sd)	min	max
Main variables											
SPEI (aridity)[1]		8343	—	0.258 (1.373)	-5.325	6.063	5312	—	-0.359 (1.419)	-6.791	8.938
Margin of victory		8343	—	0.004 (0.238)	-0.988	1.000	5312	—	-0.020 (0.249)	-0.988	1.000
Decomposition of municipalities by political alignment											
aligned		2446	0.195	—	0	1	2466	0.172	—	0	1
non-aligned		5897	0.132	—	0	1	2846	0.189	—	0	1
Decomposition of municipalities by level of aridity											
Low-Aridity		3552	0.108	—	0	1	2835	0.109	—	0	1
Moderate-Aridity		2647	0.175	—	0	1	1706	0.243	—	0	1
Severe-Aridity		2144	0.191	—	0	1	771	0.311	—	0	1
Decomposition of municipalities by level of aridity and alignment											
Low-Aridity	& aligned	1210	0.100	—	0	1	1330	0.096	—	0	1
	& non-aligned	2342	0.112	—	0	1	1505	0.120	—	0	1
Moderate-Aridity	& aligned	624	0.258	—	0	1	795	0.238	—	0	1
	& non-aligned	2023	0.150	—	0	1	911	0.248	—	0	1
Severe-Aridity	& aligned	612	0.319	—	0	1	341	0.317	—	0	1
	& non-aligned	1532	0.140	—	0	1	430	0.307	—	0	1

[1] SPEI indicates the Standardised Precipitation Evapotranspiration Index

SPEI

$$SPEI_{i,b} = \frac{(PET_{i,b} - P_{i,b}) - mean(PET_i - P_i)}{sd(PET_i - P_i)}, \tag{3}$$

PET_i: yearly Potential Evapotranspiration

P_i yearly Precipitation

$PET_{i,b} = \sum_{t-2}^{t} PET_i$ and $P_{i,b} = \sum_{t-2}^{t} P_i$ are, respectively, the cumulative PET_i and P_i for biennium b.

The mean and s.d. are computed over the period 1901-1980.

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SPEI - SPI over time

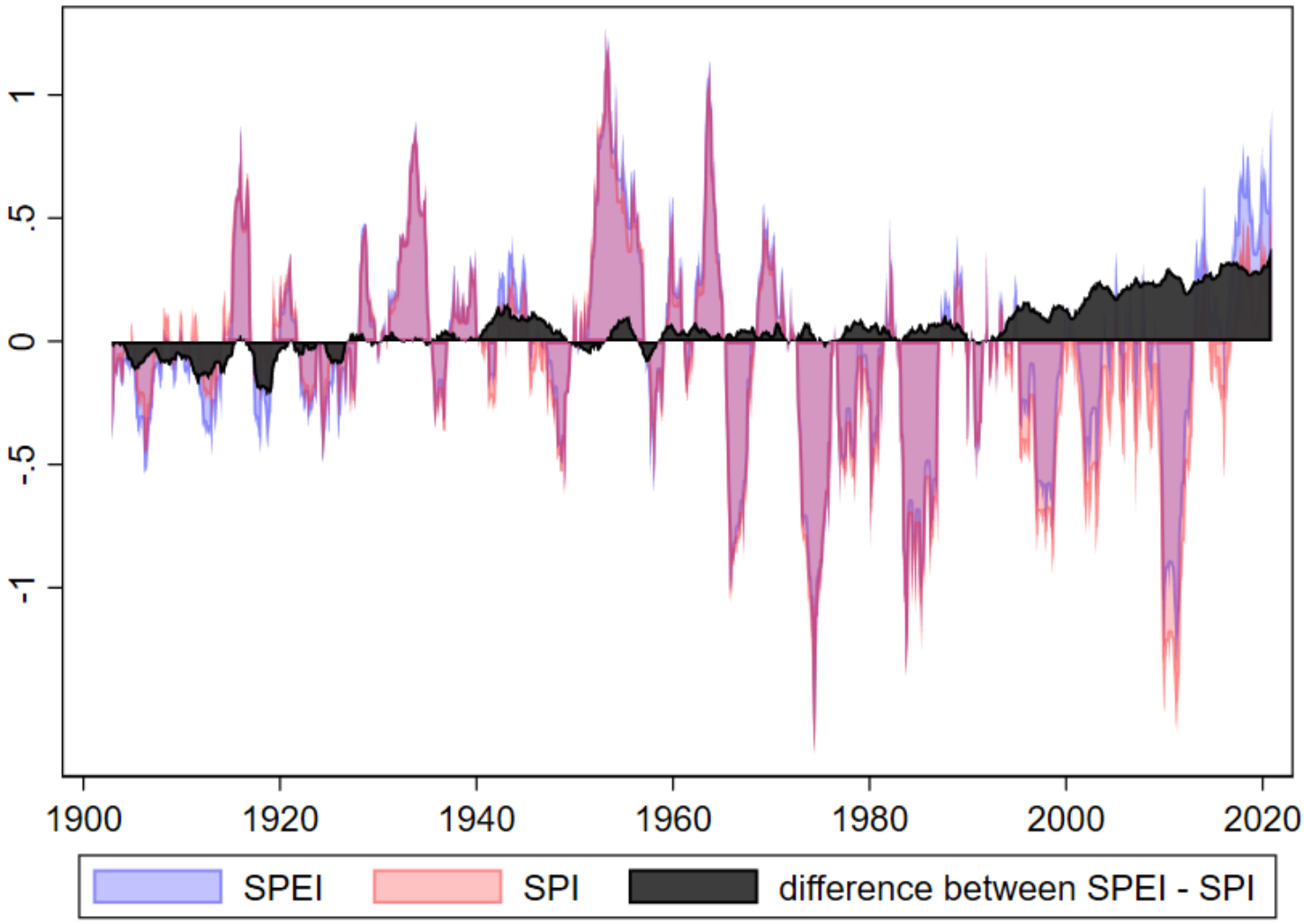

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Table: Number of observations assigned to each aridity category based on SPI or SPEI

	LOW			MODERATE			SEVERE		
Before Mayoral Elections		**SPI**			**SPI**			**SPI**	
	SPEI	*No*	*Yes*	**SPEI**	*No*	*Yes*	**SPEI**	*No*	*Yes*
	No	604	137	*No*	1018	68	*No*	1186	1
	Yes	1	765	*Yes*	136	285	*Yes*	69	251

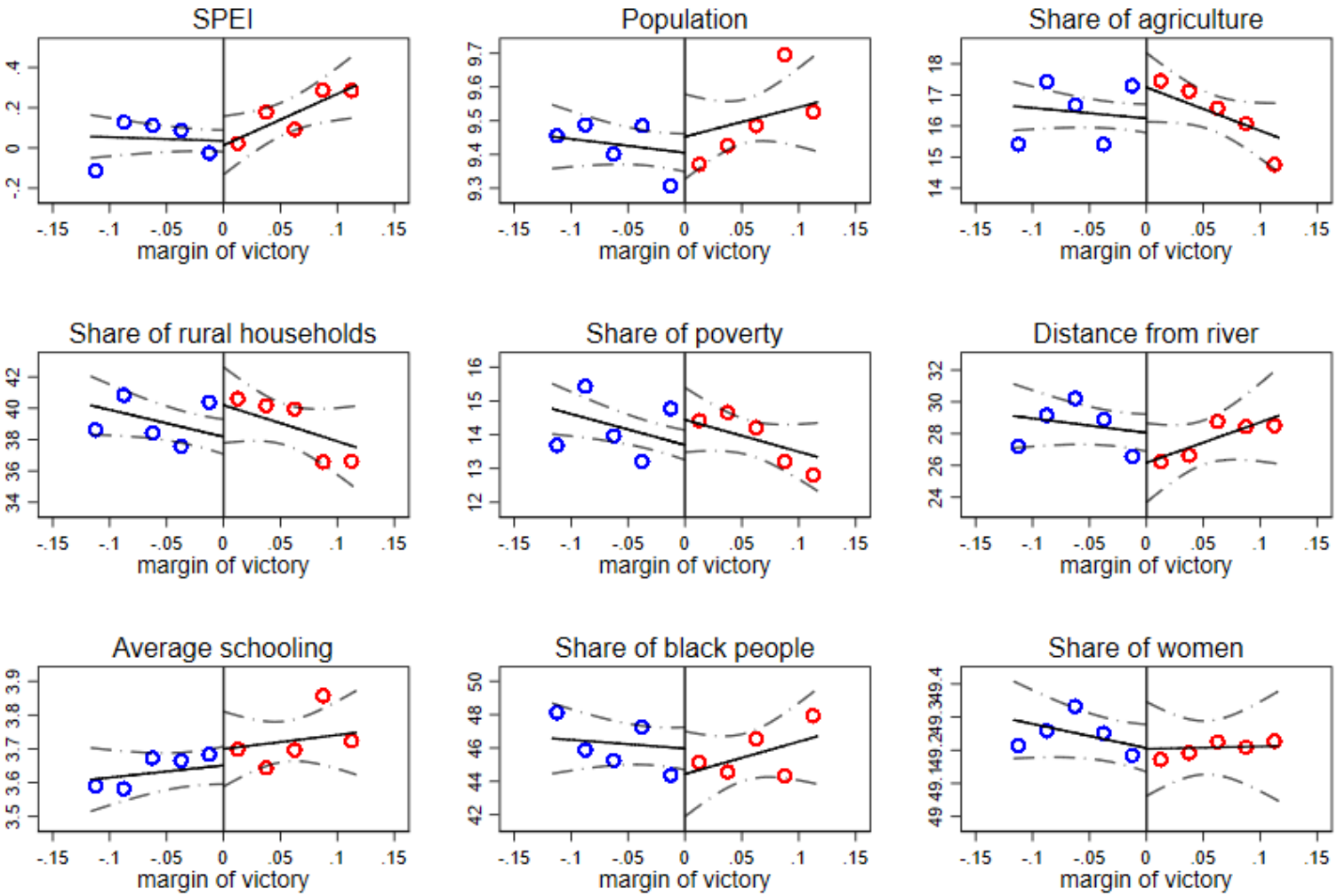
	LOW			MODERATE			SEVERE		
Before Presidential Elections		**SPI**			**SPI**			**SPI**	
	SPEI	*No*	*Yes*	**SPEI**	*No*	*Yes*	**SPEI**	*No*	*Yes*
	No	550	90	*No*	861	91	*No*	1198	0
	Yes	1	754	*Yes*	89	354	*Yes*	91	106

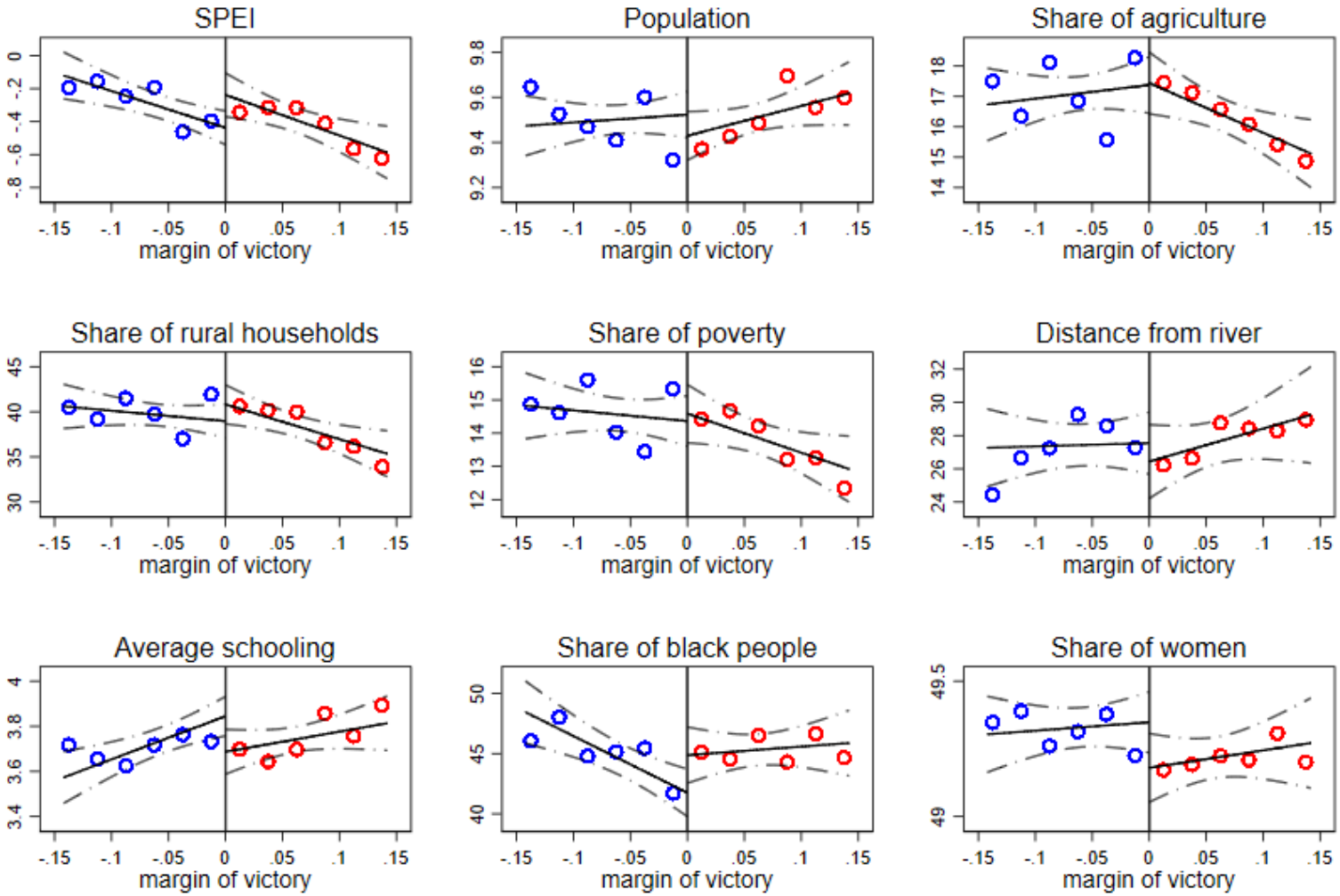
Total number of observations: 1507 before mayoral elections; 1395 before presidential elections.

Table: Impact of drought indexes on the assignment of aid relief and agricultural production

	Panel A			Panel B		
Dependent variable:	Aid relief (drought's state of emergencies)			Share of agriculture in GDP		
	(1)	(2)	(3)	(4)	(5)	(6)
SPI	0.068***		-0.168***	-0.002***		0.027***
	(0.062 - 0.075)		(-0.205 - -0.131)	(-0.004 - -0.001)		(0.018 - 0.036)
SPEI		0.074***	0.222***		-0.004***	-0.027***
		(0.068 - 0.080)	(0.188 - 0.256)		(-0.005 - -0.002)	(-0.035 - -0.019)
Observations	60,159	60,159	60,159	54,667	54,667	54,667
Root mean squared error	0.301	0.301	0.300	0.0603	0.0603	0.0602
R-squared	0.484	0.487	0.489	0.871	0.871	0.871
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: Two-way fixed effect model. 95% confidence intervals in parentheses. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10.


SPEI
-.2 0 .2 .4
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Population
9.3 9.4 9.5 9.6 9.7
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Share of agriculture
14 15 16 17 18
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Share of rural households
34 36 38 40 42
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Share of poverty
12 13 14 15 16
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Distance from river
24 26 28 30 32
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Average schooling
3.5 3.6 3.7 3.8 3.9
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Share of black people
42 44 46 48 50
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Share of women
49 49.1 49.2 49.3 49.4
-.15 -.1 -.05 0 .05 .1 .15
margin of victory


SPEI
-.8 -.6 -.4 -.2 0
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Population
9.2 9.4 9.6 9.8
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Share of agriculture
14 15 16 17 18
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Share of rural households
30 35 40 45
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Share of poverty
12 13 14 15 16
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Distance from river
24 26 28 30 32
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Average schooling
3.4 3.6 3.8 4
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Share of black people
40 45 50
-.15 -.1 -.05 0 .05 .1 .15
margin of victory
Share of women
49 49.5
-.15 -.1 -.05 0 .05 .1 .15
margin of victory