Commodity Shocks and Incumbency Effects

Supporting Information

Supporting Information

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S.I.1 Price index

Figure S.I.1 illustrates how we build the commodity price index. The shaded area pictures the year preceding municipal elections. From Equation (1), $P_{c,t}$ is the point at which price first touches the shaded area in October of the year preceding the election, and $P_{c,t+1}$ is the point where the lines last touch the shaded area.[20]

[20] Price data from IMF Primary Commodity Prices, collected through `www.quandl.com`.

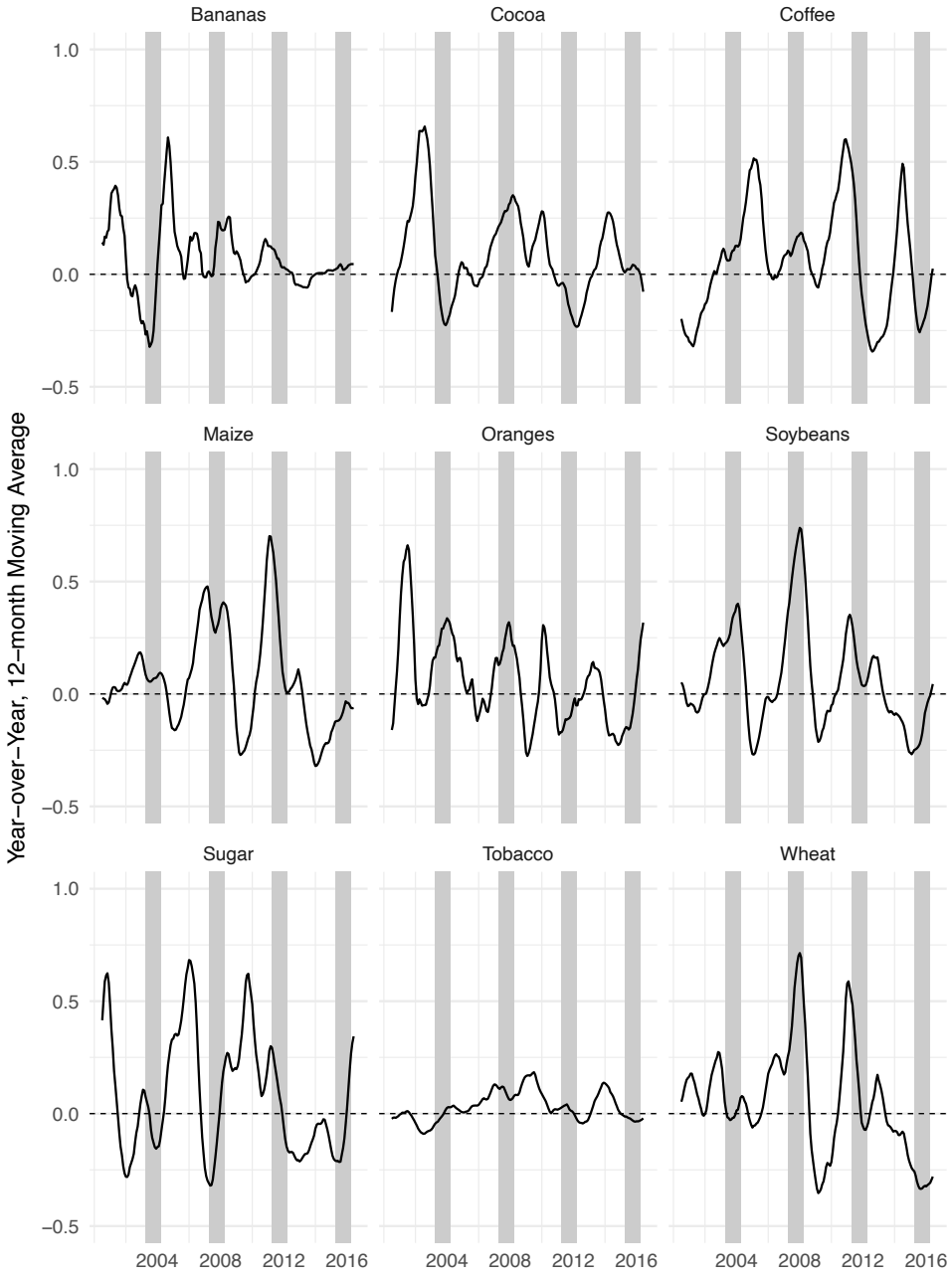


Figure S.I.1. Time Series of Crop Prices. Shaded areas indicate electoral periods.

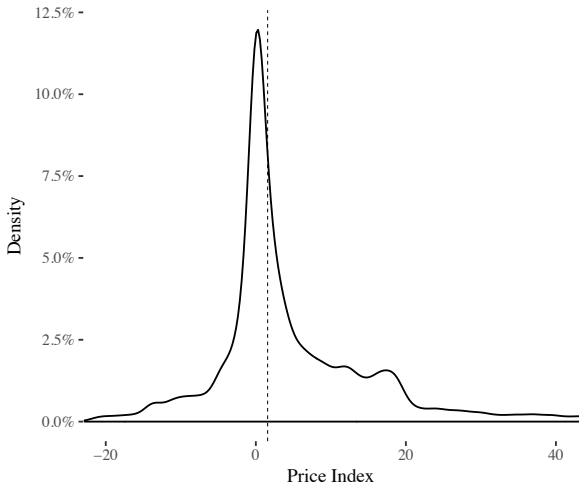


Figure S.I.2. Density of Price Index (Moving Average). Dashed vertical line shows median price index.

S.I.2 Rural and Urban municipalities

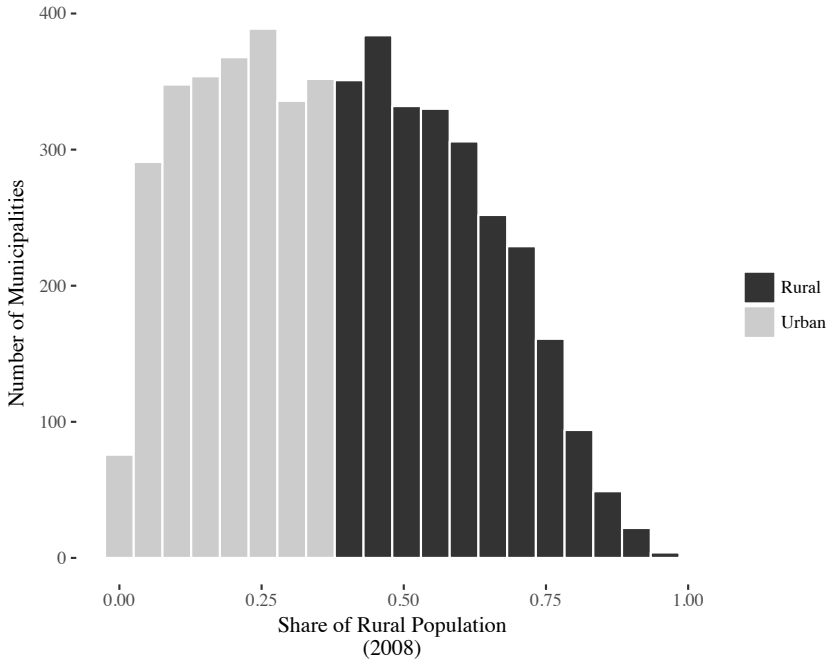


Figure S.I.3. Histogram municipalities according to rural population.

S.I.2.1 Differences across rural and urban municipalities

Table S.I.1 shows that rural and urban municipalities are different on many dimensions. We consider several variables. *Non-white population* is the total of non-white individuals divided by the total individuals in a municipality. *Illiteracy* is the percentage of illiterate adults. *Avg. Experience of candidates* is the average of the number of times candidates have been previous elected for any office before the election. *Bolsa-familia recipients* are the number of beneficiaries divided by the municipal population, which Frey (2019) shows can affect incumbent reelection chances.

Table S.I.1. Differences across rural and Urban municipalities

	Rural	Urban	Difference
GDP per capita	11.99	19.74	-7.75
Non-white population	0.56	0.49	0.08
Gini	0.52	0.49	0.02
Illiteracy	5.69	3.70	1.99
Avg. age of Candidates	46.71	48.46	-1.75
Avg. Experience of candidates	0.29	0.34	-0.04
Total left wing Candidates	0.70	0.82	-0.12
Total number of candidates	2.48	2.86	-0.38
Bolsa-Familia recipients per capita	0.12	0.08	0.05

The source for demographic variables is the IBGE. Differences measured for municipalities in 2012. All differences are statistically significant ($p < 0.01$)

S.I.3 Robustness checks for the RDD

S.I.3.1 Density plots and manipulation tests

The density plots below test for manipulation around the treatment assignment threshold, using different study groups. We use the non-parametric test described in Cattaneo, Jansson and Ma (2020), and implemented using the `rddensity` R package. The tests indicate that there is no manipulation.

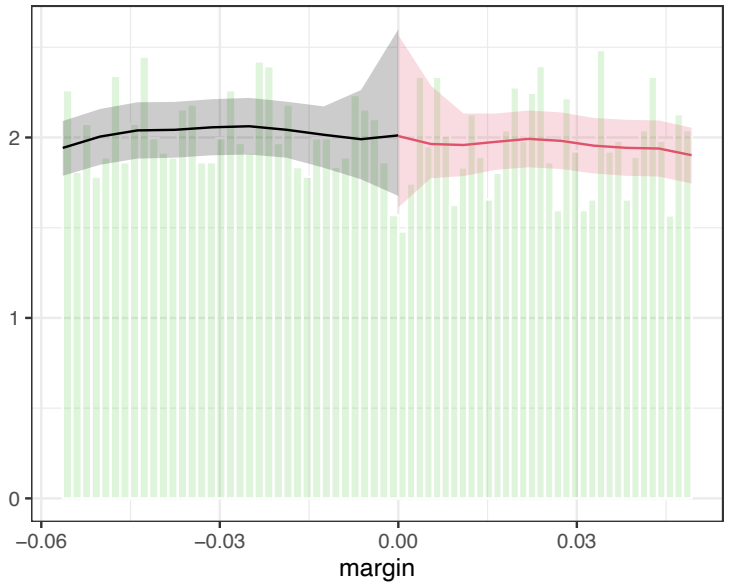


Figure S.I.4. Density test, first-order polynomial, all municipalities

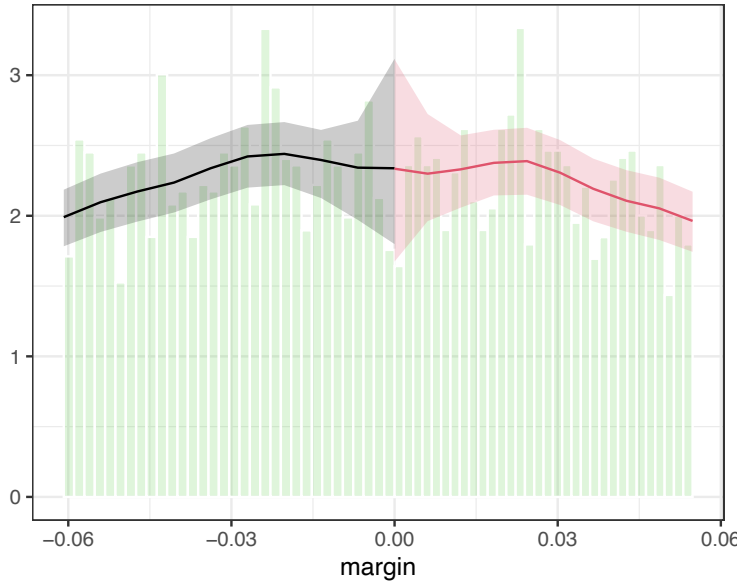


Figure S.I.5. Density test, first-order polynomial, rural municipalities

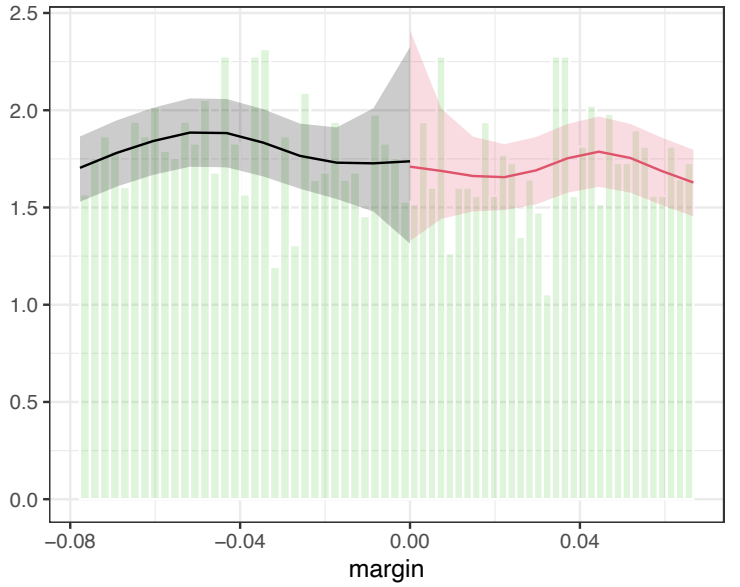


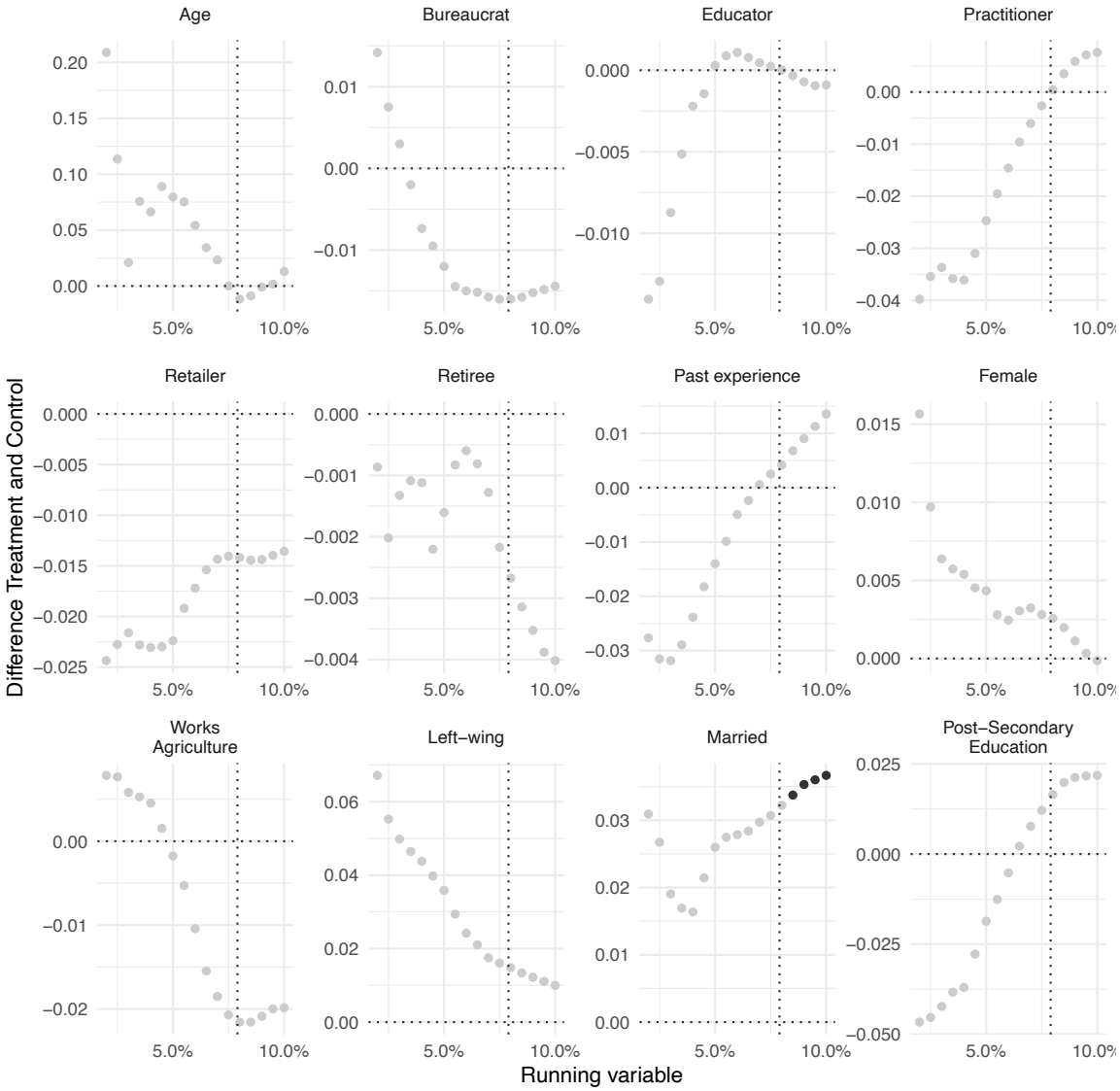
Figure S.I.6. Density test, first-order polynomial, urban municipalities

S.I.3.2 Balance tests

In this section we present balance tests for all municipalities, rural municipalities and urban municipalities. For each group, we present three different balance tests over the same covariates. Age was divided by 100 for presentation purposes. The occupational variables indicate if the candidate self-reported the occupation. $Past\ experience$ computes if the candidate has won any election in previous elections, for any office. $Female$ indicates if the candidate reported to be a woman. $Works\ agriculture$ is self-explanatory. The list of agricultural occupations is on Section S.I.6.3. Left-wing indicates if the candidate is from a left-wing party, married if the candidate declared to be married, and post-secondary education if the candidate finished high-school.

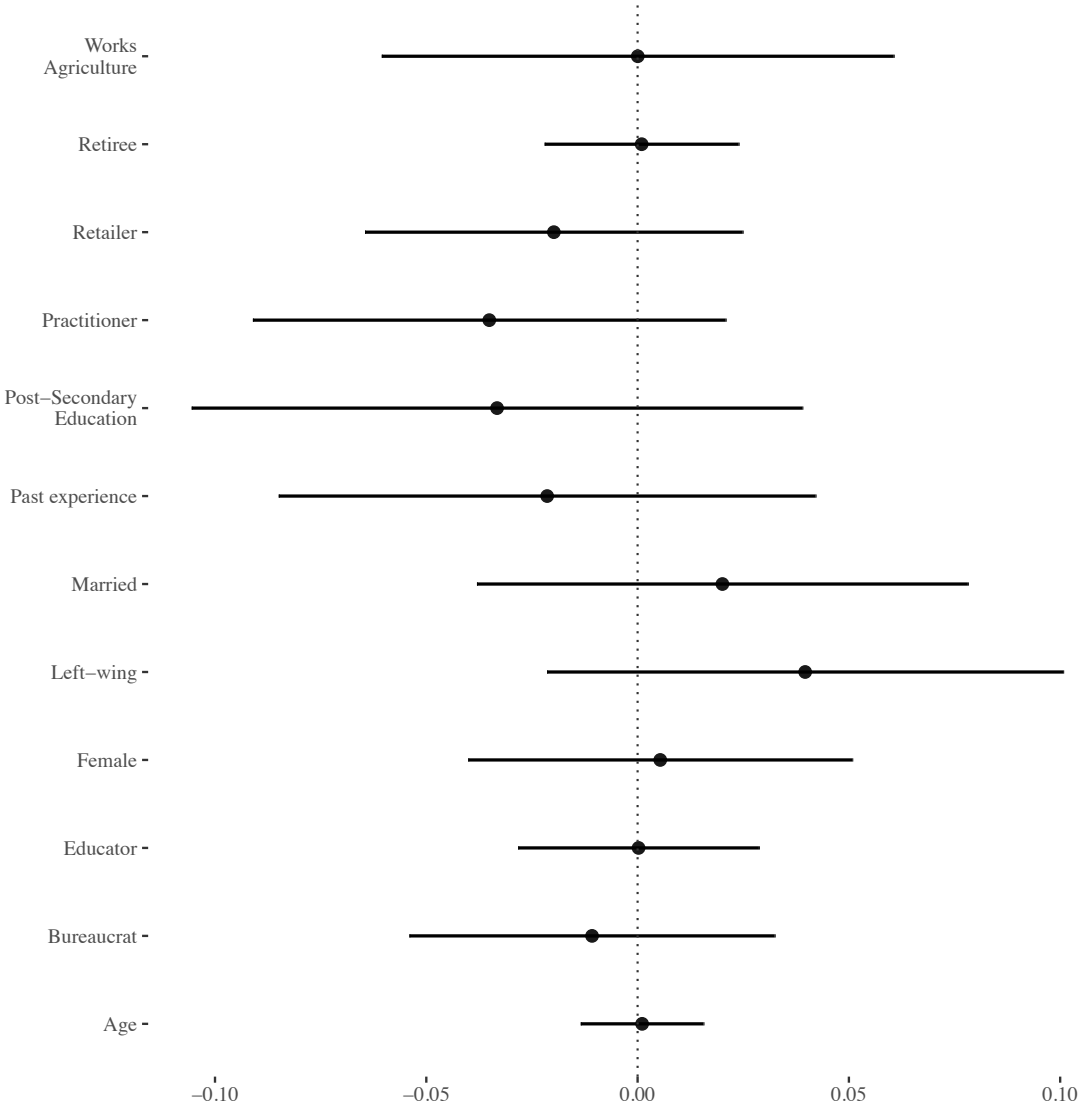
First, we present a balance test using several different local linear estimations. Second, we take the optimal bandwidth used in estimations, and on that particular bandwidth we run a non-parametric test (following Calonico, Cattaneo and Titiunik 2014). Finally, we run the same non-parametric test, only this time we allow for the algorithm to choose an individual bandwidth for each covariate. Fortunately the tests results do not show any consistent relevant differences between winners and losers, aside from the odd test that return significant in a substantively indistinct covariate, and that can be attributable to chance.

Figure S.I.7. Balance Tests, all municipalities



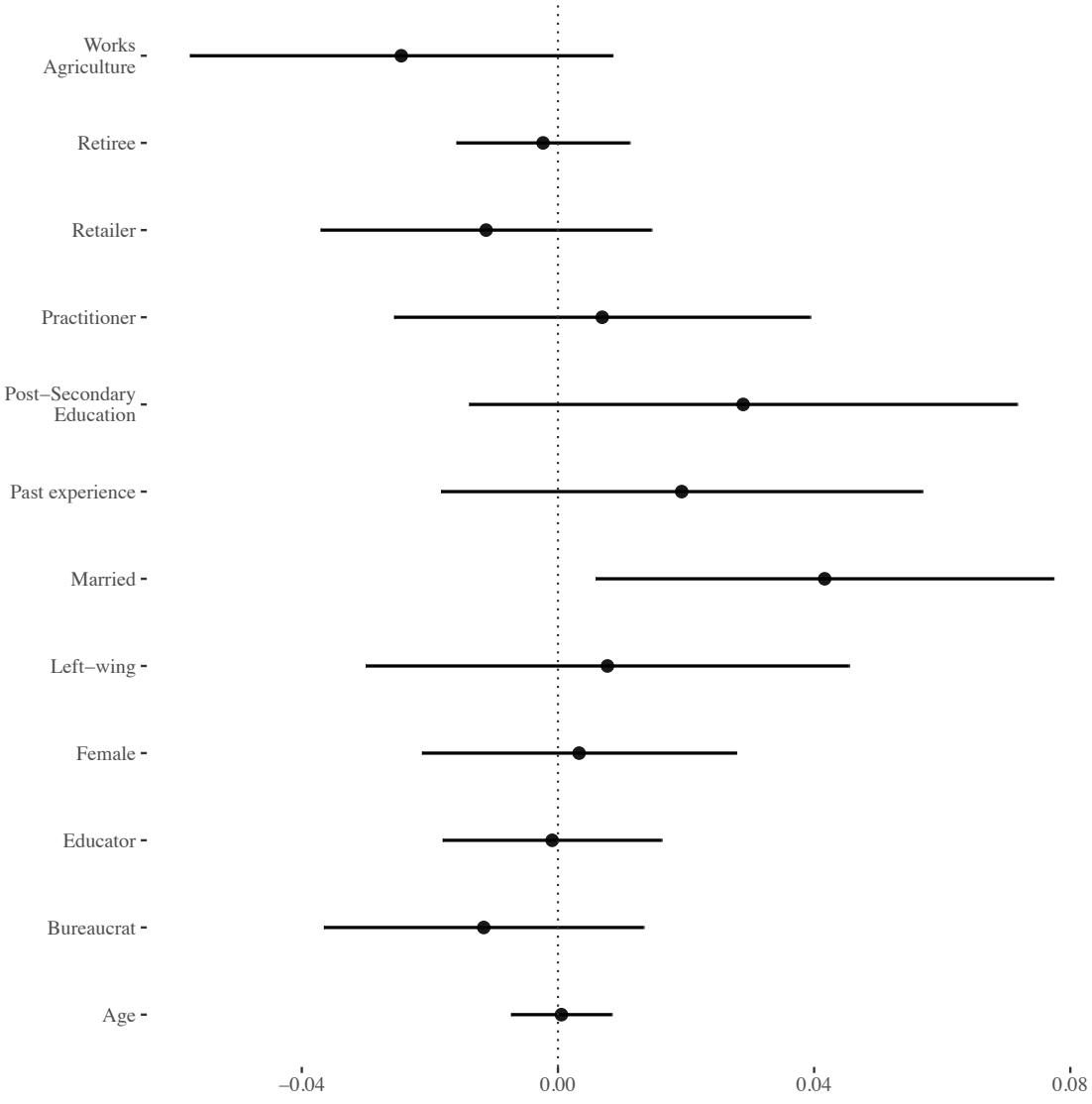
Note: *Local linear regression results, weighted by a triangular kernel. Each dot represents one regression discontinuity estimation using the covariate as the left-hand side variable. Darker dots denote statistically significant differences at 95%.*

Figure S.I.8. Balance Tests, Non-parametric, all municipalities



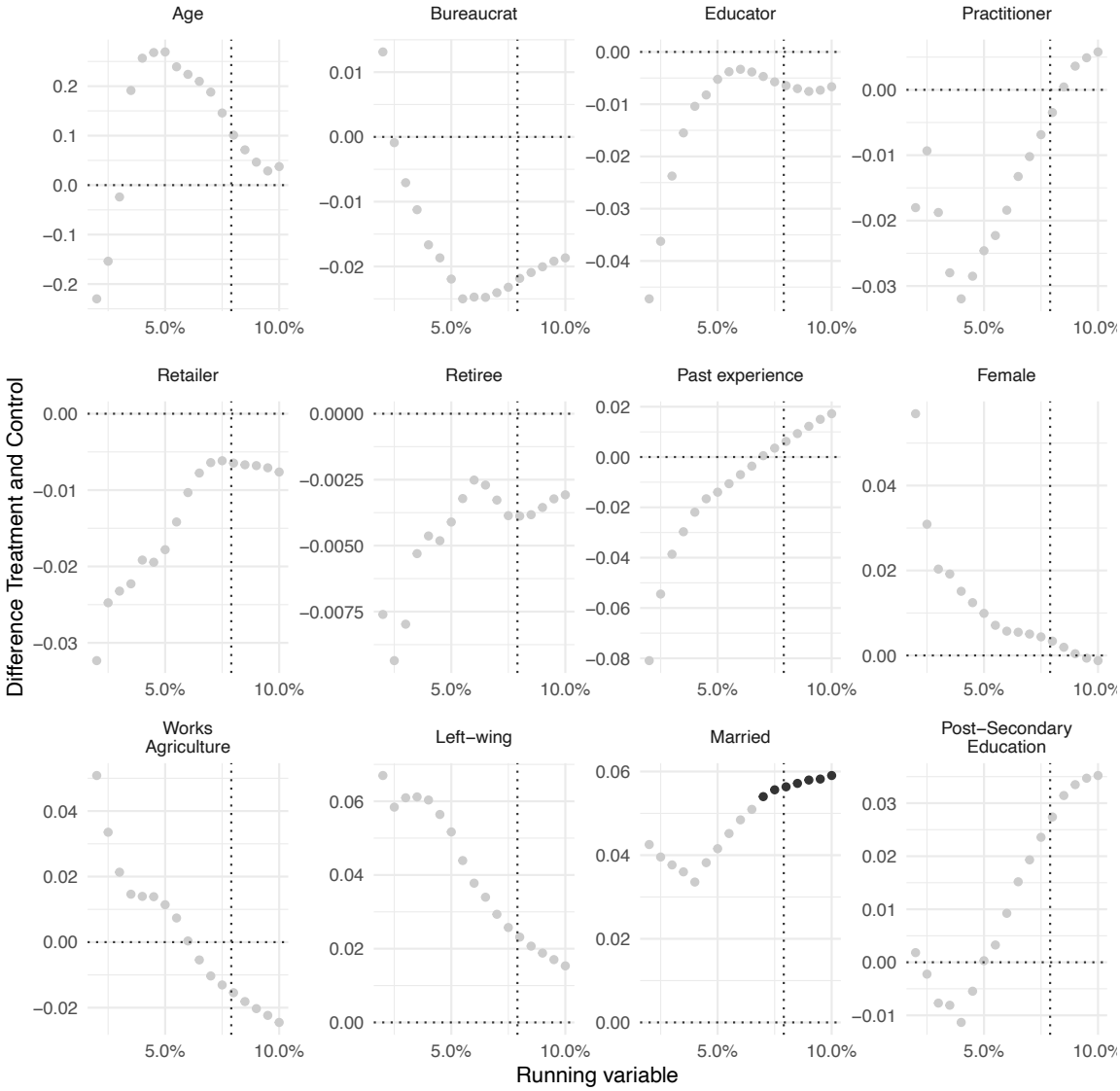
Note: *Non-parametric tests using the same optimal bandwidth for all covariates. Bars present 95% confidence intervals.*

Figure S.I.9. Balance Tests - Non-parametric, individual bandwidths, all municipalities



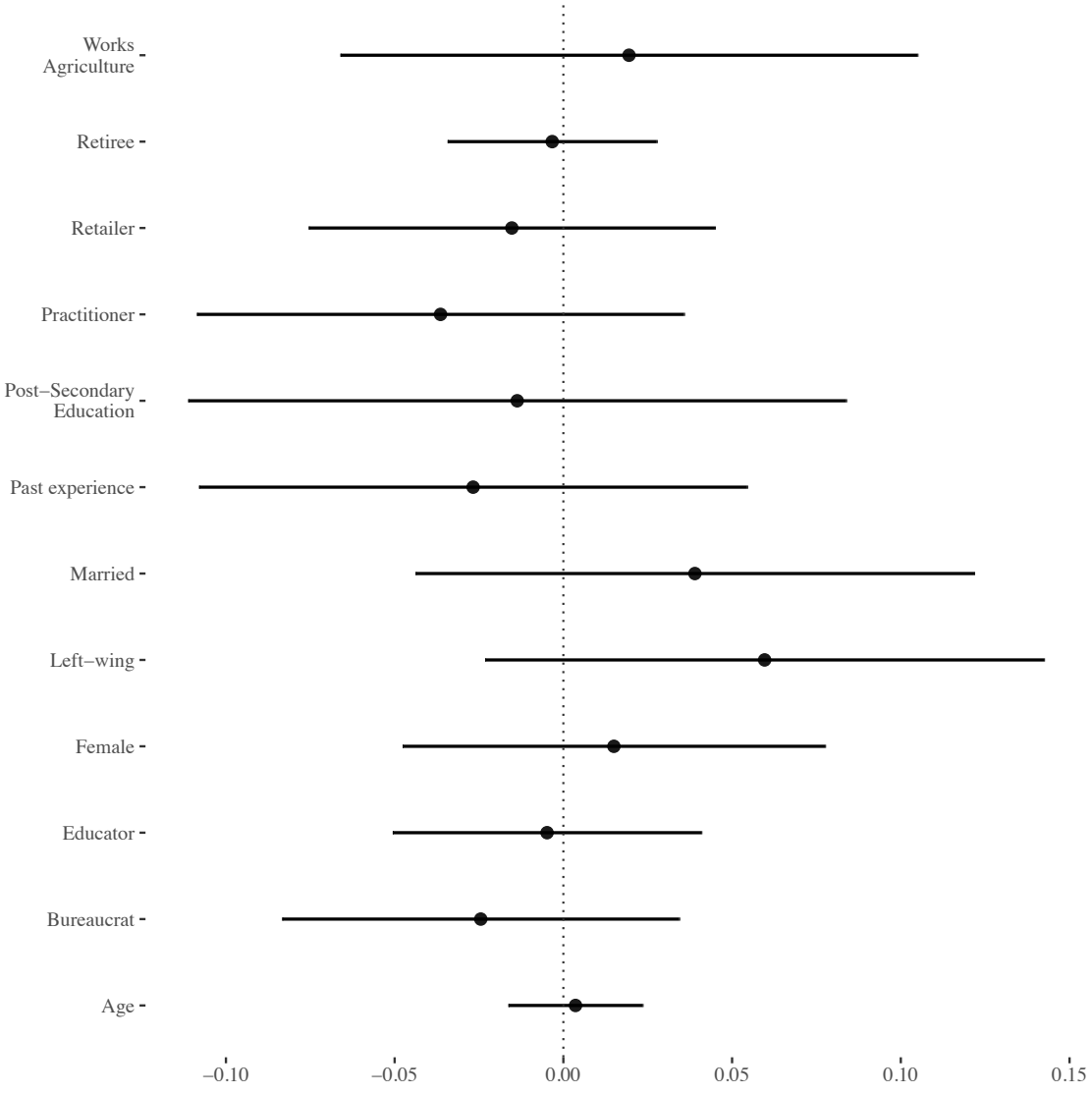
Note: *Non-parametric tests using individual optimal bandwidth for each covariate. Bars present 95% confidence intervals.*

Figure S.I.10. Balance Tests, rural municipalities



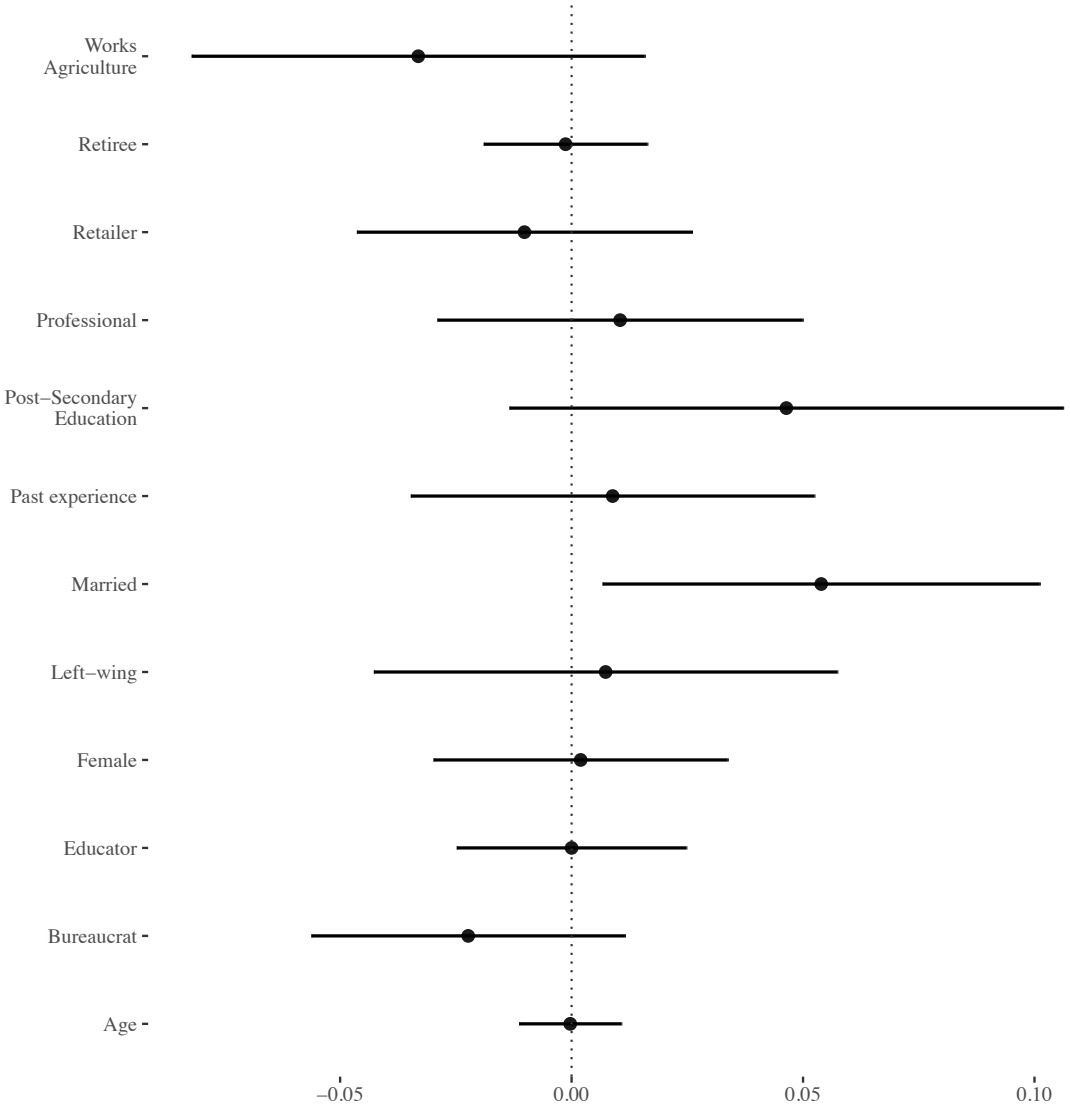
Note: *Local linear regression results, weighted by a triangular kernel. Each dot represents one regression discontinuity estimation using the covariate as the left-hand side variable. Darker dots denote statistically significant differences at 95%.*

Figure S.I.11. Balance Tests, Non-parametric, rural municipalities



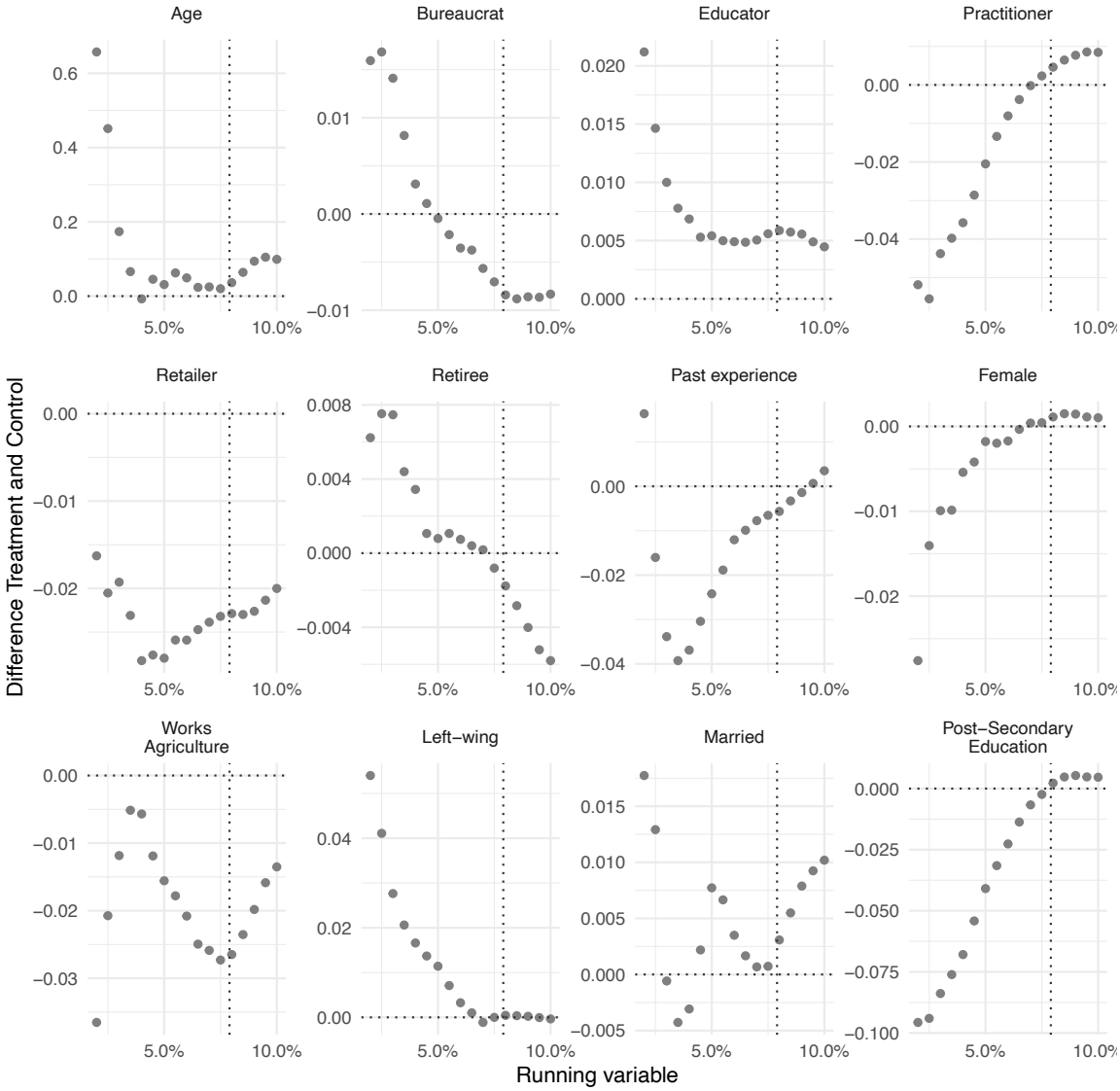
Note: *Non-parametric tests using the same optimal bandwidth for all covariates. Bars present 95% confidence intervals.*

Figure S.I.12. Balance Tests - Non-parametric, individual bandwidths, rural municipalities



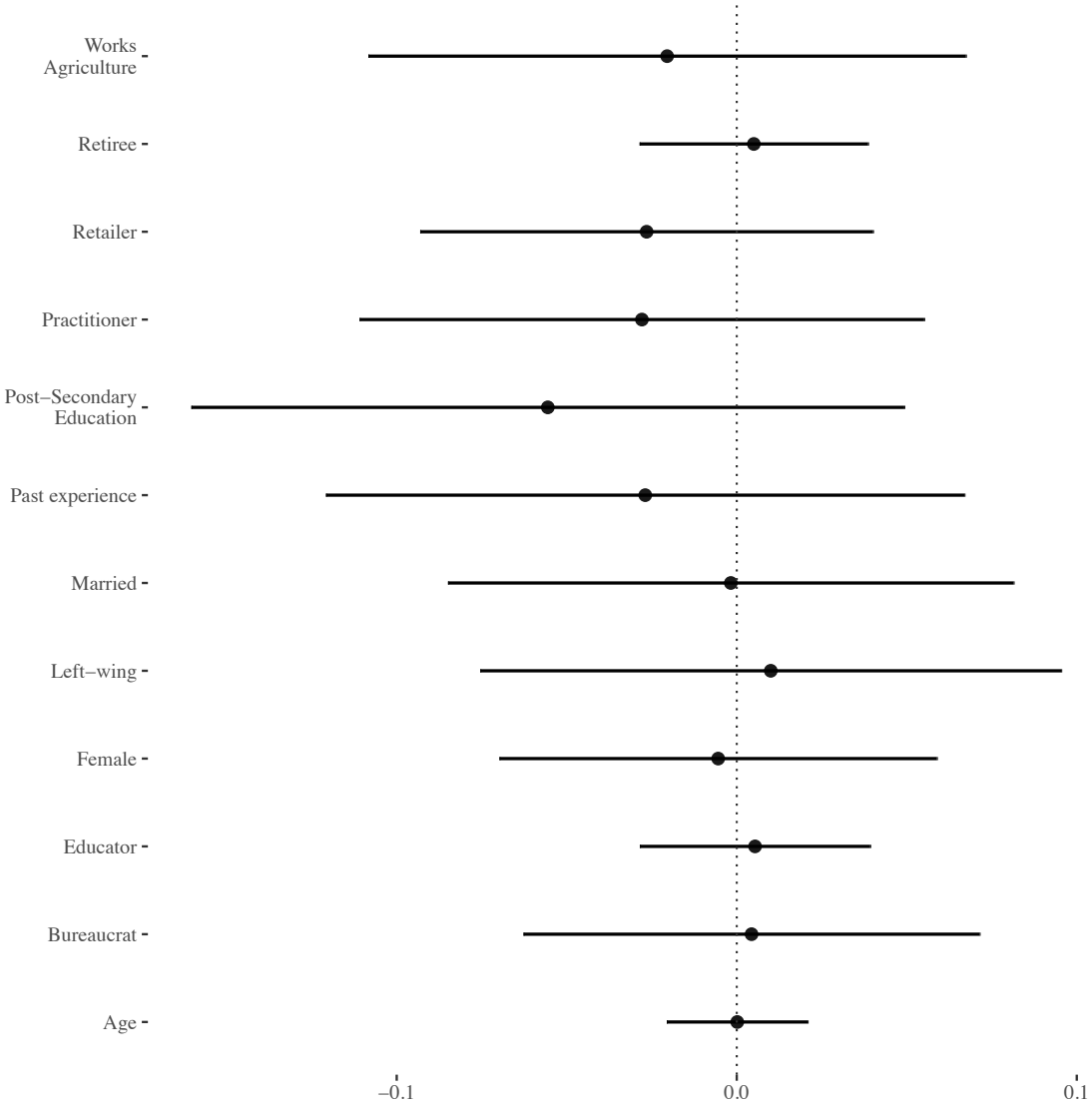
Note: *Non-parametric tests using individual optimal bandwidth for each covariate. Bars present 95% confidence intervals.*

Figure S.I.13. Balance Tests, urban municipalities



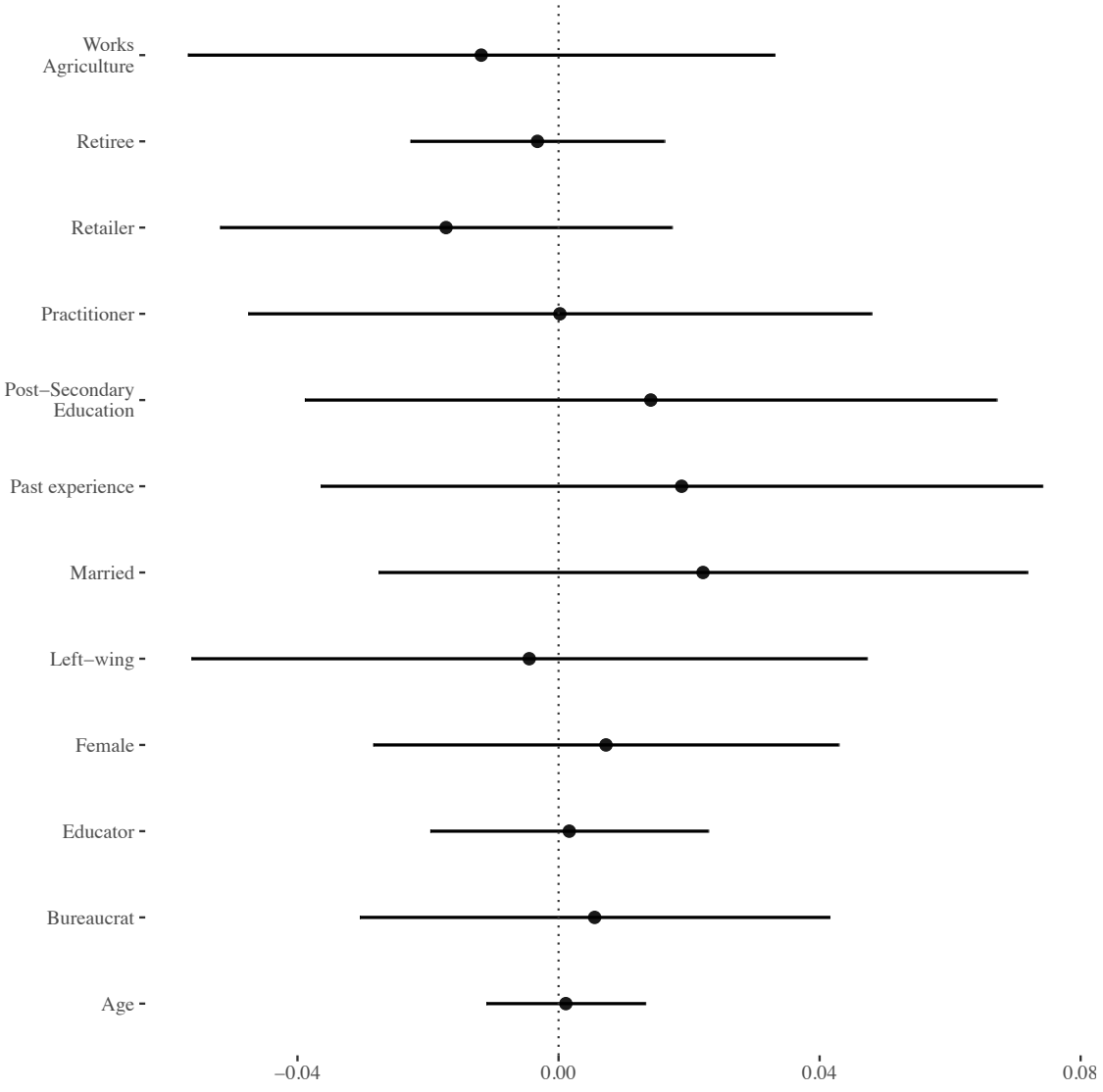
Note: *Local linear regression results, weighted by a triangular kernel. Each dot represents one regression discontinuity estimation using the covariate as the left-hand side variable. No estimation is statistically significant.*

Figure S.I.14. Balance Tests, Non-parametric, urban municipalities



Note: *Non-parametric tests using the same optimal bandwidth for all covariates. Bars present 95% confidence intervals.*

Figure S.I.15. Balance Tests - Non-parametric, individual bandwidths, urban municipalities



Note: *Non-parametric tests using individual optimal bandwidth for each covariate. Bars present 95% confidence intervals.*

S.I.3.3 Rural Placebo

Table S.I.2. Placebo test: Future price variation and incumbency effects, rural municipalities

	Probability Win Next Election		
	(1)	(2)	(3)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	0.0003	0.002	0.001
	(0.001)	(0.002)	(0.003)
$\Pi_{ki_{t+1}}$	−0.0003	−0.001	−0.001
	(0.0003)	(0.001)	(0.002)
$Incumbency_{ki_t}$	0.116***	−0.154***	−0.135
	(0.018)	(0.048)	(0.092)
$Margin$	0.552***	4.523***	6.840*
	(0.027)	(0.652)	(3.916)
$\Pi_{ki_{t+1}} \times Margin$	−0.001	−0.018	0.036
	(0.001)	(0.020)	(0.110)
$Incumbency_{ki_t} \times Margin$	−0.154**	−2.481***	−9.503***
	(0.060)	(0.603)	(3.111)
Constant	0.256***	0.439***	0.458***
	(0.009)	(0.027)	(0.051)
Bandwidth	All	Optimal	2.5%
Year FEs	Y	Y	Y
n	10860	3803	1262
Note:			*p<0.1; **p<0.05; ***p<0.01

S.I.4 Incumbency effects

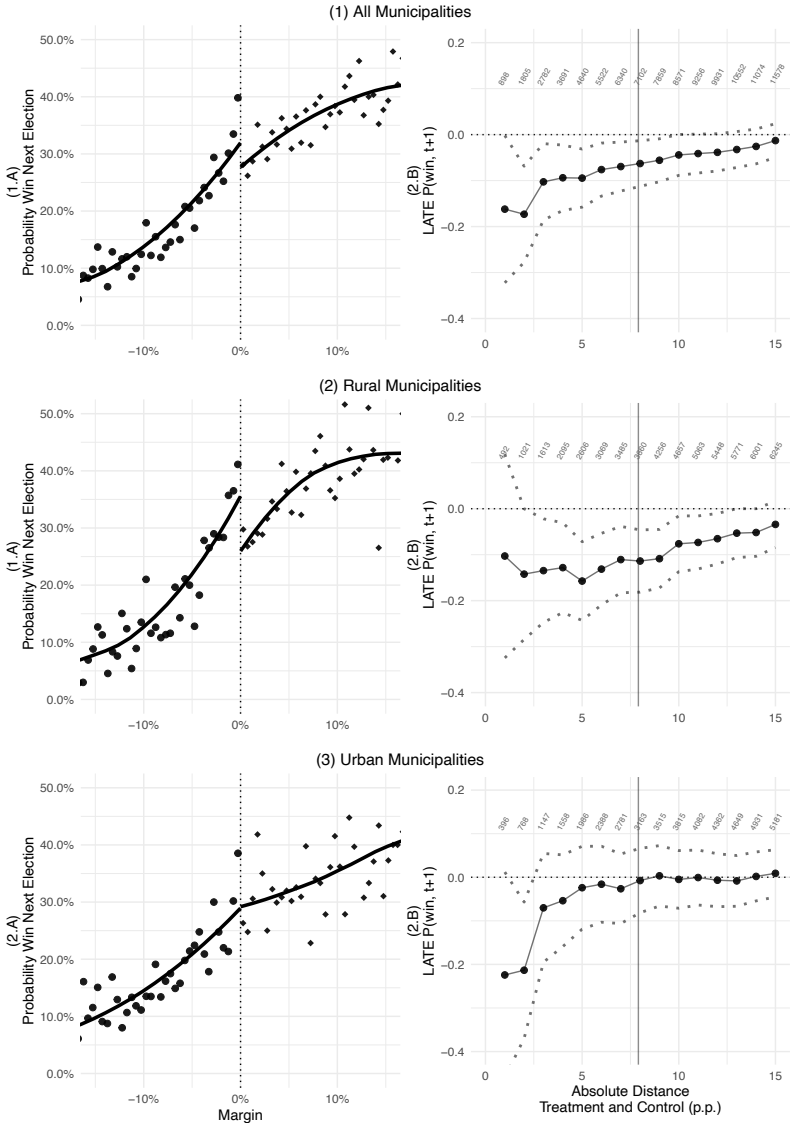
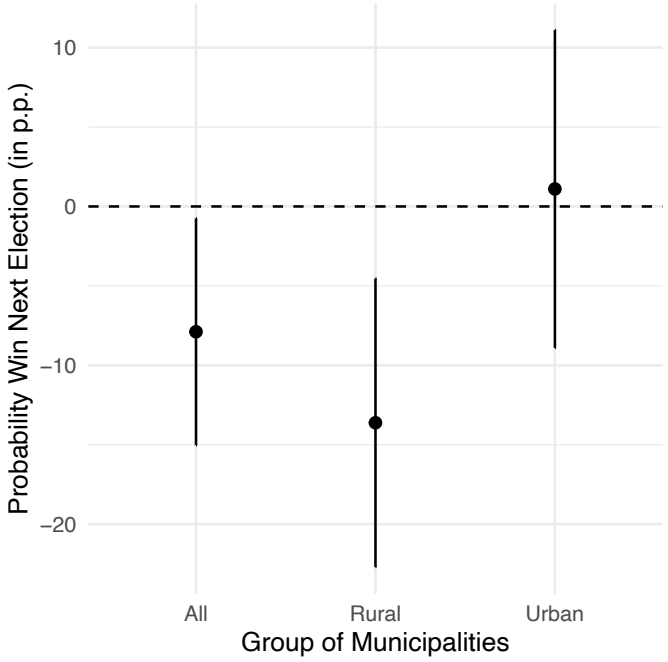


Figure S.I.16. Incumbency Effects. Rural and Urban are municipalities above and below the overall median of the percentage of individuals in rural areas, respectively. Vertical lines indicate the optimal non-parametric bandwidth.

Figure S.I.17. Incumbency Effects, controlling for development correlates.



Regression discontinuity estimates of incumbency effects include a triangular kernel, year fixed effects, and an optimal bandwidth, and use the `rdrobust` package. Bars are 95% robust confidence intervals. Rural and urban municipalities lie above or below the overall median rural population in Brazilian municipalities, respectively.

S.I.4.1 Estimations at 2.5% bandwidth

Table S.I.3. Heterogeneous Incumbency Effects Conditional on Municipal Price Index, All, Rural and Urban Municipalities

	Probability Win Next Election		
	All	Rural	Urban
	(1)	(2)	(3)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	0.003	0.008*	0.0001
	(0.002)	(0.004)	(0.004)
$\Pi_{ki_{t+1}}$	−0.001	−0.004*	0.0001
	(0.001)	(0.002)	(0.002)
$Incumbency_{ki_t}$	−0.179	−0.192***	−0.152*
	(0.114)	(0.069)	(0.078)
$Margin$	8.312***	7.204***	6.189**
	(1.759)	(2.675)	(3.143)
$\Pi_{ki_{t+1}} \times Margin$	0.039	−0.092	0.075
	(0.083)	(0.126)	(0.114)
$Incumbency_{ki_t} \times Margin$	−5.581***	−6.802***	1.170
	(0.503)	(2.581)	(3.009)
Constant	0.448***	0.465***	0.397***
	(0.063)	(0.043)	(0.053)
Bandwidth	2.5%	2.5%	2.5%
Year FEs	Y	Y	Y
n	22939	7529	11242
Note:		*p<0.1; **p<0.05; ***p<0.01	

Coefficients of linear regressions on commodity price index and year fixed effects, weighted by a triangular kernel. 2.5 corresponds to a 2.5% vote margin. robust standard errors clustered by municipality in parenthesis.

S.I.4.2 Estimations with covariates

Table S.I.4 presents coefficients from our main heterogeneous incumbency effects models including covariates (and their interaction with incumbency status), weighted by a triangular kernel. Covariates include nonwhite population, Gini coefficient, average municipal age, percentage of population that receives CCTs, average candidate experience, number of left wing candidates, total number of candidates. Number of observations differ from Table 2 due to missingness in some covariates (including illiteracy as a covariate yields same results (not shown), but leads to a large drop in the number of observations).

Table S.I.4. Heterogeneous Incumbency Effects Conditional on Municipal Price Index, Rural vs Urban Municipalities with controls

	Probability Win Next Election					
	Rural	Rural	Rural	Urban	Urban	Urban
	(1)	(2)	(3)	(4)	(5)	(6)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	0.002**	0.005*	0.008*	0.002***	0.001	−0.001
	(0.001)	(0.002)	(0.004)	(0.001)	(0.002)	(0.004)
$\Pi_{ki_{t+1}}$	−0.001*	−0.002*	−0.004*	−0.001*	0.0001	0.001
	(0.001)	(0.001)	(0.002)	(0.0005)	(0.001)	(0.002)
$Incumbency_{ki_t}$	0.366***	0.086	0.146	0.369***	0.035	−0.438
	(0.110)	(0.221)	(0.325)	(0.113)	(0.188)	(0.394)
$Margin$	0.536***	4.266***	8.034***	0.436***	1.607***	5.824*
	(0.026)	(0.595)	(2.692)	(0.023)	(0.270)	(3.214)
$\Pi_{ki_{t+1}} \times Margin$	−0.0001	−0.018	−0.103	0.0003	0.015	0.057
	(0.002)	(0.030)	(0.127)	(0.001)	(0.012)	(0.112)
$Incumbency_{ki_t} \times Margin$	0.078***	0.092	0.038	0.028	0.093*	0.142
	(0.022)	(0.060)	(0.092)	(0.022)	(0.055)	(0.108)
Constant	0.360***	0.482***	0.358*	0.388***	0.509***	0.623***
	(0.050)	(0.128)	(0.199)	(0.048)	(0.108)	(0.237)
Bandwidth	All	Optimal	2.5%	All	Optimal	2.5%
Year FEs	Y	Y	Y	Y	Y	Y
n	11158	3900	1304	11191	5009	942

Note: *p<0.1; **p<0.05; ***p<0.01

Coefficients of local linear regressions of a binary measure of victory in $t+1$ on commodity price index, an incumbency indicator, and their interaction, as well as vote margin and its interaction with incumbency. 'All' corresponds to the full sample, 'Optimal' to the optimal bandwidth calculated via Calonico, Cattaneo and Titiunik (2014), and 2.5 a 2.5% bandwidth. All specifications include year fixed effects and robust standard errors clustered by municipality (in parenthesis), and are weighted by a triangular kernel.

S.I.5 Alternative classification of rural and urban municipalities

In this section we present a different criterion for grouping municipalities according to their level of urbanization. We follow recent guidelines from the IBGE. Instead of using the proportion of rural workers, this specification uses demographic density as the main criterion to classify urban settlements. The classification also specifies "remoteness" of a municipality, which are non-agrarian and non-urban municipalities, and are not included in the study group.

In Table S.I.5 we reproduce the main finding from the manuscript using this alternative classification of municipalities. The results are qualitatively similar. While commodity shocks have a substantively and statistically in significant effect in rural municipalities across all samples, in urban municipalities this effect only appears in the overall sample but vanishes within the optimal bandwidths appropriately selected for RDD estimation.

Similarly, the results in Table S.I.6 demonstrate that the alternative classification does not substantively change the evidence for the retrospective voting mechanism showing the impact of shocks on GDP (See Table 3 in the manuscript).

Table S.I.5. Heterogeneous Incumbency Effects Conditional on Municipal Price Index, Rural vs Urban Municipalities

	Probability Win Next Election			
	Rural	Rural	Urban	Urban
	(1)	(2)	(3)	(4)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	0.003***	0.005**	0.003***	0.001
	(0.001)	(0.002)	(0.001)	(0.002)
$\Pi_{ki_{t+1}}$	−0.001***	−0.003**	−0.0005*	0.0002
	(0.0002)	(0.001)	(0.0003)	(0.001)
$Incumbency_{ki_t}$	0.110	−0.188***	0.152**	0.053
	(0.078)	(0.041)	(0.070)	(0.044)
$Margin$	0.436***	4.159***	0.295***	1.107***
	(0.043)	(0.603)	(0.032)	(0.304)
$\Pi_{ki_{t+1}} \times Margin$	0.001***	−0.012	0.001	0.016
	(0.0004)	(0.031)	(0.001)	(0.014)
$Incumbency_{ki_t} \times Margin$	−0.143***	−1.893***	−0.097	−0.850**
	(0.005)	(0.589)	(0.059)	(0.361)
Constant	0.246***	0.447***	0.180***	0.273***
	(0.030)	(0.026)	(0.027)	(0.028)
Bandwidth	All	Optimal	All	Optimal
Year FEs	Y	Y	Y	Y
n	11873	4018	1356	6531

*p<0.1; **p<0.05; ***p<0.01

Note: Coefficients of non-parametric regressions of a binary measure of victory in $t+1$ on commodity price index, an incumbency indicator, and their interaction, as well as vote margin and its interaction with incumbency. Results disaggregated by share of urban population and discontinuity bandwidth, where 'All' corresponds to the full sample, 'Optimal' to the optimal bandwidth calculated using the algorithm in Calonico, Cattaneo and Titiunik (2014). All specifications include year fixed effects, weighted by a triangular kernel, and include robust standard errors clustered by municipality (in parenthesis).

Table S.I.6. Effect of commodity shocks on municipal GDP growth (Alternative Classification)

	Change in GDP			
	Rural	Rural	Urban	Urban
$\Pi_{ki_{t+1}}$	0.001***	0.001**	0.0004	0.0003
	(0.0002)	(0.0003)	(0.0003)	(0.0004)
Bandwidth	All	Optimal	All	Optimal
Observations	3,689	1,548	1,546	1,022

*p<0.1; **p<0.05; ***p<0.01

Note: Coefficients of linear regressions of percentage change in municipal GDP on commodity price index and year fixed effects, weighted by a triangular kernel. All outcomes are measured in first differences. robust standard errors clustered by municipality in parenthesis. Data on municipal GDP comes from the IBGE.

S.I.6 Mechanisms

S.I.6.1 Shocks and Campaign Resources

In this section we show that variation in the municipal price index does not cause incumbents in rural municipalities to receive more or less campaign resources. We do so by looking at (log) campaign expenditures and the number of brokers – individuals receiving money during an electoral campaign. We collect data for campaign resources for 2012 and 2016. Hence, we test the impact of price index on price volatility for the 2008 and 2012 election years. Politicians who do not run for office in a subsequent election have their campaign expenditures and usage of brokers equal to zero.

Table S.I.7. Commodities and Campaign Resources in Rural Municipalities: Campaign expenditures

	log(1+expenses) in the next election	
	(1)	(2)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	-0.0229^{***}	0.0195
	(0.0083)	(0.0179)
$\Pi_{ki_{t+1}}$	-0.0349^{***}	-0.0616^{***}
	(0.0049)	(0.0102)
$Incumbency_{ki_t}$	2.4407^{***}	0.3189
	(0.1717)	(0.3839)
$Margin$	6.3145^{***}	33.4423^{***}
	(0.2994)	(4.9654)
$\Pi_{ki_{t+1}} \times Margin$	-0.0565^{***}	-0.5223^{***}
	(0.0158)	(0.1867)
$Incumbency_{ki_t} \times Margin$	-6.4326^{***}	-17.8798^{***}
	(0.7141)	(6.5623)
Constant	3.3770^{***}	4.8450^{***}
	(0.1023)	(0.2451)
Bandwidth	All	Optimal
Year FEs	Yes	Yes
n	10862	4510

*p<0.1; **p<0.05; ***p<0.01

Coefficients of linear regressions of log value of total campaign expenses (plus one), in Brazilian reais, on commodity price index and year fixed effects, weighted by a triangular kernel. 'All' corresponds to the full sample, 'Optimal' to the optimal bandwidth calculated via Calonico, Cattaneo and Titiunik (2014). robust standard errors clustered by municipality in parenthesis.

Table S.I.8. Commodities and Campaign Resources in Rural Municipalities: Brokers

	Number of brokers in next election	
	(1)	(2)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	0.0140	0.0571
	(0.0577)	(0.0900)
$\Pi_{ki_{t+1}}$	-0.0447	-0.0757
	(0.0298)	(0.0493)
$Incumbency_{ki_t}$	5.2018***	0.4166
	(1.0531)	(1.9509)
$Margin$	16.4773***	53.4966***
	(1.7677)	(19.8961)
$\Pi_{ki_{t+1}} \times Margin$	-0.0934	-0.6715
	(0.1049)	(0.6642)
$Incumbency_{ki_t} \times Margin$	-15.1359***	-9.2319
	(4.7937)	(25.2811)
Constant	7.8626***	10.5077***
	(0.6421)	(1.4950)
Bandwidth	All	Optimal
Year FEs	Yes	Yes
n	10862	5963

*p<0.1; **p<0.05; ***p<0.01

Coefficients of linear regressions of the number of individuals listed in candidates' campaign reports, on commodity price index and year fixed effects. 'All' corresponds to the full sample, 'Optimal' to the optimal bandwidth calculated via Calonico, Cattaneo and Titiunik (2014), and 2.5 to a 2.5% vote margin. robust standard errors clustered by municipality in parenthesis.

S.I.6.2 Heterogeneous Effects for Parties in rural municipalities

Tables S.I.9 and S.I.10 show estimates for local linear models at the optimal bandwidth, which is calculated for each study group separately. We study heterogeneous effects for parties in two different ways. First, Table S.I.9 shows estimations including one single party. Second, S.I.10 estimates the effect in study groups that have one party removed. We test for hererogeneous effects using the (then) three parties in terms of number of mayoral candidates; PMDB, PSDB, and PT; and the DEM, which has historically been attached to rural interests All models are weighted by a triangular kernel.

Table S.I.9. Heterogeneous Incumbency Effects by Party

	Prob Win Next Election			
	DEM	PMDB	PSDB	PT
	(1)	(2)	(3)	(4)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	0.009*	0.006*	0.001	0.011**
	(0.005)	(0.003)	(0.005)	(0.005)
$\Pi_{ki_{t+1}}$	−0.005*	−0.003*	0.001	−0.007**
	(0.003)	(0.002)	(0.003)	(0.003)
$Incumbency_{ki_t}$	−0.298***	−0.189***	0.016	−0.201**
	(0.105)	(0.064)	(0.087)	(0.079)
$Margin$	6.909***	3.135***	2.452**	2.421***
	(1.464)	(0.743)	(0.957)	(0.695)
$\Pi_{ki_{t+1}} \times Margin$	−0.075	−0.031	−0.007	−0.022
	(0.050)	(0.030)	(0.050)	(0.030)
$Incumbency_{ki_t} \times Margin$	−4.241**	−0.439	−1.069	−1.093
	(1.892)	(1.054)	(1.347)	(0.891)
Constant	0.568***	0.347***	0.314***	0.525***
	(0.083)	(0.049)	(0.061)	(0.076)
n	447	1061	609	619

*p<0.1; **p<0.05; ***p<0.01

Coefficients of local linear regressions of a binary measure of victory in $t + 1$ on commodity price index, an incumbency indicator, and their interaction, as well as vote margin and its interaction with incumbency. Each column shows estimates from study groups with candidates from one party, denoted at the column. Results in the optimal bandwidth. All specifications include year fixed effects, are weighted by a triangular kernel, and include robust standard errors clustered by municipality (in parenthesis).

Table S.I.10. Commodity shocks and incumbency effects, excluding one party

	Prob Win Next Election			
	W/out DEM	W/out PMDB	W/out PSDB	W/out PT
	(1)	(2)	(3)	(4)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	0.004*	0.004	0.006**	0.004*
	(0.002)	(0.003)	(0.002)	(0.002)
$\Pi_{ki_{t+1}}$	−0.002*	−0.002	−0.003**	−0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
$Incumbency_{ki_t}$	−0.131***	−0.156***	−0.185***	−0.153***
	(0.038)	(0.043)	(0.044)	(0.043)
$Margin$	3.291***	4.235***	4.361***	4.035***
	(0.446)	(0.606)	(0.636)	(0.615)
$\Pi_{ki_{t+1}} \times Margin$	−0.003	−0.003	−0.020	−0.014
	(0.024)	(0.030)	(0.031)	(0.030)
$Incumbency_{ki_t} \times Margin$	−1.538***	−2.440***	−2.369***	−1.973***
	(0.490)	(0.662)	(0.656)	(0.645)
Constant	0.413***	0.461***	0.458***	0.430***
	(0.025)	(0.029)	(0.029)	(0.028)
n	4254	3312	3479	3630

*p<0.1; **p<0.05; ***p<0.01

Coefficients of local linear regressions of a binary measure of victory in $t+1$ on commodity price index, an incumbency indicator, and their interaction, as well as vote margin and its interaction with incumbency. Each column shows estimates from study groups with candidates from all parties but one, denoted at the column. Results in the optimal bandwidth. All specifications include year fixed effects and robust standard errors clustered by municipality (in parenthesis).

S.I.6.3 Farmers and rural workers

We code candidates as farmers or rural worker if they reported any of the following categories as their occupation (in Portuguese): *veterinario e zootecnista, trabalhador rural, trabalhador florestal, trabalhador da pecuaria, trabalhador agricola, tecnico em agronomia e agrimensura, tecnico em agronomia e agrimensura, proprietario de estabelecimento agricola, da pecuaria e florestal, produtor agropecuario, produtor agropecuario, pecuarista, operador de implemento de agricultura, pecuaria e exploracao florestal, operador de implemento de agricultura, pecuaria e exploracao florestal, agronomo, agricultor.* Rural municipalities are those whose rural population is above the national median of municipal rural population.

Table S.I.11 shows estimates for all municipalities. In these estimates both incumbents and challengers are rural workers, or both are not rural workers. Columns 1, 2, 3 show the estimates for different bandwidths for municipalities with rural candidates, and the remaining columns show estimates for municipalities without rural candidates. The results indicate that shocks affect rural candidates more than non-rural candidates. These estimates should be taken with caution, as it is more likely that rural candidates will be concentrated in rural municipalities. Furthermore, since these candidates types do not vary in the chance of being elected after a shock, these differential effects cannot account for heterogeneous incumbency effects.

Table S.I.11. Exogenous shocks and re-election, farmers and rural workers

	Prob. Re-election					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	0.0029**	0.0061**	0.0071	0.0032***	0.0023	0.0020
	(0.0012)	(0.0027)	(0.0044)	(0.0007)	(0.0016)	(0.0032)
$\Pi_{ki_{t+1}}$	−0.0008	−0.0026*	−0.0042*	−0.0004	0.0001	0.00005
	(0.0007)	(0.0014)	(0.0024)	(0.0004)	(0.0008)	(0.0017)
$Incumbency_{ki_t}$	0.0660***	−0.2173***	−0.2452**	0.0928***	−0.0460*	−0.1490***
	(0.0250)	(0.0570)	(0.1022)	(0.0126)	(0.0271)	(0.0559)
$Margin$	0.5367***	4.2796***	7.3150	0.4674***	1.9767***	6.5474***
	(0.0452)	(0.7960)	(4.5133)	(0.0174)	(0.2710)	(2.2423)
$\Pi_{ki_{t+1}} \times Margin$	−0.0002	−0.0327	−0.0860	0.0005	0.0139	0.0388
	(0.0023)	(0.0303)	(0.1398)	(0.0011)	(0.0140)	(0.0982)
$Incumbency_{ki_t} \times Margin$	−0.1196	−1.6669*	−5.5968	−0.0650	−1.1777***	−2.8319
	(0.0982)	(0.9986)	(5.1777)	(0.0464)	(0.3245)	(2.3815)
Constant	0.2406***	0.4279***	0.4740***	0.2107***	0.3172***	0.3876***
	(0.0147)	(0.0380)	(0.0683)	(0.0066)	(0.0163)	(0.0344)
Bandwidth	All	Optimal	2.5%	All	Optimal	2.5%
Rural Politicians	Y	Y	Y	N	N	N
n	4032	1612	493	18902	6744	1809

*p<0.1; **p<0.05; ***p<0.01

Coefficients of local linear regressions of a binary measure of victory in $t + 1$ on commodity price index, an incumbency indicator, and their interaction, as well as vote margin and its interaction with incumbency. Columns 1- 3 estimate models that only include candidates that are farmers or rural workers. Columns 4 - 6 are all other candidates. 'All' corresponds to the full sample, 'Optimal' to the optimal bandwidth calculated via Calonico, Cattaneo and Titiunik (2014), and 2.5 to a 2.5% vote margin. All specifications include year fixed effects, are weighted by a triangular kernel, include and robust standard errors clustered by municipality (in parenthesis).

Table S.I.12. Exogenous shocks and re-election, farmers and rural workers in rural municipalities

	Prob. Re-election					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	0.0038**	0.0090***	0.0119**	0.0025**	0.0022	0.0044
	(0.0015)	(0.0031)	(0.0056)	(0.0011)	(0.0025)	(0.0049)
$\Pi_{ki_{t+1}}$	−0.0010	−0.0040**	−0.0066**	−0.0001	−0.0002	−0.0012
	(0.0008)	(0.0016)	(0.0029)	(0.0006)	(0.0014)	(0.0026)
$Incumbency_{ki_t}$	0.0839***	−0.2288***	−0.2622**	0.0978***	−0.1205***	−0.1608**
	(0.0313)	(0.0696)	(0.1286)	(0.0182)	(0.0412)	(0.0764)
$Margin$	0.5527***	5.1760***	9.2839*	0.5165***	3.1132***	6.2110**
	(0.0558)	(0.8889)	(5.4563)	(0.0271)	(0.4868)	(3.0380)
$\Pi_{ki_{t+1}} \times Margin$	−0.0008	−0.0576*	−0.1644	0.0004	0.0159	−0.0263
	(0.0031)	(0.0328)	(0.1891)	(0.0018)	(0.0267)	(0.1471)
$Incumbency_{ki_t} \times Margin$	−0.2243*	−2.5820**	−10.0780	−0.0971	−1.4994***	−5.4556*
	(0.1224)	(1.1181)	(6.3944)	(0.0700)	(0.5438)	(3.2098)
Constant	0.2400***	0.4597***	0.5349***	0.2211***	0.3716***	0.4131***
	(0.0182)	(0.0447)	(0.0829)	(0.0097)	(0.0255)	(0.0472)
Bandwidth	All	Optimal	2.5%	All	Optimal	2.5%
Rural Politicians	Y	Y	Y	N	N	N
n	2546	1090	332	8691	3609	991

*p<0.1; **p<0.05; ***p<0.01

Coefficients of local linear regressions of a binary measure of victory in $t+1$ on commodity price index, an incumbency indicator, and their interaction, as well as vote margin and its interaction with incumbency. Rural municipalities are those whose share of workers in agriculture is above the median. Columns 1- 3 estimate models that only include candidates that are farmers or rural workers. Columns 4 - 6 are all other candidates. 'All' corresponds to the full sample, 'Optimal' to the optimal bandwidth calculated via Calonico, Cattaneo and Titiunik (2014), and 2.5 to a 2.5% vote margin. All specifications include year fixed effects, weighted by a triangular kernel, and are robust standard errors clustered by municipality (in parenthesis).

S.I.7 IV: GDP growth and Incumbency: Instrumental variable approach

Our hypothesis is that commodity price variation affects growth, and this variation in growth will affect incumbency effects. In the manuscript, we took a reduced form approach separately estimating each implied relationship: an effect of price variation on (i) growth in GDP (and agricultural GDP) and (ii) on incumbency effects. Here, we present an instrumental variables approach to test the full causal chain – Commodity shocks ⇒ Economic growth ⇒ Incumbency effects. In our setup, commodity price variation serves as an instrument for growth, and the interaction between these variables serves as an instrument for the interaction between growth and incumbency.

Instrumental variable estimation via two-stage least squares rests on three main assumptions. Regarding exogeneity, as we have argued and indirectly examined via placebo evidence, there are grounds to believe that commodity shocks are exogenous. Secondly, the F-test for the interaction shows that the instrument is strong. Lastly, while the exclusion restriction cannot be conclusively demonstrated, throughout the text we have shown that price volatility does not affect a number variables that should affect incumbents' chances of reelection. These results give credence that the exclusion restriction is satisfied.

Table S.I.13 shows the results. Our variables of interest are $GDP_{ki_{t+1}} \times Incumbency_{ki_t}$ and $AgroGDP_{ki_{t+1}} \times Incumbency_{ki_t}$, which capture the effect of the growth on the probability of re-election of the incumbent. Results show that growth in overall and Agricultural GDP instrumented by commodity shocks have a statistically and substantively significant impact on incumbency effects.

Table S.I.13. 2SLS - Commodity shocks as IV for GDP Growth, and Incumbency Effects in Rural Municipalities

	Prob. Win Next Election			
	(1)	(2)	(3)	(4)
$\Delta GDP_{ki_{t+1}} \times Incumbency_{ki_t}$	1.2837***	2.2005*		
	(0.4460)	(1.2010)		
$\Delta GDP_{ki_{t+1}}$	−0.5049**	−1.1794*		
	(0.2483)	(0.6409)		
$\Delta AgroGDP_{ki_{t+1}} \times Incumbency_{ki_t}$			0.5246***	0.8185*
			(0.1777)	(0.4627)
$\delta AgroGDP_{ki_{t+1}}$			−0.2109**	−0.4375*
			(0.1015)	(0.2452)
$Incumbency_{ki_t}$	−0.0549	−0.4182**	0.0313	−0.2798***
	(0.0623)	(0.1659)	(0.0355)	(0.1006)
$Margin$	0.5607***	4.9323**	0.5520***	4.4588***
	(0.1051)	(1.9750)	(0.0572)	(1.1454)
$\Delta GDP_{ki_{t+1}} \times Margin$	−0.2392	−7.0962		
	(0.7556)	(14.2411)		
$\Delta Agro_G DP_{ki_{t+1}} \times Margin$			−0.1437	−1.5902
			(0.2924)	(5.3421)
$Incumbency_{ki_t} \times Margin$	−0.1239**	−2.2544***	−0.1422**	−2.1609***
	(0.0603)	(0.5906)	(0.0600)	(0.5730)
Constant	0.3161***	0.5783***	0.2834***	0.5024***
	(0.0381)	(0.0940)	(0.0232)	(0.0577)
Bandwidth	All	Optimal	All	Optimal
Year FEs	Yes	Yes	Yes	Yes
n	11233	3946	11233	3946
F-Test, interaction	91.04	17.94	72.1	12.54

*p<0.1; **p<0.05; ***p<0.01

Note: Coefficients of 2SLS regressions, weighted by a triangular kernel. 'All' corresponds to the full sample, 'Optimal' to the optimal bandwidth calculated via Calonico, Cattaneo and Titiunik (2014). robust standard errors clustered by municipality in parenthesis.

S.I.8 Scope conditions: commodity shocks and local council candidates

As argued in the main text, voters evaluate mayors for their management of local administration, which includes the local economy. Contrary to mayors, local councilors in Brazil have very limited instruments to affect the local economy, and their linkages to voters are largely non-programmatic. Therefore, we do not expect voters to evaluate councilors retrospectively. Testing how commodity shocks interact with the incumbency of councilors thus provides a placebo test for our theory. We examine this conjecture with a straightforward test. Focusing on councilors, we replicate the main tests for mayors presented in the paper. We adapt the framework for the proportional representation system that allocates local council seats in Brazil. To do that, we build a running variable that calculates the margin of victory or defeat of candidates within the same coalition. This is a similar procedure Boas and Hidalgo (2011) use to analyze council candidates in Brazil. Specifically, we build the running variable in two steps. First, we calculate the distance between a winning candidate from the top-voted losing candidate in the coalition, and for losing candidates we calculate their distance from the last-elected candidate in their coalition. Second, we divide that distance (in absolute votes) by the total valid votes in the municipality.

Once again, we are interested in the interaction between incumbency and price volatility. The results indicate that council candidates' incumbency effects do not vary according to commodity shocks.

Table S.I.14. Incumbency effects of council candidates, conditional on price index change

	Probability Win Next Election	
	Rural	Urban
	(1)	(2)
$\Pi_{ki_{t+1}} \times Incumbency_{ki_t}$	−0.0002	0.001
	(0.0004)	(0.001)
$\Pi_{ki_{t+1}}$	−0.0003	−0.0002
	(0.0002)	(0.001)
$Incumbency_{ki_t}$	−0.048***	−0.050**
	(0.009)	(0.024)
$Margin$	0.363***	0.361***
	(0.008)	(0.017)
n	65372	45537

*p<0.1; **p<0.05; ***p<0.01

Coefficients of local linear regressions of a binary measure of victory in $t+1$ on commodity price index, an incumbency indicator, and their interaction, as well as vote margin and its interaction with incumbency, weighted by a triangular kernel. Bandwidths calculated non-parametrically using the `msetwo` algorithm in Calonico, Cattaneo and Titiunik (2014), to account for the distribution that is not centered at the cutoff (most candidates lose the election). All specifications include year fixed effects and robust standard errors clustered by municipality (in parenthesis).