

# Tying Your Enemy's Hands in Close Races: The Politics of Federal Transfers in Brazil\*

## *Online Appendix*

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### **Abstract**

This Appendix provides additional materials that are also discussed in the paper. Section A1 presents the theoretical derivations of the model's predictions. Section A2 provides further details and robustness checks supporting the validity of our RD exercise. In particular, we detail the definition of our measures of political alignment in Brazil; we test for the continuity of the density at the threshold of zero margin of victory; we show evidence on the external validity of the RD samples; we perform tests of the balancing of observable covariates in the pre-treatment period, as well as placebo tests at false electoral thresholds.

**Keywords:** distributive politics, fiscal federalism, regression discontinuity design.

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# A1 Theoretical derivations

## Proof of Proposition 1

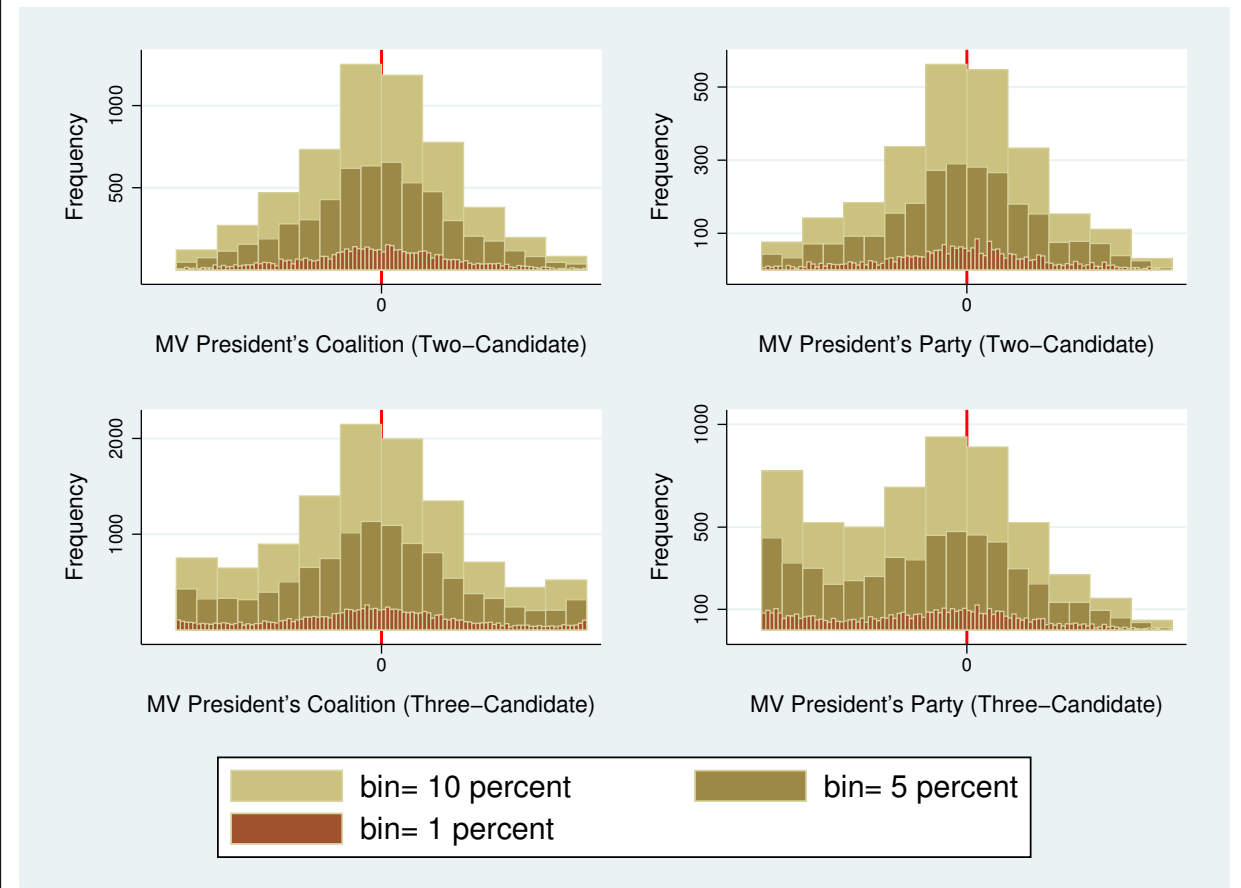
Define  $\underline{\tau} = E[\tau \mid P_i = 0, MVP_i^0 = 0] = \lim_{MVP_i^0 \uparrow 0} \tau_i$  as the optimal transfers to unaligned municipalities in close races, and  $\bar{\tau} = E[\tau \mid P_i = 1, MVP_i^0 = 0] = \lim_{MVP_i^0 \downarrow 0} \tau_i$  as the optimal transfers to aligned municipalities in close races. These quantities are derived from the following first-order conditions, respectively:  $(1 - \theta)U'(\underline{\tau}) - \frac{R\theta f'(\underline{\tau})}{\sigma} \phi\left[\frac{-\theta f(\underline{\tau})}{\sigma}\right] - C'(\underline{\tau}) = 0$ ;  $(1 - \theta)U'(\bar{\tau}) + \frac{R\theta f'(\bar{\tau})}{\sigma} \phi\left[\frac{\theta f(\bar{\tau})}{\sigma}\right] - C'(\bar{\tau}) = 0$ . It follows that:  $\underline{\tau} = \tau^* - z < \tau^* < \bar{\tau} = \tau^* + k$ , with  $z, k > 0$ , which proves Proposition 1.

## Proof of Proposition 2

Define the first-order condition in equation (4) as  $g(\tau_i, MVP_i^0) = 0$ . Therefore, at  $P_i = 1$ :  $(\partial\tau_i/\partial MVP_i^0) = -(\partial g/\partial MVP_i^0)/(\partial g/\partial\tau_i) < 0$ . In fact:  $(\partial g/\partial\tau_i) < 0$  because of the second-order condition; and  $(\partial g/\partial MVP_i^0) = -\frac{R\theta f'(\tau_i)}{\sigma} \frac{\rho MVP_i^0 + \theta f(\tau_i)}{\sigma} \phi\left[\frac{\rho MVP_i^0 + \theta f(\tau_i)}{\sigma}\right] < 0$ , as  $\phi'[x] = -x\phi[x]$ . Similarly, at  $P_i = 0$ :  $(\partial\tau_i/\partial MVP_i^0) = -(\partial g/\partial MVP_i^0)/(\partial g/\partial\tau_i) < 0$ , because in this case:  $(\partial g/\partial MVP_i^0) = \frac{R\theta f'(\tau_i)}{\sigma} \frac{\rho MVP_i^0 - \theta f(\tau_i)}{\sigma} \phi\left[\frac{\rho MVP_i^0 - \theta f(\tau_i)}{\sigma}\right] < 0$ .

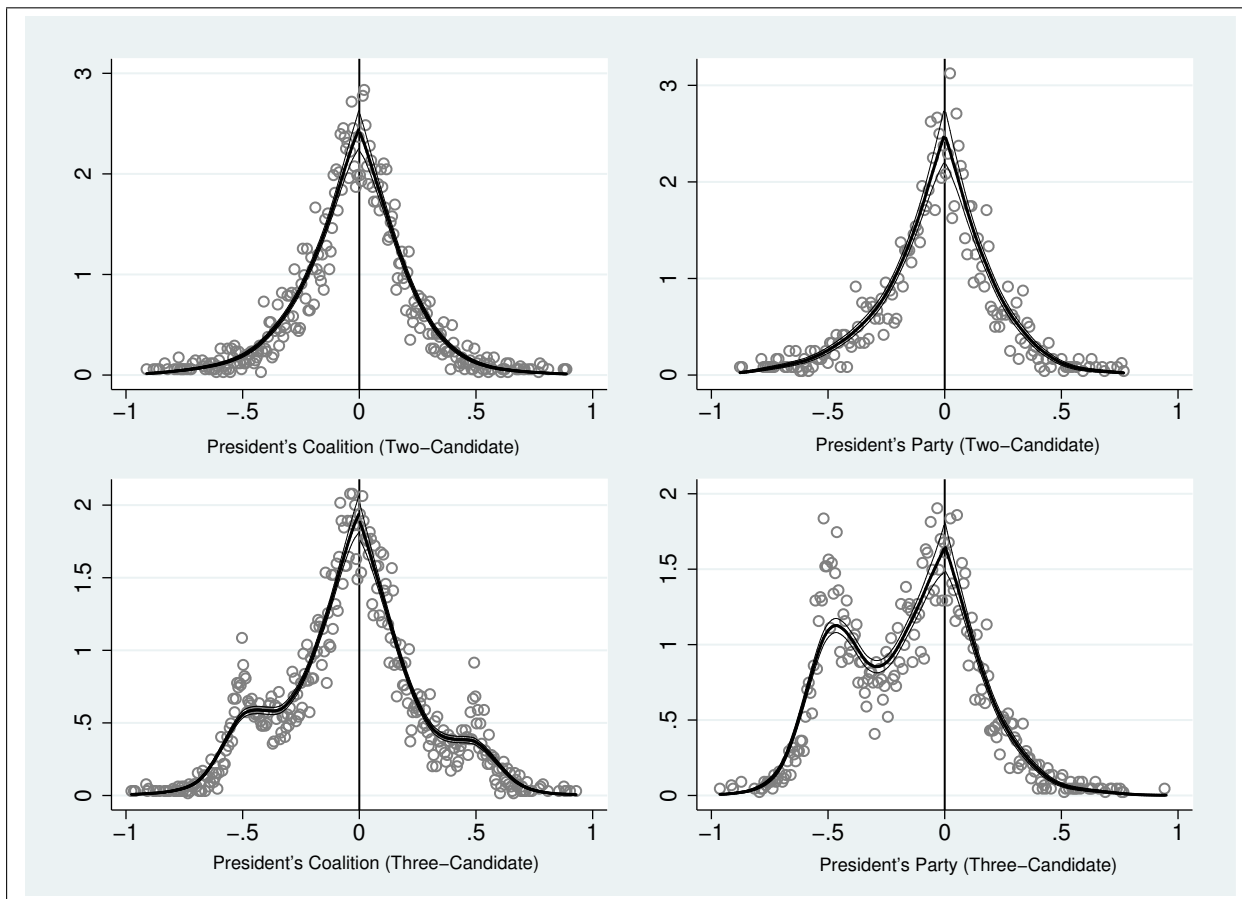
# A2 Robustness checks

Figure A1 – Histograms of the margin of victory



Notes. Frequency of municipalities according to the margin of victory of the President's coalition or the President's party. *Two-candidate (Three-candidate)* races are those where only two (three) candidates run for mayor and one of them is affiliated with the President's coalition or party.

Figure A2 – Testing the continuity of the density in close races



Notes. Weighted kernel estimation of the log density according to the margin of victory of the President's coalition or the President's party, performed separately on either side of the zero threshold. Optimal binwidth and binsize as in McCrary (2008). *Two-candidate* (*Three-candidate*) races are those where only two (three) candidates run for mayor and one of them is affiliated with the President's coalition or party.

Table A1 – Definitions of President's coalition in the two-year subperiods of municipal terms

Political party	Chamber of Deputies seats			Government coalition						
	1998 election	2002 election	2006 election	1995 & 1996	1997 & 1998	1999 & 2000	2001 & 2002	2003 & 2004	2005 & 2006	2007 & 2008
PMDB	83	76	89	YES	YES	YES	YES	NO	NO	YES
PT	59	91	83	NO	NO	NO	NO	YES	YES	YES
PSDB	99	70	65	YES	YES	YES	YES	NO	NO	NO
PFL	105	84	65	YES	YES	YES	YES	NO	NO	NO
PP	60	48	42	YES	YES	YES	YES	NO	NO	NO
PSB	18	22	27	NO	NO	NO	NO	YES	YES	YES
PDT	25	21	24	NO	NO	NO	NO	YES	YES	YES
PL	12	26	23	NO	NO	NO	NO	YES	YES	YES
PTB	31	26	22	YES	NO	NO	NO	YES	YES	YES
PPS	3	15	21	YES	YES	NO	NO	YES	YES	YES
PV	1	5	13	NO	NO	NO	NO	YES	YES	YES
PC do B	7	12	13	NO	NO	NO	NO	YES	YES	YES
PRONA*	1	6	2	NO	NO	NO	NO	NO	YES	YES
PSC	2	0	9	NO	NO	NO	NO	NO	NO	NO
PTC	0	0	4	NO	NO	NO	NO	NO	NO	NO
PSL	0	0	3	NO	NO	NO	NO	NO	NO	NO
PMN	2	1	3	NO	NO	NO	NO	NO	NO	NO
PHS	0	0	2	NO	NO	NO	NO	NO	NO	NO
PT do B	0	0	1	NO	NO	NO	NO	NO	NO	NO
PAN	0	0	1	NO	NO	NO	NO	NO	NO	NO
PRB	0	0	1	NO	NO	NO	NO	NO	NO	NO
PSDC	0	1	0	NO	NO	NO	NO	NO	NO	NO
PSL	1	1	0	NO	NO	NO	NO	NO	NO	NO
PSD	3	4	0	NO	NO	NO	NO	NO	NO	NO
PST	1	3	0	NO	NO	NO	NO	NO	NO	NO
Others	0	0	0	NO	NO	NO	NO	NO	NO	NO

Notes. See Figure 2 in the paper for the timing of federal and municipal elections over our sample period. Fernando Henrique Cardoso (PSDB) was elected as President in both 1994 and 1998. Luis Inácio Lula da Silva (PT) was elected as President in both 2002 and 2006. \*The political party PRONA merged with PL and PR after 2005.

Table A2 – Descriptive statistics, two-candidate vs. other races

	President's coalition			President's party		
	Two-candidate	Other	<i>p-value</i>	Two-candidate	Other	<i>p-value</i>
First two-year transfers	15.831	21.006	0.000	19.770	19.568	0.921
Last two-year transfers	18.384	16.127	0.008	20.795	16.164	0.000
Reelection rate	0.346	0.358	0.095	0.397	0.349	0.000
Population	12,007	15,620	0.000	11,712	15,088	0.000
Per-capita income	153.58	161.34	0.000	159.77	159.29	0.804
Urban	0.533	0.575	0.000	0.557	0.565	0.076
Water	0.554	0.578	0.000	0.572	0.572	0.894
Sewer	0.190	0.224	0.000	0.243	0.212	0.000
Electricity	0.870	0.875	0.025	0.881	0.873	0.019
Literacy rate	0.551	0.558	0.001	0.565	0.555	0.000
Radio	0.141	0.179	0.000	0.138	0.174	0.000
North	0.051	0.063	0.002	0.059	0.060	0.931
Northeast	0.321	0.309	0.079	0.229	0.323	0.000
Center	0.070	0.087	0.000	0.070	0.084	0.014
South	0.293	0.232	0.000	0.237	0.249	0.202
Southeast	0.265	0.310	0.000	0.404	0.284	0.000
Obs.	5,723	16,564		2,612	19,675	

Notes. *Two-candidate* races are those where only two candidates run for mayor and one of them is affiliated with the President's coalition or party. *Other races* are the other elections. All columns except those with *p-value* report the average values in the respective subsamples; *p-value* refers to the statistical significance of the difference between means. *First two-year transfers* (*Last two-year transfers*) are the average infrastructure transfers from the federal government to municipalities in the first (last) two years of the mayoral term (per-capita real values in 2000 Brazilian reais). *Reelection rate* captures whether the incumbent mayor is reelected or not. *Population* is the number of resident inhabitants in 2000. *Per-capita income* refers to monthly income in 2000 and is measured in Brazilian reais. The following variables refer to the 2000 Census and are expressed in percentage terms: *Urban population* is the fraction of people living in urban areas; *Water access*; *Sewer*; and *Electricity*; *Literacy rate* is the fraction of people above 20 who are literate; are the fraction of houses with access to water supply, sewer, and electricity, respectively; *Radio* captures whether there is at least one local radio station in the municipality. *North*, *Northeast*, *Center*, *South*, and *Southeast* are macro-regions.

Table A3 – Descriptive statistics, three-candidate vs. other races

	President's coalition			President's party		
	Three-candidate	Other	<i>p-value</i>	Three-candidate	Other	<i>p-value</i>
First two-year transfers	17.818	21.695	0.003	20.542	19.270	0.388
Last two-year transfers	15.693	17.943	0.003	16.193	16.907	0.389
Reelection rate	0.339	0.374	0.000	0.374	0.347	0.000
Population	17,099	11,757	0.000	18,176	13,335	0.000
Per-capita income	162.99	154.91	0.000	172.71	154.14	0.000
Urban	0.576	0.550	0.000	0.594	0.552	0.000
Water	0.581	0.560	0.000	0.597	0.562	0.000
Sewer	0.224	0.205	0.000	0.259	0.198	0.000
Electricity	0.878	0.868	0.000	0.885	0.869	0.000
Literacy rate	0.560	0.552	0.000	0.575	0.549	0.000
Radio	0.203	0.128	0.000	0.222	0.149	0.000
North	0.057	0.063	0.034	0.064	0.058	0.069
Northeast	0.307	0.318	0.071	0.239	0.340	0.000
Center	0.074	0.093	0.000	0.071	0.087	0.000
South	0.264	0.227	0.000	0.248	0.247	0.900
Southeast	0.299	0.298	0.899	0.378	0.268	0.000
Obs.	12,245	10,042		6,248	16,039	

Notes. *Three-candidate* races are those where only three candidates run for mayor and one of them is affiliated with the President's coalition or party. *Other races* are the other elections. All columns except those with *p-value* report the average values in the respective subsamples; *p-value* refers to the statistical significance of the difference between means. *First two-year transfers* (*Last two-year transfers*) are the average infrastructure transfers from the federal government to municipalities in the first (last) two years of the mayoral term (per-capita real values in 2000 Brazilian reais). *Reelection rate* captures whether the incumbent mayor is reelected or not. *Population* is the number of resident inhabitants in 2000. *Per-capita income* refers to monthly income in 2000 and is measured in Brazilian reais. The following variables refer to the 2000 Census and are expressed in percentage terms: *Urban population* is the fraction of people living in urban areas; *Water access*, *Sewer*, and *Electricity*; *Literacy rate* is the fraction of people above 20 who are literate; are the fraction of houses with access to water supply, sewer, and electricity, respectively; *Radio* captures whether there is at least one local radio station in the municipality. *North*, *Northeast*, *Center*, *South*, and *Southeast* are macro-regions.

Table A4 – Testing the continuity of town characteristics in close races

	<i>Two-candidate races</i>			<i>Three-candidate races</i>		
	President's coalition [-10;+10]	President's coalition [-5;+5]	President's party [-10;+10]	President's coalition [-10;+10]	President's coalition [-5;+5]	President's party [-10;+10]
<i>OLS interval</i>						
Per-capita income	-309.489 (636.197)	-262.708 (964.686)	-2.736 (6.753)	1.925 (3.668)	5.384 (5.113)	-5.639 (5.449)
Population	2.192 (4.808)	6.200 (6.827)	696.967 (1,150.393)	278.376 (790.663)	-410.688 (1,133.589)	987.090 (1,471.050)
Urban	0.001 (0.012)	0.001 (0.017)	-0.008 (0.018)	-0.001 (0.009)	-0.000 (0.013)	-0.012 (0.014)
Water	-0.008 (0.013)	-0.013 (0.018)	-0.007 (0.020)	0.000 (0.010)	0.001 (0.014)	-0.011 (0.015)
Sewer	0.013 (0.014)	-0.005 (0.019)	0.008 (0.023)	0.010 (0.012)	0.008 (0.016)	-0.014 (0.019)
Electricity	0.010 (0.009)	0.010 (0.012)	0.005 (0.013)	0.003 (0.007)	0.008 (0.009)	-0.004 (0.010)
Literacy rate	-0.002 (0.007)	0.002 (0.010)	-0.005 (0.010)	0.000 (0.006)	0.005 (0.007)	-0.004 (0.008)
Radio	0.007 (0.019)	0.036 (0.027)	-0.039 (0.029)	0.003 (0.016)	0.002 (0.023)	-0.042 (0.026)
North	-0.017 (0.012)	-0.010 (0.016)	0.029 (0.021)	0.007 (0.010)	0.008 (0.014)	0.030* (0.016)
Northeast	0.022 (0.026)	0.028 (0.036)	-0.033 (0.035)	-0.003 (0.020)	-0.015 (0.027)	-0.036 (0.027)
Center	0.009 (0.013)	0.027 (0.018)	-0.001 (0.020)	0.004 (0.010)	0.009 (0.015)	0.000 (0.016)
South	-0.015 (0.026)	0.003 (0.036)	-0.029 (0.037)	-0.016 (0.019)	0.002 (0.026)	-0.009 (0.027)
Southeast	0.002 (0.024)	-0.049 (0.032)	0.035 (0.039)	0.008 (0.019)	-0.003 (0.026)	0.015 (0.031)
Lagged MV	0.003 (0.023)	-0.004 (0.031)	0.065 (0.050)	-0.010 (0.018)	-0.009 (0.025)	0.027 (0.043)
Obs.	1,317	697	595	2,259	1,210	993
<i>F-test</i>	0.552	0.310	0.531	0.943	0.959	0.182
						516 0.111

Notes. Estimated discontinuities of town characteristics at the threshold of zero margin of victory. OLS specifications restricted to the close intervals of the margin of victory: [-10;+10] or [-5;+5], as specified. *Per-capita income* refers to monthly income in 2000 and is measured in Brazilian reais. *Population* is the number of inhabitants in 2000. The following variables refer to the 2000 Census and are expressed in percentage terms: *Urban population* is the fraction of people living in urban areas; *Literacy rate* is the fraction of people above 20 who are literate; *Water access*, *Sewer*, and *Electricity* are the fraction of houses with access to water supply, sewer, and electricity, respectively; *Radio* captures whether there is at least one radio station in the municipality. *North*, *Northeast*, *Center*, *South*, and *Southeast* are macro-regions. *Lagged MV* is the lagged margin of victory of either the President's coalition or the President's party at the municipality level. Robust standard errors clustered at the municipality level are in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.



Table A5 – Testing the continuity of pre-treatment characteristics in close races

<i>OLS interval</i>	<i>Two-candidate races</i>			<i>Three-candidate races</i>		
	President's coalition [-10;+10]	President's party [-10;+10]	President's party [-5;+5]	President's coalition [-10;+10]	President's coalition [-5;+5]	President's party [-5;+5]
Employed	-0.149 (0.409)	-0.001 (0.602)	0.539 (0.803)	0.034 (0.290)	0.034 (0.398)	0.009 (0.423)
Water	-0.014 (0.011)	-0.010 (0.009)	0.001 (0.013)	0.001 (0.015)	0.008 (0.021)	-0.003 (0.017)
Sewer	-0.022* (0.020)	-0.021 (0.012)	-0.042 (0.018)	-0.016 (0.010)	-0.017 (0.014)	-0.018 (0.017)
Electricity	-0.011 (0.016)	-0.014 (0.025)	0.025 (0.034)	-0.008 (0.012)	0.008 (0.017)	-0.010 (0.019)
Durables	-0.232 (0.235)	-0.309 (0.362)	0.365 (0.480)	-0.179 (0.178)	-0.070 (0.246)	-0.276 (0.271)
Radio	-0.158 (0.267)	-0.286 (0.349)	0.022 (0.467)	-0.094 (0.196)	-0.006 (0.266)	-0.119 (0.262)
Car	-0.148 (0.153)	-0.106 (0.233)	0.315 (0.300)	-0.079 (0.112)	0.015 (0.152)	-0.105 (0.169)
Obs.	869	398	220	1,595	854	386
<i>F-test</i>	0.577	0.684	0.330	0.654	0.835	0.700

Notes. Estimated discontinuities of pre-treatment characteristics at the threshold of zero margin of victory. OLS specifications restricted to the close intervals of the margin of victory: [-10;+10] or [-5;+5], as specified. All variables refer to the 1980 Census, are expressed in percentage terms, and measure, respectively: average employment; house access to water and sewer; ownership of durable goods; radio ownership; car ownership. Robust standard errors clustered at the municipality level in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

Table A6 – Placebo tests at false electoral thresholds

	President's coalition	President's party	President's coalition	President's party	President's coalition	President's party
<i>Panel A1: Median on the left, two-candidate races</i>						
	Last two-year transfers		Incumbent party's reelection		President's vote share	
	-9.186 (7.614)	-10.015 (9.560)	-0.050 (0.144)	0.051 (0.167)	-0.023 (0.042)	0.021 (0.056)
Obs.	785	785	785	785	785	785
<i>Panel A2: Median on the left, three-candidate races</i>						
	Last two-year transfers		Incumbent party's reelection		President's vote share	
	-2.340 (4.799)	-2.701 (8.691)	0.102 (0.122)	0.086 (0.123)	-0.015 (0.030)	0.017 (0.043)
Obs.	1,167	1,167	1,167	1,167	1,167	1,167
<i>Panel B1: Median on the right, two-candidate races</i>						
	Last two-year transfers		Incumbent party's reelection		President's vote share	
	4.118 (5.841)	-1.200 (10.198)	0.049 (0.081)	-0.203 (0.135)	-0.009 (0.023)	-0.064** (0.033)
Obs.	2,711	1,214	2,711	1,214	2,711	1,214
<i>Panel B2: Median on the right, three-candidate races</i>						
	Last two-year transfers		Incumbent party's reelection		President's vote share	
	-0.716 (4.892)	4.801 (6.932)	0.070 (0.063)	-0.158 (0.105)	-0.010 (0.018)	-0.026 (0.025)
Obs.	4,444	1,943	4,444	1,943	4,444	1,943

Notes. Impact of political alignment at false electoral threshold (i.e., median on the left and on the right of the true threshold at zero margin of victory). Dependent variables: *Last two-year transfers*, i.e., the average infrastructure transfers from the federal government to municipalities in the last two years of the mayoral term (per-capita real values in 2000 Brazilian reais); *Incumbent party's reelection*, i.e., the probability that the mayor's political party wins the next election; *President's vote share*, i.e., the incumbent President's vote share in a given municipality at the next presidential election. *Two-candidate (Three-candidate)* races are those where only two (three) candidates run for mayor and one of them is affiliated with the President's coalition or party. Estimation methods: RDD specifications with 3<sup>rd</sup>-order spline polynomial approximation. Robust standard errors clustered at the municipality level are in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.