

Candidate Behavior in Local Elections: Campaigning in the Digital Age

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Inspire

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Motivation & Research Question

Motivation

Comigo não tem politicagem. Não tenho rabo preso com ninguém.

Comigo é pobre em primeiro lugar. Prioridade para a periferia.

#L[redacted] #C[redacted] #I[redacted] 3 #. #

#IndependenciaeCoragem



“With me, there is no politicking. I have no strings attached to anyone. With me, the poor come first. Priority for the outskirts.”

“With me, the poor come first”

#IndependenceAndCourage

#nameofthemunicipality #nameofthepolitician

#nameoftheparty #changennameofthemunicipality

Why Digital Campaigning?

- Social media became a ubiquitous part of everyday life
 - Brazil: users average **3h 49min/day** on social platforms (Social et al., 2024)
 - Brazilian campaigns invested **USD 58 million** in digital content in 2024
 - Facebook/Instagram/Meta alone: **USD 39.4 million** (68% of digital spend)
- Digital advertising differs from traditional advertising:
 - Near-instantaneous launch (mean lag: **< 2 hours**)
 - Near-zero marginal cost (median CPM: **USD 2.93**/1,000 impressions)
 - 6× cheaper than a printed campaign flyer

Research Question and Empirical Strategy

Research Question

How do electoral rules shape candidates' **digital** campaign strategies?

Exogenous Variation

- Brazil's **200,000-voter threshold** for runoff elections
- **Below:** single-round plurality
- **Above:** runoff if no candidate gets $> 50\% + 1$ of valid votes
- Creates distinct **intertemporal incentives** on either side

Empirical Strategy

- **Regression Discontinuity Design**
- TSE finance records: 728 candidates
- Meta Marketing API: **57,677 Instagram ads** from 540 candidates
- 2024 Municipal Elections (mayors)

Background and Data

The Brazilian Electoral System

Runoff Rule

- Brazil's 1988 Constitution introduced two-round elections during the transition to democracy (Chamon et al., 2019)
- Presidential and gubernatorial: automatic runoff if no candidate secures an absolute majority
- **Municipal:** runoff applies *only* in municipalities with $\geq 200,000$ registered voters

Why the threshold is a valid discontinuity

- Voting is **compulsory** (literate citizens aged 18–70)
- Voter registration is mandatory — municipalities **cannot** artificially inflate the electorate
- Crossing 200,000 voters is **plausibly exogenous** to local political engagement

Data Sources

- **Electoral and finance data (TSE)**

- Registered voters, votes by candidate, candidate characteristics
- Detailed campaign finance reports
- **728 candidates** in 154 municipalities (100k–300k voter window)

- **Municipal characteristics (IBGE Census 2022)**

- **Digital advertising data (Meta Marketing API)**

- Political & Issue Ads on Instagram — first round campaign window
- Fuzzy-matching of candidates to Meta pages
- Final dataset: **57,677 unique ads** from **540 candidates**
- Ad-level info: spending, reach, impressions, demographics, targeting, text, timing

► Matching Details

- **Sample:** municipalities with 100,000–300,000 registered voters

- **Period:** **16 August – 3 October 2024** (7 weeks, first round)

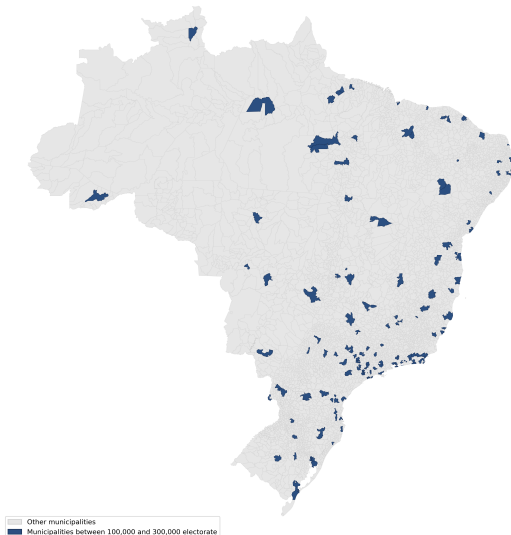
Sample and Geographic Coverage

- TSE sample: **728 candidates**, 154 municipalities
- Matched Meta sample: **540 candidates**
- Local RD window: 100k–300k voters

Neither municipal nor candidate characteristics display meaningful discontinuities at the 200,000-voter cutoff

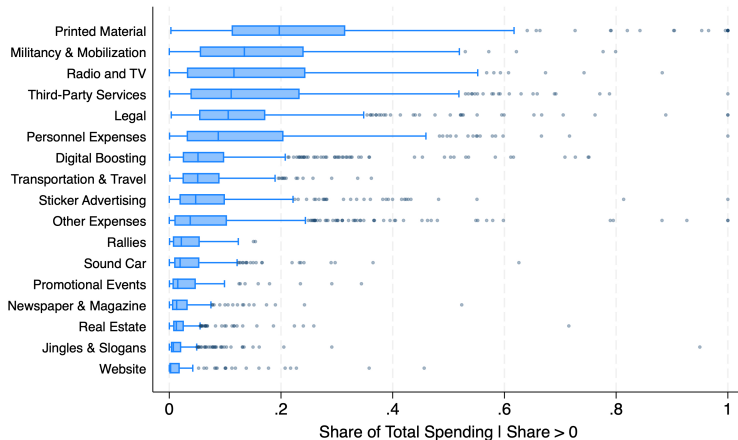
► Covariate Smoothness

Municipalities between 100,000 and 300,000 electorate



Descriptive Evidence

Campaign Expenditure Patterns

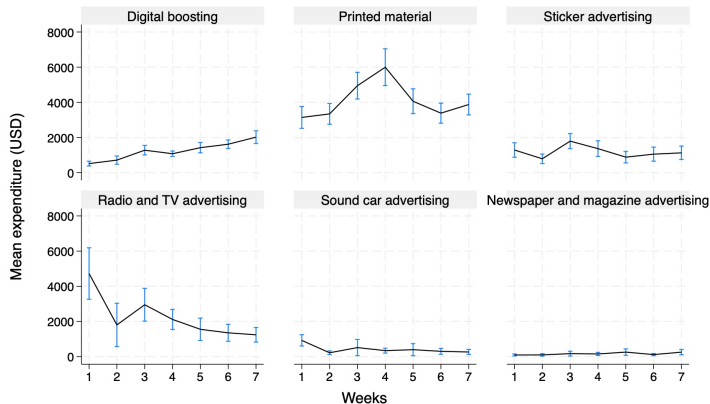


- **Printed Material:** highest median share, near-universal adoption

- **Digital Boosting:** widely adopted (86%) but median share < 10%

► Extensive Margin

Weekly Evolution of Marketing Expenditures



- **Digital Boosting:** monotonic increase — scales steeply in the final stretch
- **Printed Material:** hump-shaped
- **Radio & TV:** heavily front-loaded
- **Other categories:** roughly stable

► All 17 Categories

Digital Advertising Facts

Speed and campaign intensity

- Mean lag creation → delivery: **just over 2 hours**
- Average ad duration: **6.06 days**
- Median candidate: **61.5 ads**
- Weekly volume: **1,492 (week 1) → 26,090 (week 7)** (17-fold)

Cost

- Median CPM: **USD 2.93**/1,000 impressions
- 6× cheaper than a campaign flyer

Targeting: Broad Reach, Not Micro-Targeting

- **91.6%** of ads: no gender restriction
- **78.1%** target full 18–65 age range

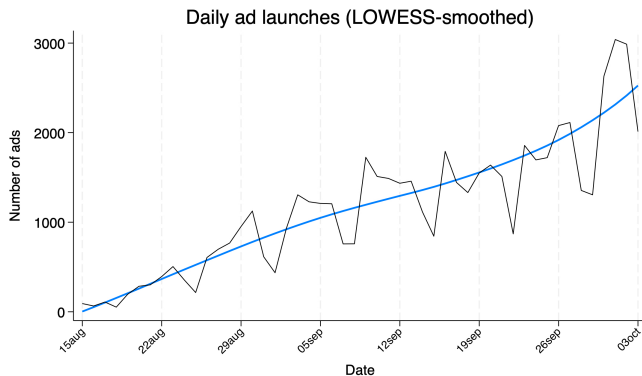
Ad content

- Mobilization: *vote, let's go, together*
- Policy: *health, safety, schools* [▶ Worldcloud](#)

Volume Escalation Near Election Day

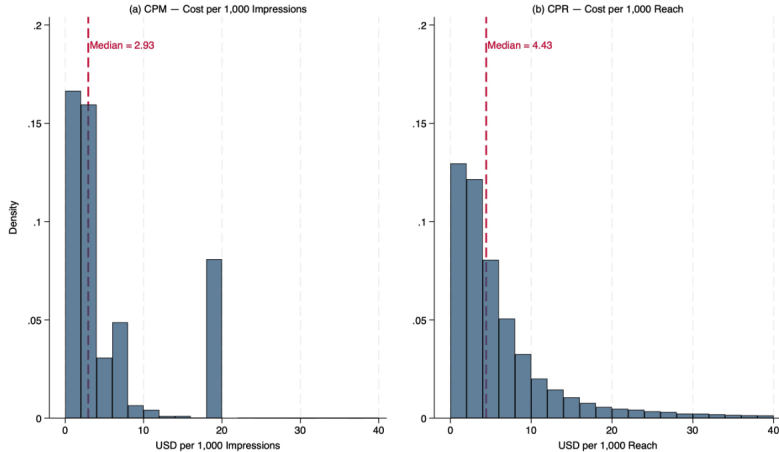
Activity accelerates sharply in the campaign's final weeks.

Week	Number of Advertisements
1	1,492
2	5,114
3	9,715
4	13,961
5	16,798
6	20,262
7	26,090



Cost Structure

Figure A.7: Distribution of price (USD)



- **CPM (Cost per mille)**
The average cost per one thousand impressions. It is a common metric used to measure the cost efficiency of ad delivery
- **CPR (Cost per Reach)**
The average cost per one thousand unique users reached

Theoretical Framework

Intertemporal Trade-off under a Runoff Rule

Below 200k: single round

Maximise first-round vote share. Spend all resources before election day. **No intertemporal trade-off.**

Above 200k: potential runoff

Resources spent in round 1 are **unavailable for round 2**. Trade-off: first-round position vs. resources for the runoff.

Why only digital?

Traditional media: advance booking, inflexible.

Digital: near-instantaneous, near-zero marginal cost.

⇒ uniquely suited to intertemporal reallocation.

Main prediction

- Crossing the 200k threshold reduces first-round digital boosting expenditure
- Effect exclusive to competitive candidates
- Concentrated in the final weeks, when the intertemporal trade-off is most salient

Empirical Strategy

Regression Discontinuity Design (RDD)

Running variable: number of registered voters in municipality m , v_m .

► No Manipulation

$$D_m = \begin{cases} 1, & \text{if } v_m \geq 200,000 \\ 0, & \text{if } v_m < 200,000 \end{cases}$$

$$\tau_{RDD} = \lim_{v_m \downarrow 200,000} \mathbb{E}[y_{cm}|v_m] - \lim_{v_m \uparrow 200,000} \mathbb{E}[y_{cm}|v_m]$$

$$y_{cm} = \alpha + \beta D_m + \gamma v_m + \delta(v_m \times D_m) + \varepsilon_{cm}$$

- Local linear RDD, triangular kernel; bandwidth $h = 100,000$
- Robust bias-corrected SE clustered at municipality level (Calonico et al., 2014)

Sequence: extensive margin $\rightarrow$ spending share & level $\rightarrow$ timing $\rightarrow$ competitiveness $\rightarrow$ portfolio $\rightarrow$ ad-level mechanism

Results

Extensive Margin: No Effect on Adoption

Table 2: RD Estimates: Digital Boosting Adoption

RD Estimate	0.022 (0.055)
Robust p-value	0.300
N (Left)	505
N (Right)	223
Bandwidth	100000
Mean outcome	0.836

Local linear RD estimates with triangular kernel.

Conventional standard errors clustered at the municipality level in parentheses;

Robust bias-corrected p -value reported.

Mean outcome is the control-group mean (below the cutoff) within the bandwidth.

Takeaway: the runoff rule does not affect *whether* candidates advertise digitally — any behavioral response operates through intensity.

Intensive Margin: Reallocation Away from Digital

Table 3: Effect of Crossing the Runoff Threshold on Digital Boosting Spending (First Round)

	Share of Spending (1) Digital Boosting	Spending in USD (Level) (2) Digital Boosting	Log of Spending (3) Digital Boosting
RD Estimate	-0.041 (0.014)	-4183.20 (2371.68)	-0.645 (0.237)
Robust p-value	0.011	0.002	<0.001
N (Left)	505	505	422
N (Right)	223	223	202
Bandwidth	100000	100000	100000
Mean outcome	0.070	7137.31	8.254

Local linear RD estimates with triangular kernel.

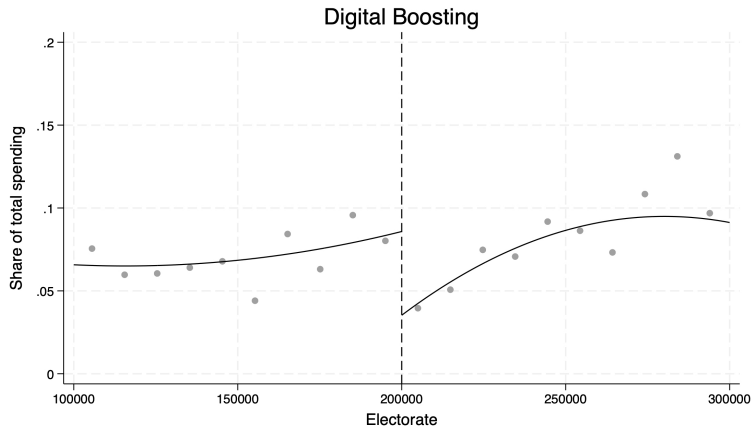
Conventional standard errors clustered at the municipality level in parentheses;

Robust bias-corrected p -value reported.

Column (3): log of spending, conditional on positive spending; sample size differs accordingly.

Mean outcome is the control-group mean (below the cutoff) within the bandwidth.

Graphical RD Evidence



Timing: Effect Concentrated in the Final Two Weeks

Table 4: Effect of Crossing the Runoff Threshold During the Last 14 Days of the Campaign

	Share of Spending (1) Digital Boosting	Spending in USD (Level) (2) Digital Boosting	Log of Spending (3) Digital Boosting
RD Estimate	-0.047 (0.021)	-3848.27 (2223.15)	-0.740 (0.233)
Robust p-value	0.076	0.001	<0.001
N (Left)	505	505	402
N (Right)	223	223	197
Bandwidth	100000	100000	100000
Mean outcome	0.091	6300.16	8.151

Local linear RD estimates with triangular kernel.

Conventional standard errors clustered at the municipality level in parentheses;

Robust bias-corrected p -value reported.

Column (3): log of spending, conditional on positive spending; sample size differs accordingly.

Mean outcome is the control-group mean (below the cutoff) within the bandwidth.

Final 2 weeks:

- Share $\downarrow$ 4.7 p.p. ($p = 0.076$)
- Level $\downarrow$ USD 3,848 ($p = 0.001$)
- Log $\downarrow$ 0.740 ($p < 0.001$)

Last week:

[▶ See Table](#)

- Share $\downarrow$ 5.3 p.p. ($p = 0.026$)
- Level $\downarrow$ USD 3,989 ($p < 0.001$)
- Log $\downarrow$ 0.761 ($p < 0.001$)

First 5 weeks: all estimates ≈ 0

[▶ See Table](#)

Adjustment concentrated when the intertemporal trade-off is most salient.

Who Adjusts? Competitive Candidates Only

Table 6: Competitive versus non-competitive

	Share of Spending (1) Digital Boosting	Spending in USD (Level) (2) Digital Boosting	Log of Spending (3) Digital Boosting
<i>Panel A: Non-competitive (rank > 2)</i>			
RD Estimate	-0.043 (0.022)	-1580.88 (1834.29)	-0.434 (0.344)
Robust p-value	0.198	0.202	0.052
N (Left)	258	258	198
N (Right)	132	132	116
Mean outcome	0.082	3704.15	7.567
<i>Panel B: Competitive (rank ≤ 2)</i>			
RD Estimate	-0.036 (0.011)	-5645.90 (4402.07)	-0.711 (0.323)
Robust p-value	<0.001	0.028	0.009
N (Left)	228	228	213
N (Right)	88	88	86
Mean outcome	0.059	11526.92	8.971
Bandwidth	100000	100000	100000

Competitive (ex-post top-2):

- Boosting share ↓ 3.6 p.p.
($p < 0.001$)
- ≈ **1.9M fewer impressions** at median CPM (USD 2.93/1k)
- Robustness: effects persist when **redefining competitive**
= **ex-post top 3**

► See Table

Portfolio Response: Digital-Specific

Table 7: Categories of Marketing

	(1) Digital	(2) Printed	(3) Sticker	(4) Radio/TV	(5) Sound car	(6) Newspaper
RD Estimate	-0.041 (0.014)	0.011 (0.041)	-0.007 (0.010)	-0.001 (0.035)	0.004 (0.009)	-0.006 (0.006)
Robust p-value	0.011	0.560	1.000	0.424	0.665	0.561
N (Left)	505	505	505	505	505	505
N (Right)	223	223	223	223	223	223
Bandwidth	100000	100000	100000	100000	100000	100000
Mean outcome	0.070	0.242	0.054	0.078	0.014	0.009

Local linear RD estimates with triangular kernel.

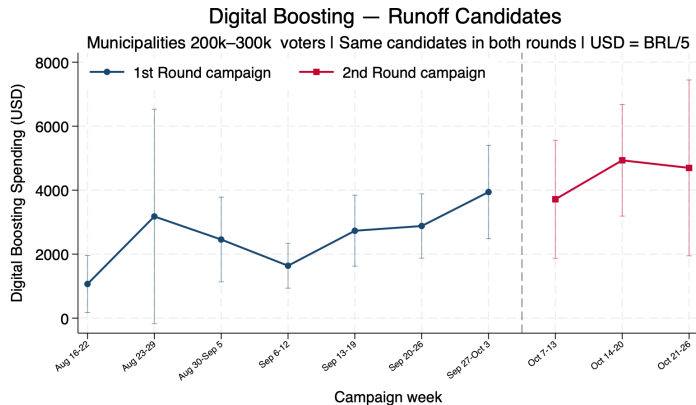
Conventional standard errors clustered at the municipality level in parentheses;

Robust bias-corrected p -value reported. Outcome: share of total campaign spending.

Mean outcome is the control-group mean (below the cutoff) within the bandwidth.

Only digital boosting displays a statistically significant discontinuity at the threshold. No other expenditure category responds to the runoff rule.

Digital Spending in Round 2



Spending is postponed, not abandoned: runoff candidates continue using digital in round 2.

Illustrative only: based on the 44 treated candidates who advanced to the runoff.

Mechanism at the Ad Level (Instagram data)

What changes (scale)

Outcome	Estimate	<i>p</i> robust
Impressions/voter	−8.45***	0.003
Impressions (000s)	−1,678.05***	0.004
Reach (000s)	−866.00**	0.030
Spending (000s USD)	−5.53***	< 0.001

What does *not* change (content)

Outcome	Estimate	<i>p</i> robust
Number of ads	−18.40	0.649
Avg. duration	−1.13	0.134
Avg. text length	40.48	0.981
Total text length	−1,166.11	0.387
CPM (USD/1k imp)	−0.42	0.368
CPR (USD/1k rch)	−0.60	0.435

Conclusion

Main Takeaways

- ➊ **Runoff rule $\neq$ entry deterrent:** adoption rates are high on both sides; response operates through *intensity*, not the adoption decision
- ➋ **Strategic reallocation :** runoff-eligible candidates reduce first-round digital boosting by ≈ 4 p.p. (*of total campaign spending*), concentrated in the *final weeks* and driven by *competitive candidates*
- ➌ **Effect is digital-specific:** no other expenditure category responds — digital characteristics makes intertemporal reallocation uniquely feasible
- ➍ **Scale, not content:** same ads, fewer people see them
- ➎ **Digital spending postponed, not abandoned:** 1st round restraint gives way to sustained digital spending in 2nd round among runoff-advancing candidates

Thank you!

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Appendix: Meta Data Collection Procedure

Step 1 — First API request

- Query all *Political & Issue Ads* on Instagram mentioning any municipality in the 100k–300k sample
- Initial universe: **≈350,000 ads** from **≈46,000 pages**

Step 2 — Candidate matching

- Fuzzy-match ballot name then legal name to page name
- Similarity threshold: **0.70**
- Manual inspection when below threshold
- Output: **543 matched candidates** (41 manual)
- 3 excluded (zero reach) → **540 final**

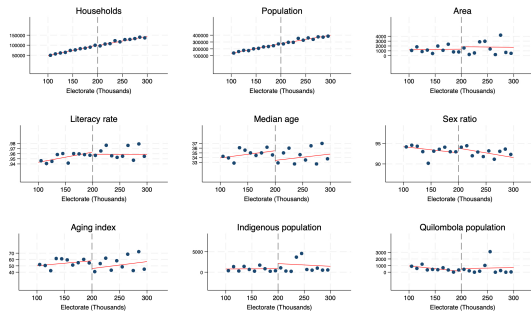
Step 3 — Second API request

- All ads from matched pages in the campaign window
- Captures ads that do **not** mention municipality names
- Final ad dataset: **57,677 unique ads**

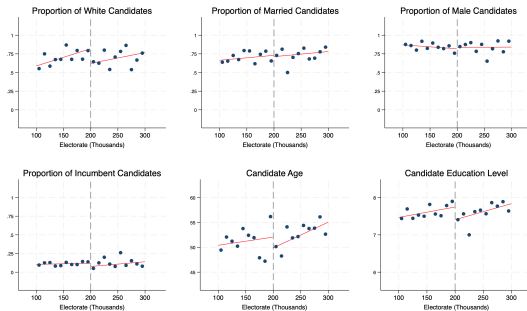
Coverage: 16 August – 3 October 2024 (first round).

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Appendix: RD Validity — Covariate Smoothness



Municipal characteristics



Candidate characteristics

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Appendix: Last Week

Table 5: Effect of Crossing the Runoff Threshold During the Last Week of the Campaign

	Share of Spending (1) Digital Boosting	Spending in USD (Level) (2) Digital Boosting	Log of Spending (3) Digital Boosting
RD Estimate	-0.053 (0.021)	-3988.92 (2191.11)	-0.761 (0.252)
Robust p-value	0.026	<0.001	<0.001
N (Left)	505	505	393
N (Right)	223	223	188
Bandwidth	100000	100000	100000
Mean outcome	0.094	6120.29	8.117

Local linear RD estimates with triangular kernel.

Conventional standard errors clustered at the municipality level in parentheses;

Robust bias-corrected p -value reported.

Column (3): log of spending, conditional on positive spending; sample size differs accordingly.

Mean outcome is the control-group mean (below the cutoff) within the bandwidth.

Appendix: No Effect in the First Five Weeks

Table A.7: Regression Discontinuity Estimates First 5 Weeks

	Share of Spending (1) Digital Boosting	Spending in USD (Level) (2) Digital Boosting	Log of Spending (3) Digital Boosting
RD Estimate	-0.019 (0.012)	-334.97 (358.78)	-0.579 (0.390)
Robust p-value	0.788	0.272	0.247
N (Left)	505	505	234
N (Right)	223	223	97
Bandwidth	100000	100000	100000
Mean outcome	0.053	837.15	6.607

Local linear RD estimates with triangular kernel.

Conventional standard errors clustered at the municipality level in parentheses;

Robust bias-corrected *p*-value reported.

Column (3): log of spending, conditional on positive spending; sample size differs accordingly.

Mean outcome is the control-group mean (below the cutoff) within the bandwidth.

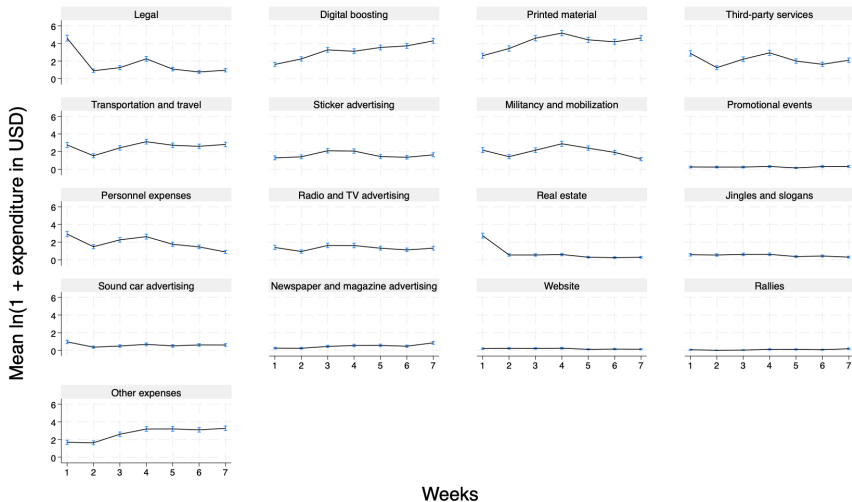
Early campaign weeks show no digital contraction.

Appendix: Alternative Competitiveness Definition (Top-3)

Table A.8: Competitive versus non-competitive — robustness using top 3 ranking

	Share of Spending (1) Digital Boosting	Spending in USD (Level) (2) Digital Boosting	Log of Spending (3) Digital Boosting
<i>Panel A: Non-competitive (rank > 3)</i>			
RD Estimate	-0.063 (0.034)	-908.71 (1557.17)	-0.006 (0.466)
Robust p-value	0.134	0.415	0.314
N (Left)	155	155	105
N (Right)	88	88	75
Mean outcome	0.084	2615.99	7.168
<i>Panel B: Competitive (rank ≤ 3)</i>			
RD Estimate	-0.031 (0.011)	-4509.80 (3143.44)	-0.705 (0.290)
Robust p-value	0.007	0.007	0.001
N (Left)	331	331	306
N (Right)	132	132	127
Mean outcome	0.065	9602.21	8.682
Bandwidth	100000	100000	100000

Appendix: Weekly Evolution — All 17 Campaign Categories



Appendix: Extensive Margin by Expenditure Category

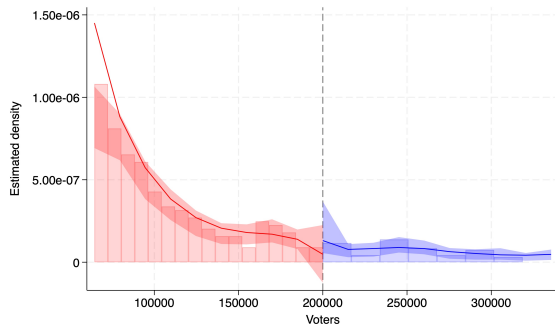
Category	N Candidates
Printed Material	701
Digital Boosting	624
Legal	610
Other Expenses	614
Transportation & Travel	505
Third-Party Services	504
Sticker Advertising	466
Militancy & Mobilization	404
Personnel Expenses	398
Real Estate	385
Radio and TV	381
Jingles & Slogans	305
Sound Car	259
Newspaper & Magazine	190
Website	125
Promotional Events	112
Rallies	41



Identification: No Manipulation of the Running Variable

Why manipulation is implausible

- Voter registration is **mandatory** nationwide
- Municipalities **cannot** artificially inflate the electorate to opt into the runoff system
- Voting is **compulsory** (literate citizens aged 18–70)
- Crossing 200k is **plausibly exogenous** to local political engagement



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Density test

No bunching or discontinuity in the distribution of registered voters at the threshold