Candidate Behavior in Local Elections: Campaigning in the Digital Age

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This paper studies how electoral institutions shape candidates' digital campaign strategies, exploiting Brazil's 200,000-voter runoff threshold in a regression discontinuity design. We combine official campaign finance records from the 2024 municipal elections with high-frequency Instagram advertising data from Meta's Marketing API — 57,677 ads matched to 540 candidates. We document three patterns of digital campaigning: near-instantaneous ad deployment, a strong preference for broad demographic reach over micro-targeting, and a sharp escalation in advertising intensity as election day approaches. Runoff-eligible candidates reduce their digital boosting budget share by approximately 4 p.p in the first round, with the effect concentrated in the final weeks and driven entirely by competitive candidates. No other expenditure category responds to the threshold. This strategic reallocation operates through scale rather than content: candidates above the threshold accumulate approximately 866,000 fewer impressions without altering the format, duration, or cost structure of individual ads. Consistent with this timing behavior, we find that an increase of BRL 100,000 in digital boosting is associated with a 5 p.p increase in vote share, with total reach — not content — driving electoral returns. These findings reveal digital advertising as a strategically flexible instrument whose near-zero marginal deployment cost enables intertemporal allocation decisions that traditional media cannot accommodate.

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1 Introduction

As social media became a ubiquitous part of everyday life (Aridor et al., 2024), economists have grappled with understanding its potential impacts on those who consume its content and, by extension, on society as a whole.[1]In this context, political campaigns represent a particularly relevant domain, as social media fundamentally transforms how candidates communicate with voters, and ultimately shape electoral outcomes (Jacobson, 2015). A growing body of research documents that social media shapes voter information, political participation, and electoral outcomes (Enikolopov et al., 2020; Fujiwara et al., 2024).

Unlike traditional advertising—which requires long production lags and where slots must be booked days or weeks in advance —digital platforms enable almost instantaneous deployment and real-time adjustment at minimal cost. Our data illustrate this: the average lag between ad creation and initial delivery is just 0.09 days, and the median cost per impression is approximately two cents, roughly four times cheaper than the average printing cost per unit of a standard campaign flyer *(santinho)*, BRL 0.09 per unit.[2] Yet despite these transformative changes, we know surprisingly little about how candidates make strategic decisions regarding the timing and intensity of digital spending, a central dimension of electoral competition with direct implications for voter information, participation, and democratic representation.

This technological shift is particularly salient in Brazil, where high social network penetration means users dedicate an average of three hours and 49 minutes daily to social media (Social et al., 2024). During the 2024 municipal elections alone, campaigns invested over BRL 317 million in digital advertising.

Understanding these strategic decisions requires exogenous variation in campaign incentives. We exploit an institutional rule that creates precisely such variation: Brazil's 200,000-voter threshold mechanically determines whether mayoral elections can proceed to a runoff. Municipalities below this cutoff elect mayors in a single decisive round, while those above hold a runoff if no candidate secures a simple majority. This discontinuity creates exogenous variation in the temporal structure of electoral competition. Given that digital advertising enables near-instantaneous deployment and real-time adjustment with near-zero marginal cost, candidates face different intertemporal trade-offs on either side of the threshold, since advertising effects dissipate over time (Hill et al., 2013; Gerber et al., 2011). We leverage this institutional discontinuity to answer how candidates adjust the intensity of digital advertising when electoral stakes vary.

We study this question using data from Brazil's 2024 municipal elections. Our main dataset combines detailed campaign finance records from the Superior Electoral Court (TSE) with high-frequency digital advertising data retrieved from Meta's Marketing API. To the best of our knowledge, this is the first paper to use Meta's advertising library data to study elections in Brazil,

[1]We follow Aridor et al. (2024) in defining social media as two-sided platforms that primarily host user-generated content distributed via algorithms, while allowing for interactions among users.

[2]The average cost per santinho reflects only printing costs, excluding distribution and logistics. Prices were quoted from three Brazilian printing companies on February 23, 2026, yielding per-unit costs of BRL 0.111, BRL 0.095, and BRL 0.070 for orders of 2,000 units.

and more broadly one of the first to leverage platform-level ad data to analyze digital campaign strategy in a developing democracy. Despite its large user base, Instagram remains substantially understudied in the economics literature relative to Facebook and Twitter (Aridor et al., 2024). The advertising dataset comprises 57,677 unique Instagram ads placed by 540 matched candidates across 154 municipalities during the first-round campaign period, providing granular information on each ad's content, timing, audience, targeting parameters, and cost.

We document three patterns of digital campaign behavior in Brazilian municipal elections. First, ads are deployed almost immediately after creation and remain active for approximately six days on average. Second, despite platforms' sophisticated targeting capabilities, candidates overwhelmingly pursue broad-reach strategies: 92 percent of ads carry no gender restriction and nearly 80 percent target the full 18-to-65 age range. Third, advertising activity escalates sharply as election day approaches, with weekly ad volumes increasing 17-fold from the first to the final week of the campaign. Together, these patterns reveal that candidates use digital advertising primarily as a flexible, low-cost instrument for late-stage mass mobilization rather than for sustained, targeted persuasion across the electoral period.

Our main empirical results show that candidates in municipalities above the 200,000-voter threshold reduce their share of digital boosting spending by approximately 4 p.p in the first round ($p = 0.011$). This effect is concentrated in the final two weeks of the campaign — precisely when the intertemporal trade-off between rounds is most salient — and is entirely driven by competitive candidates who have a realistic chance of advancing to a runoff ($p < 0.001$) . Non-competitive candidates show no significant behavioral response. Moreover, this strategic reallocation is unique to digital advertising: no other expenditure category exhibits a statistically significant discontinuity at the threshold. Turning to the mechanism, we find that the runoff rule reduces voter exposure — candidates above the threshold accumulate approximately 866,000 fewer impressions and reach a 4.3 percentage-point smaller share of the local electorate — without altering the content, format, or cost structure of individual ads. Candidates preserve resources by scaling back reach, not by changing what they communicate.

Finally, we provide suggestive evidence on the electoral returns to digital advertising. An increase of BRL 100,000 in digital boosting expenditure is associated with a 5.0 percentage-point increase in vote share ($p = 0.013$) and, within digital advertising, it is total reach rather than content or ad count that drives electoral performance. This pattern provides a rationale for the strategic timing behavior we document: by preserving digital spending for the runoff, competitive candidates strategically curtail their digital visibility in the first round, reserving reach for when an outright victory is required.

Our paper contributes to several literatures. First, we add to research on the influence of media on political outcomes. Canonical studies demonstrate that mass media shape voter information, attitudes, and electoral outcomes (Prat and Strömberg, 2013), whether through partisan news coverage (DellaVigna and Kaplan, 2007), state-controlled propaganda (Adena et al., 2015), or variation in free television airtime (Da Silveira and De Mello, 2011; Goldstein and Freedman, 2002). The rise of social media has expanded these channels by providing personalized, low-cost, and high-frequency modes of communication. Internet and social media penetration have been

shown to increase political engagement and issue awareness (Zhuravskaya et al., 2020), while also amplifying the risks of misinformation and echo-chamber dynamics (Guess et al., 2023; Allcott et al., 2024; Eady et al., 2025). However, this literature has largely treated campaign intensity as fixed or studied supply-side shocks to media availability. We extend this literature by shifting attention from media exposure to campaign decisions, showing how candidates strategically adjust advertising intensity in response to institutional incentives.

Second, we contribute to research on campaign strategy under different electoral institutions. A growing literature exploits variation in electoral rules — including runoff systems and changes in voting technology — to study how election structure shapes political behavior, documenting effects on candidate entry, the effective number of candidates, policy volatility, fiscal expenditure choices, and voter participation (Bordignon et al., 2016; Fujiwara et al., 2011; Chamon et al., 2019; Fujiwara, 2015). However, this literature has largely focused on electoral outcomes and post-election consequences, leaving unexplored how these rules shape candidates' strategic behavior during the campaign itself. We fill this gap by showing that institutional design influences not only who enters and wins, but also how candidates allocate campaign resources, and that digital advertising serves as the margin of adjustment.

Third, we speak to the literature on political communication in digital environments. Prior work shows that as social media becomes more accessible or cost-effective, politicians reallocate effort away from traditional voter outreach toward digital channels (Bessone et al., 2022), while theoretical models emphasize how low marginal costs enable micro-targeting and core-supporter mobilization (Eady et al., 2025). We extend this perspective by showing that digital platforms are not merely adopted in place of traditional media; they are strategically leveraged in response to institutional incentives in ways that traditional advertising categories are not.

Finally, we contribute to the literature on the effectiveness of campaign advertising. Identifying causal effects remains challenging due to reverse causality and omitted variables. Although our design does not fully resolve these identification concerns, we provide suggestive evidence distinguishing between effects driven by message content and those driven by reach and timing — a distinction central to understanding why candidates reallocate advertising effort across electoral rounds.

The remainder of the paper is organized as follows. Section 2 presents the institutional background of the Brazilian electoral system and describes our data sources. Section 3 provides descriptive evidence on campaign expenditure patterns and digital advertising behavior. Section 4 details our empirical strategy. Section 5 presents our main results. Section 6 provides suggestive evidence on advertising effectiveness, and Section 7 concludes.

2 Background and Data

2.1 Background

Brazil's 1988 Constitution introduced two-round (runoff) elections to bolster the perceived legitimacy of executive mandates during the country's transition to democracy (Chamon et al., 2019). Presidential and gubernatorial contests automatically advance to a second ballot if no candidate secures an absolute majority in the first. At the municipal level, however, the rule applies only in cities with 200,000 or more registered voters: below this threshold, mayors are elected by single-ballot plurality; at or above it, a runoff is triggered when no candidate surpasses 50 percent of valid votes, defined as total votes excluding blank and null ballots. Table A.1 summarizes the distribution of municipalities across voter ranges.

Municipal elections occur every four years to choose mayors, vice-mayors and city councillors. Incumbent mayors may seek one consecutive re-election, for a maximum of two successive terms. Voting is compulsory for literate citizens aged 18–70 and optional for 16 and 17 year-olds, senior citizens over 70 and illiterate voters. Because voter registration itself is mandatory nationwide, municipalities cannot "opt in" to the two-round system by artificially inflating the electorate. As a result, crossing the 200,000-voter mark is plausibly exogenous to local political engagement, providing a sharp institutional discontinuity that this paper exploits for identification.

Access to traditional media during campaigns is governed by constitutional provisions that create substantial asymmetries in candidate visibility. In Brazil, television and radio advertising during elections is provided to candidates at no direct cost, making these channels critical avenues for voter outreach. However, eligibility for this free airtime is conditional on party performance. A constitutional amendment established a performance clause requiring parties to meet at least one of two criteria: electing at least 11 federal deputies distributed across at least nine states, or obtaining at least 2% of valid votes in the national election for the Chamber of Deputies, also across at least nine states, with a minimum of 1% of valid votes in each of these states.

For parties and candidates who qualify for free airtime, the total available slots are divided into two components: an equal share and a proportional share. The equal share allocates a minimal, identical amount of airtime to all eligible parties, while the proportional share distributes additional time according to each party's representation in the federal legislature. This system results in candidates from larger parties receiving significantly more airtime than those from smaller parties, even though the advertising is formally free for all. Consequently, candidates with limited or no free airtime face strong incentives to rely on alternative forms of voter outreach.

Campaign spending is further shaped by legally mandated expenditure ceilings that vary significantly across Brazil's 5,570 municipalities. In the 2024 elections, first-round spending caps ranged from as low as BRL 159,850.76 in the smallest municipalities to BRL 67.28 million in São Paulo, the highest ceiling in the country. Among the expenditures reported in 2024, spending on paid digital content stood out as a major strategic priority. Campaigns invested a combined total of BRL 317.02 million in digital advertising, where Facebook Serviços Online do Brasil Ltda.,

which operates the main social media platforms managed by Meta (including Facebook, Instagram, and WhatsApp), emerged as the largest individual supplier in the election, receiving BRL 196.84 million, or approximately 62% of all digital advertising expenditures.

The regulatory framework governing digital campaigns is comprehensive and strictly enforced by the Superior Electoral Court (TSE). All digital content, including social media posts, campaign websites, and messaging app communications, must be hosted on servers physically located within Brazil and registered with the TSE. Paid promotions are permitted exclusively when contracted by official campaign agents, such as candidates, political parties, or federations. Content regulations further restrict the use of negative advertising and prohibit the purchase of keywords containing opponents' names or identifying information. Finally, all paid or promoted electoral content must be suspended from 48 hours prior to election day until 24 hours after polls close.

2.2 Data

Electoral data come from the TSE, this dataset includes detailed information on the total number of registered voters, votes for each candidate, candidates' characteristics such as gender,race, education level, incumbecy status and married status, and detailed campaign finance reports. We complement these data with municipal characteristics from the 2022 IBGE Census.

We also integrate detailed digital advertising information obtained through Meta's Marketing API. To identify the advertisements disseminated by candidates, we began by querying the API for all Political and Issue Ads that mentioned the name of any municipality in our sample of localities with 100,000 to 300,000 registered voters and that were delivered on Instagram. [3] This initial request yielded approximately 350,000 unique ads originating from roughly 46,000 distinct pages. Using this set of pages, we proceeded to match advertisers to candidates.

The matching procedure relied on a fuzzy-matching algorithm applied to the subset of pages that referenced the municipality in which each candidate was running for mayor. The linkage was performed using, sequentially, the candidate's ballot name and legal name, compared to the page name. We adopted a minimum similarity threshold of 0.70. In cases where the algorithm did not reach this threshold, we manually inspected the three closest matches and assigned a link when a correct correspondence could be verified. If no match could be confidently established, the candidate was dropped from the matching process. Overall, this procedure yielded 550 candidates successfully matched to a Meta page, including 84 matches identified through manual verification.

Using the final vector of candidate pages, we submitted a second API request to retrieve all advertisements sponsored by these pages during the first-round campaign period of the 2024 elections. This step ensures that we capture the full universe of ads disseminated by candidates, including those that did not explicitly mention the municipality in their creative text. The final dataset contains 57,677 unique advertisements sponsored by matched candidates during the

[3] As of March 2024, it had approximately 141 million users in Brazil, representing 63.9% of the population. (de Albuquerque et al. (2025)

campaign window.

For each advertisement, the data provide a detailed profile of its content, timing, audience, and dissemination. We observe when the ad was created, the exact period during which it was delivered, and the page responsible for sponsoring it, along with the full text displayed to users. The dataset also reports how much the advertiser spent, the size of the audience reached and demographic information on the individuals exposed to the ad, including age groups and gender. In addition, we have access to the advertiser's targeting choices—such as the age ranges, gender, and geographic locations they intended to reach. To the best of our knowledge, no prior work has used high-frequency digital advertising data from Meta's Marketing API to study elections in Brazil.

Our analysis focuses on the first-round campaign period of the 2024 municipal elections. Following the official electoral calendar, we define seven consecutive campaign weeks spanning from 16 August 2024 to 3 October 2024, covering the entire campaign window prior to the first-round election. Table A.2 reports the exact start and end dates of each week, each comprising a standardized seven-day interval used consistently across our empirical exercises.

3 Descriptive Statistics

This section characterizes the municipalities, candidates, and campaign activities that form the basis of our empirical analysis. We focus on the sample of municipalities with electorates between 100,000 and 300,000 voters — the window around Brazil's 200,000 voter runoff threshold that we exploit for identification. We first document the demographic and political characteristics of these municipalities and their candidates, showing that both evolve smoothly around the threshold and supporting the validity of our regression discontinuity design. We then describe campaign expenditure patterns across spending categories, highlighting differences in scale and timing. Finally, we provide detailed descriptive evidence on digital advertising activity using data retrieved from Meta's Marketing API, characterizing the intensity, cost structure, targeting strategies, and temporal dynamics of candidates' Instagram campaigns.

3.1 Municipalities and Candidates Characteristics

Table 1 presents descriptive statistics for municipalities with electorates between 100,000 and 300,000 voters, separately for those below and above the 200,000 voter threshold, and Figure A.1 illustrates their spatial distribution across the country. Figures A.2 and A.3, together with Table A.4, confirm that neither municipal characteristics nor candidate attributes display meaningful discontinuities at the cutoff. The statistically significant differences in household counts and population size are mechanical — larger electorates naturally correspond to larger municipalities — while all other demographic and political variables evolve smoothly around the threshold. At the candidate level, race, marital status, gender, incumbency status, age, and education are sta-

tistically indistinguishable across groups. The one notable exception is total campaign spending, which is higher above the cutoff, for this reason, our main analyses focus on spending shares, which allows for meaningful comparisons across municipalities below and above the 200,000 voter threshold.

3.2 Campaign Expenditures

Figure 1 reveals substantial dispersion in spending shares across categories, even conditional on positive spending. The wide inter-quartile ranges and long right tails indicate that candidates adopt markedly heterogeneous expenditure portfolios, allocating very different proportions of their budgets to expenditures categorizes. In other words, campaigns rely on distinct "spending baskets", reflecting diverse strategic choices.[4]

Printed Material stands out as the category with both the highest median share and the largest number of users (Table A.3), suggesting it constitutes a near universal component of campaign strategy. Digital Boosting, by contrast, displays a compressed distribution with a median share below 10 percent — widely adopted but with candidates allocating a modest fraction of their total budget to it.

Figure 2 complements this picture by documenting the weekly evolution of spending across the main marketing categories. Digital Boosting exhibits a steady and monotonic increase over the course of the campaign. This pattern is consistent with candidates treating online advertising as a flexible instrument that can be scaled up rapidly in the final stretch of the race, when marginal returns to voter outreach may be highest.

Printed Material, in contrast, follows a hump-shaped trajectory, peaking around week 4 before gradually declining. This dynamic likely reflects the production and distribution constraints inherent in physical campaign materials, which must be designed, ordered, and produced well in advance of election day. As a result, spending in this category tends to be front- or mid-loaded rather than concentrated in the campaign's final phase.

Radio and TV advertising displays yet another temporal logic. Spending is heavily front-loaded, with a pronounced peak in the first week followed by a gradual decline. This pattern is consistent with upfront production costs—such as recording content for free electoral airtime—that are incurred early and subsequently broadcast repeatedly throughout the campaign, reducing the need for sustained weekly outlays.

In contrast to these categories, sticker advertising, sound car advertising, and newspaper and magazine ads exhibit relatively stable trajectories over time. For comparability across categories with very different spending scales, Figure A.4 in the Appendix presents the analogous patterns for all 17 expenditure categories using log-transformed expenditures, which compress the scale and allow smaller categories to be meaningfully visualized alongside larger ones.

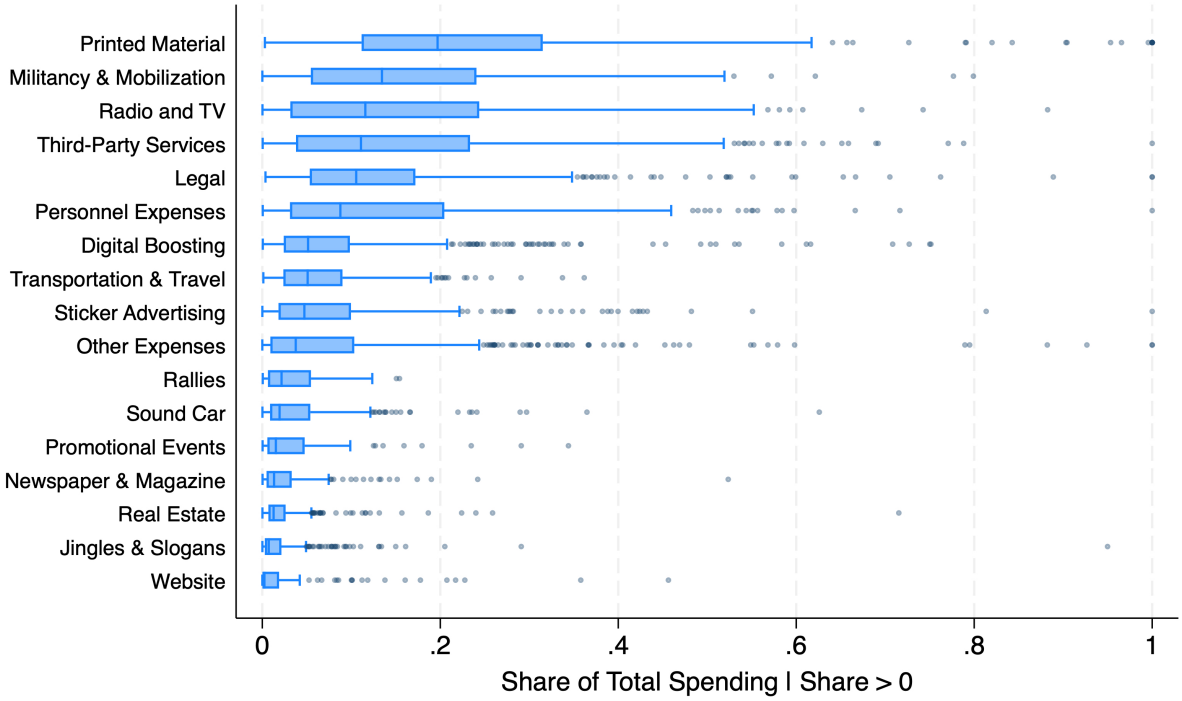
[4]Evidence from the United Kingdom shows that advertising has been the dominant and growing component of campaign expenditure since the late nineteenth century (Fouirnaies, 2021).

Table 1: Races With 100,000–300,000 Voters

	Mean (<200k)	Mean (≥200k)	t-stat
Panel A: Demographics Variables			
Households	69032.23	117785.98	-16.45***
	(16476.34)	(17256.28)	
Population	191057.23	329185.72	-17.44***
	(43583.23)	(47234.70)	
Area	1282.36	1792.93	-1.19
	(2048.76)	(3166.46)	
Literacy rate	0.95	0.96	-1.31
	(0.03)	(0.02)	
Median age	34.59	34.00	1.15
	(2.88)	(2.86)	
Sex ratio	93.63	92.85	1.36
	(3.39)	(2.90)	
Ageing index	53.61	50.53	0.93
	(18.53)	(19.14)	
Indigenous population	821.22	1810.66	-1.80*
	(2404.22)	(4410.05)	
Quilombola population	628.49	612.45	0.05
	(1870.90)	(1957.51)	
Observations	114	44	
Panel B: Political Competition Variables			
Number of candidates	4.39	5.20	-3.28***
	(1.37)	(1.50)	
Effective number of candidates	2.32	2.56	-2.03**
	(0.60)	(0.80)	
Share of votes of 3rd+ (%)	12.52	18.39	-3.12***
	(9.99)	(11.97)	
Observations	114	44	

Notes. Table reports means and standard deviations (in parentheses).

Figure 1: Distribution of Campaign Spending Shares by Category



3.3 Digital Advertising

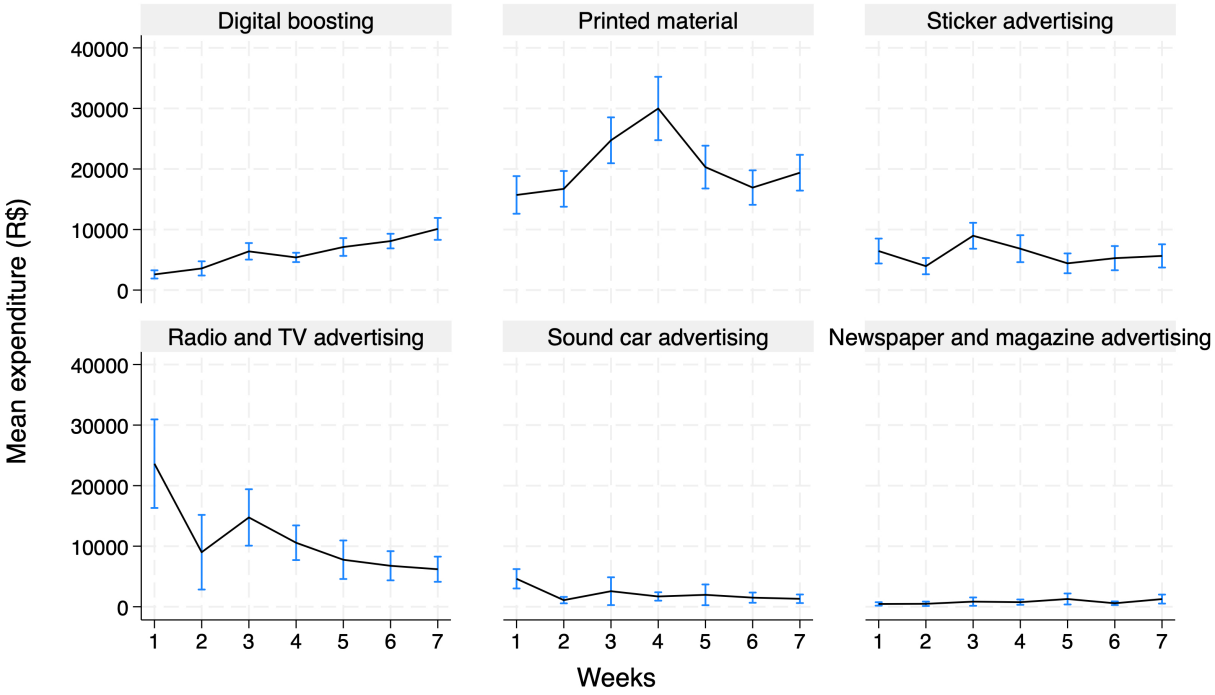
The expenditure data capture only the financial dimension of campaigns. To characterize the behavioral dimension of digital campaigning — how candidates deploy, time, and target their online content — we turn to advertising data from Meta's Marketing API. These data complement the campaign finance records by providing high-frequency information on each advertisement's creation date, delivery window, cost, reach, targeting parameters and content.

Our dataset comprises 57,677 Instagram advertisements placed by 540 candidates across 154 municipalities during the first round. Ads were typically deployed almost immediately after being created: the average lag between creation and initial delivery is only 0.09 days. Once launched, ads remained active for an average of 6.06 days.

Beyond these aggregate features, the intensity of digital campaigning varies substantially across candidates and municipalities. The median candidate placed 61.5 ads during the first round, whereas the mean is 106.8, indicating that a small set of candidates accounts for a disproportionate share of total activity. At the municipal level, the median is 291.5 ads, with a mean of 374.5, again indicating considerable heterogeneity in the local density of digital campaigning.

Campaigns also differ in the creative content they deploy. Among the 57,677 ads, 5,040 contain no text, while the remaining advertisements correspond to 21,011 unique creative bodies.

Figure 2: Marketing Spending During Electoral Campaign



Although captions are generally used only once, a mean of 2.50 uses per caption indicates that a subset of campaigns systematically recycles the same text across multiple ads. The word cloud in Figure A.5 illustrates the vocabulary of these creatives bodies. The most prominent terms combine mobilization appeals — such as *vamos* (let's go), *vote* (vote), *juntos* (together), and *compromisso* (commitment) — with substantive campaign themes, including *saúde* (health), *segurança* (public safety), and *escolas* (school), suggesting that candidates use digital content both to mobilization and to signal policy priorities.

Expenditures vary markedly across individual ads: the median cost per advertisement is 149.5 reais, while the mean reaches 363.7 reais. The median advertisement is delivered to approximately 7,421 users, while the mean reach is 22,269, driven by a small number of high-reach ads. When normalized by municipal electorate size, the median ad reaches 4.5 percent of local voters and the mean reaches 13.9 percent, indicating that most ads generate modest audience penetration while a subset achieves substantially broader exposure. Although total spending on digital boosting is lower in absolute terms than expenditures on traditional activities such as Militancy and Mobilization or Printed Materials, this largely reflects cost structure rather than strategic relevance. As Figure A.6 makes clear, the distribution of price per reach is highly concentrated near zero, with a median cost of approximately 2.2 cents per impression — a level of cost efficiency that helps explain why even modest budgets can translate into broad online visibility.[5]

[5]The cost per impression in our sample is consistent with evidence from other contexts, Pierri (2023) document an average cost of approximately 0.4 euro cents per impression — in the 2022 Italian general election.

The timing of digital advertising follows a consistent pattern of escalation as election day approaches. Table A.5 reports the number of advertisements active in each of the seven weeks preceding the election. Weekly ad counts increase monotonically, from 1,492 in the first week to 26,090 in the final week. Figure A.7 complements this evidence by plotting the daily number of ads that begin delivery alongside a LOWESS-smoothed trend. In contrast to the weekly counts, the daily measure records each ad only once — on its initial delivery date — providing a cleaner representation of campaign activity over time. The downward spikes visible throughout the series align almost entirely with weekends, reflecting the substantially lower volume of new ads created on Saturdays and Sundays, while the underlying trend rises steeply and continuously through the campaign period.

Finally, we examine the use of demographic targeting features. Table A.6 shows that gender-based targeting is rare: 91.6 percent of ads carry no gender restriction, with only small shares directed exclusively to men (3.2 percent) or women (5.3 percent). Age targeting follows a similar pattern. As shown in Figure A.8, nearly 80 percent (78.1 percent) of ads are directed to the full 18–65 age bracket, with very few campaigns selecting narrower age bands. These patterns are notable given that demographic targeting represents one of the most distinctive features of digital advertising relative to traditional campaign media. Modern campaigns in developed democracies have adopted sophisticated predictive scores to target nearly every aspect of outreach, from door-to-door canvassing to social media, with evidence suggesting that targeted communications can generate substantially more votes than indiscriminate outreach (Nickerson and Rogers, 2014). Yet despite its availability, this tool goes largely unused in our setting, showing that candidates treat digital boosting primarily as a mass-communication instrument.

This is consistent with the nature of Meta's advertising ecosystem: platforms do not simply deliver ads to the audiences chosen by advertisers, but instead optimize for revenue-weighted user engagement, selecting content that maximizes time spent on the platform (Aridor et al., 2024). Moreover, recent evidence suggests that Meta's algorithm prioritizes showing political advertisements to users most likely to already agree with the candidate, regardless of the demographic parameters set by the campaign (Haenschen, 2023). Under these conditions, broad reach may be a rational response to an environment where the returns to precise demographic targeting are inherently uncertain.

Together, these descriptive patterns paint a coherent picture of digital campaigning in Brazilian municipal elections. The combination of low costs, near-instantaneous deployment, broad-reach targeting, and late-stage intensification makes digital boosting a strategically flexible instrument — and motivates our investigation of how candidates adjust its use. We now turn to our empirical strategy.

4 Empirical Strategy

Our goal is to identify how the runoff rule affects candidates' campaign behavior — both in terms of the overall allocation of financial resources across spending categories (as recorded in the

TSE expenditure data) and in terms of the deployment of Instagram advertising (as captured by the Meta Marketing API data). To achieve this, we exploit a sharp institutional discontinuity in Brazil's municipal electoral legislation that generates plausibly exogenous variation in the electoral environment faced by candidates, following the regression discontinuity framework outlined in Lee and Lemieux (2010).

Let v_m denote the number of registered voters in municipality m. Municipalities with more than 200,000 registered voters are subject to the two-round system, whereby a candidate must obtain an absolute majority of valid votes to win in the first round; otherwise, the two most-voted candidates advance to a runoff. Municipalities at or below this threshold elect their mayor by simple plurality. We define the treatment indicator as:

$$D_m = \mathbf{1}\{v_m \geq 200{,}000\} \tag{1}$$

The treatment effect of being subject to the runoff rule on outcome y_{cm} — where c indexes a candidate competing in municipality m — is given by:

$$\hat{\tau}_{\text{SRD}} = \lim_{v_m \downarrow 200{,}000} \mathbb{E}[y_{cm} \mid v_m] - \lim_{v_m \uparrow 200{,}000} \mathbb{E}[y_{cm} \mid v_m] \tag{2}$$

Under the assumption that the conditional expectation of y_{cm} on v_m is continuous at the threshold, the first term converges to the expected campaign behavior of a candidate competing under the runoff rule in a municipality with exactly 200,000 voters, while the second term converges to the expected behavior of a candidate competing under plurality rule in an otherwise identical municipality. Hence, $\hat{\tau}_{\text{SRD}}$ identifies the local average treatment effect for candidates at the cutoff. This underscores that the estimated effects are inherently local and should be interpreted with caution when extrapolating to municipalities far from the 200,000-voter threshold, where the conditions of campaigns may be different.

The local polynomial regression estimate is equivalent to the OLS estimation of the following equation, using only observations satisfying $v_m \in (200{,}000 - h,\ 200{,}000 + h)$:

$$y_{cm} = \alpha + \beta \cdot \mathbf{1}\{v_m \geq 200{,}000\} + \gamma\, v_m + \delta\, v_m \cdot \mathbf{1}\{v_m \geq 200{,}000\} + \varepsilon_{cm} \tag{3}$$

where $\mathbf{1}\{v_m > 200{,}000\}$ is a dummy variable equal to one if the number of registered voters exceeds 200,000. The coefficient β — our estimator of $\hat{\tau}_{\text{SRD}}$ — is the parameter of interest and identifies the causal effect of the runoff rule on candidate campaign behavior. We use robust bias-corrected standard errors clustered at the municipality level, following Calonico et al. (2014), to account for within-municipality correlation across candidates and since the number of municipalities near the 200,000-voter threshold is limited, the data-driven optimal bandwidth yields too few observations for reliable estimation. We therefore adopt a fixed bandwidth of $h = 100{,}000$ registered voters.

A key identifying assumption of this design is that no predetermined characteristic changes discontinuously at the 200,000-voter threshold. If municipalities or candidates on either side of the cutoff differed systematically in ways correlated with campaign behavior, the estimated discontinuity in our outcomes could reflect these pre-existing differences rather than the causal

effect of the runoff rule. We assess this assumption by estimating equation (3) for a broad set of predetermined covariates. Figures A.2 and A.3 plot the resulting discontinuity estimates for municipal and candidate characteristics, respectively.

Our empirical analysis proceeds in several steps. We begin at the extensive margin, examining whether the runoff rule shapes the decision to engage in paid digital advertising at all. We then turn to the intensive margin, estimating treatment effects on both the level and budget share of digital spending — allowing us to distinguish between a scale effect and a reallocation effect. We further explore whether any behavioral response varies by timing, candidate competitiveness, and across the full portfolio of campaign expenditure categories. Finally, we leverage granular advertisement-level data from the Meta Marketing API to characterize how the runoff rule affects the observable features of digital ads themselves.

5 Results

To assess whether runoff eligibility effectively alters campaign behavior, we begin by examining candidates' extensive-margin decision, before turning to the intensity of its use. As reported in Table 2, crossing the 200,000-voter threshold has no discernible impact on the probability that a candidate uses digital boosting in their campaign (adoption rates are high on both sides of the threshold — 83.6% of candidates below and 90.6% above). This null result indicates that the decision to adopt digital advertising is not affected by whether candidates face a potential runoff, suggesting that any behavioral response to the runoff rule operates through the intensity of digital campaigning rather than through the entry decision itself.

Table 2: RD Estimates: Digital Boosting Adoption

RD Estimate	0.04
	(0.03)
p-value	0.165
N (Left)	505
N (Right)	265
Bandwidth	100000

Local linear RD estimates with triangular kernel.

Robust bias-corrected standard errors clustered at the municipality level in parentheses.

Table 3 turns to the intensive margin, estimating the effect of runoff eligibility on the composition of campaign spending. The results reveal a clear reallocation: candidates above the 200,000-voter threshold shift approximately 4 p.p of their campaign budget away from digital boosting and toward other expenditure categories (columns 1 and 2). Consistent with the regression estimates, Figure 3 shows a sharp drop in the share of digital boosting spending at the 200,000-voter threshold.

Columns (3) and (4) report the corresponding level estimates, allowing for a simple back-of-the-envelope assessment of scale. At a median cost of BRL 0.022 per impression, the estimated reduction of BRL 20,916 in digital boosting expenditure translates into approximately 950,000 fewer ad impressions for candidates subject to the runoff rule. This figure suggests that the behavioral response is not merely an accounting shift across budget categories, but one with potentially substantial consequences for candidate visibility and voter information during the campaign

Table 3: Regression Discontinuity of Expenditures by type First Round

	Share of Spending		Spending (Level)	
	(1)	(2)	(3)	(4)
	Digital Boosting	Others	Digital Boosting	Others
RD Estimate	-0.04	0.04	-20916.22	217127.47
	(0.016)	(0.016)	(6607.17)	(368448.33)
p-value	0.011	0.011	0.002	0.550
N (Left)	505	505	505	505
N (Right)	223	223	223	223
Bandwidth	100000	100000	100000	100000

Local linear RD estimates with triangular kernel.

Robust bias-corrected standard errors clustered at the municipality level in parentheses.

Having established the existence and scale of this reallocation, we now turn to its timing, asking whether the effect is spread across the campaign window or concentrated at a particular moment. Restricting attention to spending in the final two weeks of the campaign, Table 4 provides compelling evidence that the behavioral response is driven by this closing stretch: candidates above the threshold reduce their digital boosting share by 5 p.p ($p = 0.075$) and cut digital spending by approximately BRL 19,241 ($p = 0.001$), approximately 875,000 fewer ad impressions. This pattern suggests that runoff-eligible candidates adjust their advertising strategy precisely when electoral stakes are highest. Consistent with this interpretation, Table A.7 shows that the analogous estimates (columns 1 and 3) for the first five weeks of the campaign are statistically indistinguishable from zero.

We now examine whether the reallocation of campaign spending is concentrated among candidates with a realistic prospect of winning. Following standard practice in the literature, we classify candidates as competitive or non-competitive on the basis of their ex-post electoral standing, which we use as a proxy for their ex-ante standing at the time campaigning decisions were made.[6] Specifically, we define competitive candidates as those who finished among the top two vote-getters in their race, and estimate the treatment effect separately for each group across three outcomes: total campaign spending, digital advertising expenditure, and its share of the campaign budget.

The results in Table 5 reveal that the reallocation of campaign resources away from digital

[6]See, for example, Nakaguma and Souza (2022).

Figure 3: Regression Discontinuity: Share of Digital Boosting

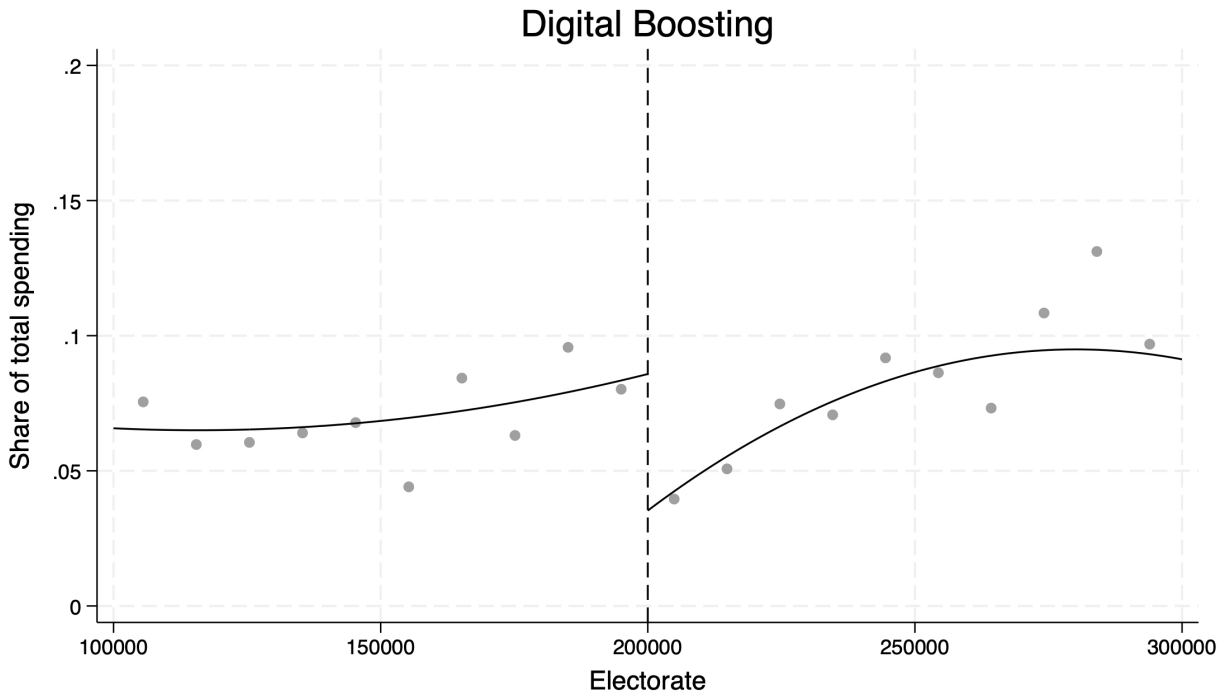


Table 4: Regression Discontinuity Estimates Last 2 Weeks

	Share of Spending		Spending (Level)	
	(1)	(2)	(3)	(4)
	Digital Boosting	Others	Digital Boosting	Others
RD Estimate	-0.05	0.05	-19241.35	209636.67
	(0.026)	(0.033)	(5825.08)	(206855.30)
p-value	0.075	0.168	0.001	0.310
N (Left)	505	505	505	505
N (Right)	223	223	223	223
Bandwidth	100000	100000	100000	100000

Local linear RD estimates with triangular kernel.

Robust bias-corrected standard errors clustered at the municipality level in parentheses.

boosting is driven by competitive candidates. Among this group, crossing the 200,000-voter threshold leads to a statistically significant reduction of approximately 4 p.p. in the digital boosting share ($p < 0.001$) and a corresponding decline in digital expenditure levels ($p = 0.028$), while total campaign spending remains unchanged. By contrast, non-competitive candidates exhibit no statistically discernible response across any of the three outcomes. This pattern is consistent with a strategic calculus: only candidates who perceive themselves as genuinely contending for a seat internalize the incentives created by runoff eligibility and adjust their advertising behavior accordingly. As a robustness check, Table A.8 replicates this analysis using a broader definition of competitiveness that includes the top three finishers; the results are unchanged.

Table 5: Competitive versus non-competitive

	Total Campaign Spending		Digital Boosting (Level)		Digital Boosting (Share)	
	(1)	(2)	(3)	(4)	(5)	(6)
	Non-comp.	Competitive	Non-comp.	Competitive	Non-comp.	Competitive
RD Estimate	23987.97	604801.58	-7904.42	-28229.49	-0.04	-0.04
	(75363.81)	(544376.24)	(6198.07)	(12862.96)	(0.03)	(0.01)
p-value	0.750	0.267	0.202	0.028	0.198	0.000
N (Left)	258	228	258	228	258	228
N (Right)	132	88	132	88	132	88
Bandwidth	100000	100000	100000	100000	100000	100000

Local linear RD estimates with triangular kernel.

Robust bias-corrected standard errors clustered at the municipality level in parentheses.

Having established that runoff eligibility induces a reallocation away from digital boosting, a natural question arises: is this effect exclusive to digital advertising, or does crossing the 200,000-voter threshold more broadly alter spending across other marketing categories? To investigate this, we broaden the set of outcomes to encompass all marketing expenditure categories recorded in the TSE data, allowing us to characterize the full portfolio response to the runoff rule. The results, reported in Table 6, provide a clear answer: the effect is unique to digital boosting. Of the six expenditure categories examined, only digital boosting exhibits a statistically significant discontinuity at the threshold.

Finally, we exploit the granular information on individual advertisements retrieved from the Meta Marketing API to examine how the runoff rule affects the observable characteristics of digital ads on *Instagram*. We focus on eight core dimensions of digital advertising activity. The first outcome is *electorate reach*, defined as the total number of impressions — that is, the number of times any of a candidate's ads appeared in a user's feed — divided by the size of the municipal electorate, measuring the penetration of a candidate's digital campaign relative to the local voter base. The second is the *number of ads*, which counts the total number of distinct advertising units released by a candidate over the course of the campaign. Therefore, two ads with identical text or visual content may still be considered distinct if they differ in any administrative attribute, and will be counted separately. Third, *reach* corresponds to the raw total number of impressions accumulated by a candidate throughout the campaign, without normalizing by electorate size;

Table 6: Categories of Marketing

	(1) Digital Boosting	(2) Printed Material	(3) Sticker Advertising	(4) Radio and TV	(5) Sound Car	(6) Newspaper and Magazine
RD Estimate	-0.041	0.011	-0.007	-0.001	0.004	-0.006
	(0.015)	(0.017)	(0.248)	(0.024)	(0.029)	(0.018)
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

Local linear RD estimates with triangular kernel.

Robust bias-corrected standard errors clustered at the municipality level in parentheses.

an impression is recorded each time an ad appears in a user's feed, regardless of whether the user engaged with the content. Fourth, *spending* is constructed from Meta's categorical spending brackets by assigning to each ad the midpoint of its reported range and summing these median-imputed values across all of a candidate's ads, with all amounts expressed in thousands of reais. Fifth, *total text length* aggregates the caption length across all ads released by a candidate, reflecting the overall volume of written content produced throughout the campaign. Sixth, *average duration* captures the mean number of days that a candidate's ads remained active on the platform, computed by averaging ad-level durations across all ads in the campaign. Seventh, *average text length* measures the mean caption length per individual ad, capturing differences in the textual content of each advertising unit as reported in the ad's metadata. Finally, *price per reach*, expressed in cents, is computed as the candidate's total spending over the entire campaign divided by their total impressions, proxying the average cost per impression and capturing variation in targeting efficiency.

Before turning to the ad-level evidence, one important caveat regarding the back-of-the-envelope calculation above is worth noting. The TSE expenditure records classify campaign disbursements under the broad category of digital boosting, but this label does not allow us to identify the precise destination of these funds. A candidate's reported digital boosting expenditure may encompass payments to marketing agencies, platform fees, content production costs, and other intermediary services, only a fraction of which translates directly into paid ad placements on any given platform. As a result, the mapping between TSE-reported spending and actual ad impressions is necessarily approximate. The analysis that follows addresses this limitation by drawing directly on data retrieved from Meta's Ad Library API, which provides precise, platform-level information on individual ad placements. Because the link between TSE candidates and their Meta ad accounts relies on a fuzzy matching procedure, this specification covers 540 candidates — compared to the 728 candidates in the main TSE-based sample — as not all candidates in the original sample could be matched to a Instagram account. Nonetheless, the resulting estimates offer a more transparent and granular picture of how runoff eligibility shapes digital advertising behavior at the level of

individual ads.

Table 7 reports RD estimates for each of these outcomes. The results reveal that candidates above the 200,000-voter threshold not only spend less on digital boosting, but also achieve a meaningfully smaller advertising exposure: they accumulate approximately 866,000 fewer impressions (p = 0.030), reach a 4.3 p.p. smaller share of the local electorate (p = 0.024), and spend roughly BRL 27,660 less on digital advertising in total ($p < 0.001$). By contrast, the number of ads run, total and average caption length, average ad duration, and price per reach are all statistically indistinguishable from zero across the threshold. This pattern delivers a clear message: runoff-eligible candidates do not alter the content, format, or cost structure of their individual ads — what changes is exclusively the scale at which those ads are deployed. Candidates above the threshold run the same kinds of ads, for the same duration, with the same textual content, but simply reach fewer voters.

Having established that the runoff rule induces a contraction in the scale of digital advertising without altering its observable content characteristics, a natural question follows: does this reallocation of campaign resources carry electoral consequences? The next section provides suggestive evidence on this by examining the relationship between campaign spending categories and vote share, as well as between the observable characteristics of digital ads and electoral performance.

6 Suggestive Evidence

To assess whether the reallocation of campaign resources documented above carries electoral consequences, we estimate the relationship between campaign spending and vote share using an OLS framework. While these estimates are not causal, they provide suggestive evidence on the electoral returns to different categories of campaign investment.[7]

We begin by estimating the following specification, which distinguishes digital boosting from all other campaign expenditures:

$$\text{VoteShare}_c = \alpha + \beta_1 \text{DigitalBoosting}_c + \beta_2 \text{OtherSpending}_c + \mathbf{X}_c'\boldsymbol{\gamma} + \mathbf{Z}_m'\boldsymbol{\lambda} + \delta_p + \varepsilon_c \quad (4)$$

where VoteShare_c is the first-round vote share of candidate c, DigitalBoosting_c and OtherSpending_c are measured in BRL 100,000, $\mathbf{X}_c$ is a vector of candidate-level controls comprising demographics (race, marital status, gender, and incumbency status), $\mathbf{Z}_m$ is a vector of municipality-level

[7] Campaign spending is endogenous to electoral prospects and the direction of the bias may differ across candidate types (Levitt, 1994; Gerber, 1998). More broadly, Lewis and Rao (2015) show, using one of the largest collections of advertising RCTs to date, that inferring the effects of advertising is exceedingly difficult even in experimental settings, a challenge that is particularly acute in the political context, where there is only a single outcome period (Aridor et al., 2024).

Table 7: Advertising Outputs

	(1) Electorate Reach	(2) Number of Ads	(3) Reach (thousands)	(4) Spending (thousands)	(5) Total Text Length	(6) Avg. Duration (days)	(7) Avg. Text Length	(8) Price per Reach (cents)
RD Estimate	-4.30	-18.40	-866.00	-27.66	-1166.11	-1.13	40.48	-0.30
	(1.90)	(40.45)	(398.60)	(7.24)	(1347.00)	(0.75)	(1730.70)	(0.38)
p-value	0.024	0.649	0.030	0.000	0.387	0.134	0.981	0.435
N (Left)	389	389	389	389	389	389	389	389
N (Right)	151	151	151	151	151	151	151	151
Bandwidth	100000	100000	100000	100000	100000	100000	100000	100000

Local linear RD estimates with triangular kernel.

Robust bias-corrected standard errors clustered at the municipality level in parentheses.

controls comprising the legal campaign spending limit and measures of electoral competition (effective number of candidates, total number of candidates, and number of registered voters), and δ_p denotes party fixed effects. Standard errors are clustered at the municipality level.

We then decompose other spending into its constituent marketing categories by estimating:

$$\text{VoteShare}_c = \alpha + \sum_k \beta_k \text{Spending}_c^k + \mathbf{X}_c'\boldsymbol{\gamma} + \mathbf{Z}_m'\boldsymbol{\lambda} + \delta_p + \varepsilon_c \tag{5}$$

where k indexes the six marketing categories recorded in the TSE data: digital boosting, printed material, sticker advertising, radio and television, sound car, and newspaper and magazine.

The results are reported in Tables 8 and 9, with the corresponding coefficient plots displayed in Figures 4 and 5. Table 8 shows that both digital boosting and other campaign spending are positively and significantly associated with vote share, but the coefficient on digital boosting (0.048) is nearly five times larger than that on other spending (0.010), suggesting substantially higher electoral returns per unit of expenditure. Table 9 disaggregates these effects across marketing categories and reinforces this finding: digital boosting exhibits the largest and most precisely estimated coefficient (0.050, p = 0.013), followed by printed material and sticker advertising (both 0.029, p = 0.001), while radio and television, sound cars, and newspapers and magazines display coefficients close to zero and statistically indistinguishable from zero. While our estimates are not causal, the direction of the association is in line with evidence from Spenkuch and Toniatti (2018), who find that a one standard deviation increase in the partisan difference in advertising exposure raises vote shares by approximately 0.5 p.p. Taken together, these results suggest that digital boosting is not only the category most responsive to the runoff rule, but also the one with the highest estimated electoral return.

We complement the spending analysis by examining whether the observable characteristics of digital ads retrieved from the Meta Ad Library are themselves associated with electoral performance. To this end, we estimate an analogous OLS specification in which the regressors are standardized measures of ad characteristics, allowing coefficients to be interpreted as the change in vote share associated with a one standard deviation increase in each variable:

$$\text{VoteShare}_c = \alpha + \sum_j \beta_j \widetilde{\text{AdvChar}}_c^{\,j} + \mathbf{X}_c'\boldsymbol{\gamma} + \mathbf{Z}_m'\boldsymbol{\lambda} + \delta_p + \varepsilon_c \tag{6}$$

where $\widetilde{\text{AdvChar}}_c^{\,j}$ denotes the standardized value of advertising characteristic j for candidate c, comprising total reach, price per reach, number of ads, total spending, and average ad text length.

The results, reported in Table 10, reveal that total reach is the only ad characteristic significantly associated with electoral performance: a one standard deviation increase in total reach is associated with a 0.050 p.p. increase in vote share (p=0.001). By contrast, price per reach, total spending, and ad text length are all statistically indistinguishable from zero, while the number of

Table 8: Effects of Spending on Vote Share

	Vote Share
Other campaign spending (R$ 100,000)	0.010***
	(0.001)
Digital boosting spending (R$ 100,000)	0.048***
	(0.015)
Municipal competition controls	Yes
Candidate demographics	Yes
Party fixed effects	Yes
Observations	706
R-squared	0.570

Controls include: municipal competition (effective number of candidates, number of candidates, number of voters), candidate demographics (white, married, male, incumbency status), campaign spending limit, and runoff possibility. Standard errors clustered at municipality level in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 4: Estimated Coefficients: Digital Boosting vs. Other Expenditures

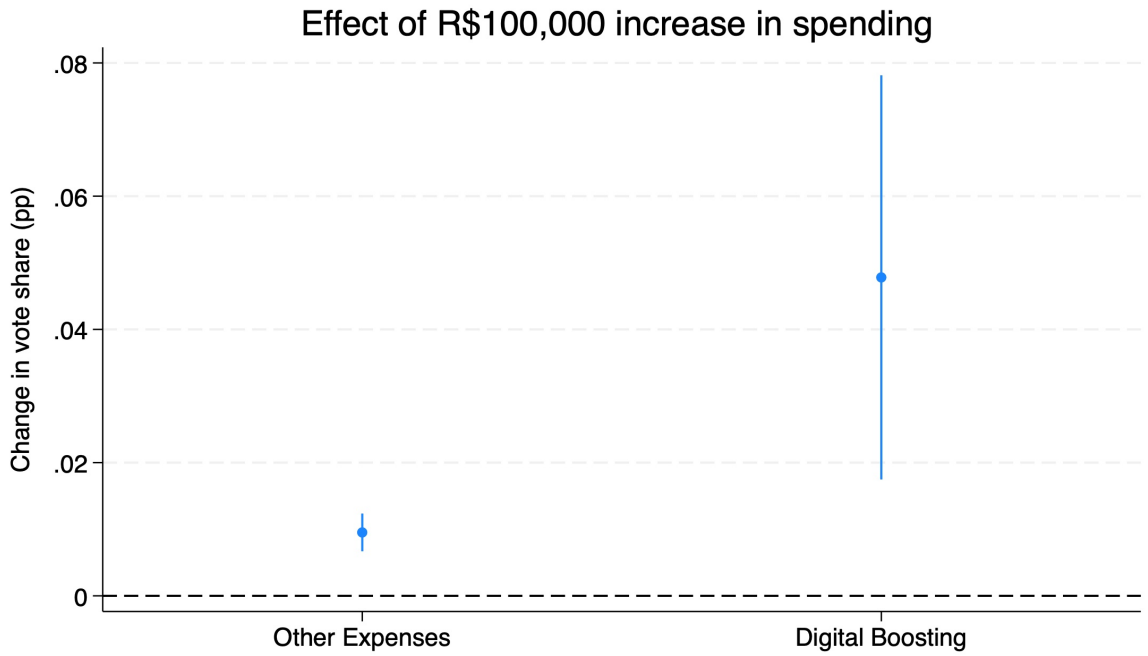
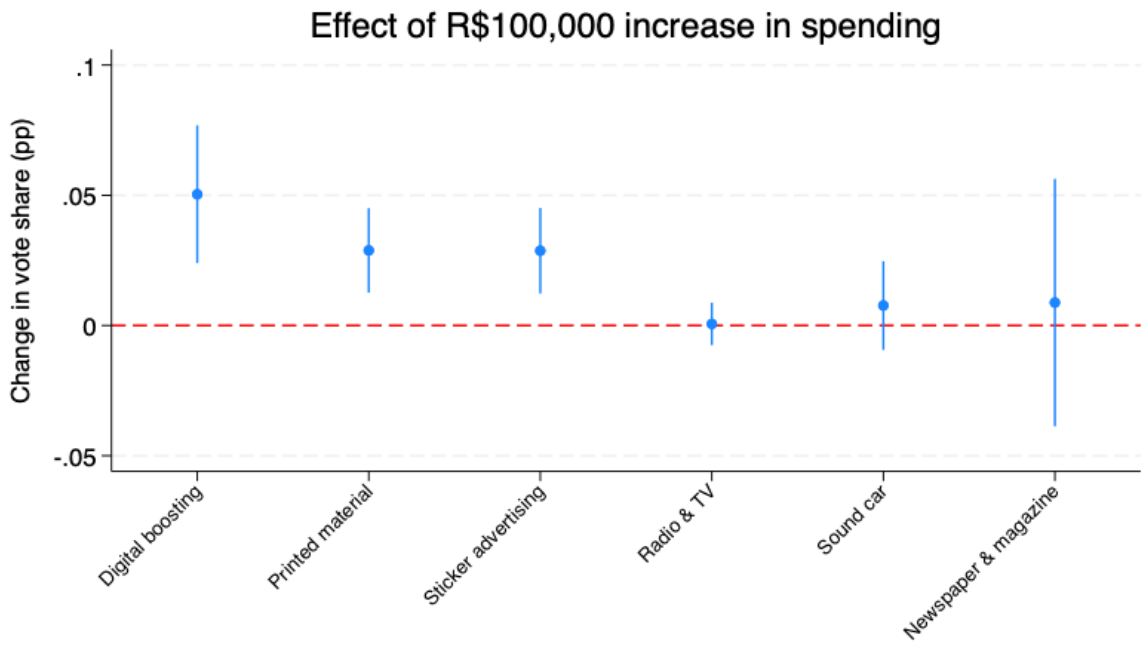


Table 9: Effects of Marketing Spending on Vote Share

	(1) Vote Share
Digital Boosting	0.050***
	(0.013)
Printed Material	0.029***
	(0.008)
Sticker Advertising	0.029***
	(0.008)
Radio and TV	0.001
	(0.004)
Sound Car	0.008
	(0.009)
Newspaper and Magazine	0.009
	(0.024)
Municipal competition controls	Yes
Candidate demographics	Yes
Party fixed effects	Yes
Observations	706
R-squared	0.570
Adjusted R-squared	0.555

Standard errors clustered at the municipality level in parentheses.
All spending variables are measured in R$100,000.
Controls include party fixed effects, candidate characteristics, and measures of electoral competition.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 5: Estimated Coefficients by Advertising Category



ads displays a small negative and marginally significant coefficient (p=0.071). This pattern is consistent with the RD findings and suggests that exposure — rather than content or cost structure — is more strongly associated with electoral performance. The contraction in reach documented above occurs along a dimension that is correlated with electoral performance, suggesting it may carry electoral consequences, however we cannot establish this causally.

Table 10: Effects of Ads Characteristics on Vote Share

	Vote Share
Total reach (std.)	0.0498***
	(0.0150)
Price per reach (std.)	0.0144
	(0.0094)
Number of ads (std.)	-0.0139*
	(0.0076)
Total spending (std.)	0.0069
	(0.0206)
Ad text length (std.)	0.0055
	(0.0083)
Municipal competition controls	Yes
Candidate demographics	Yes
Party fixed effects	Yes
Observations	539
R-squared	0.5285
Adjusted R-squared	0.4917

Standardized coefficients show the effect of one standard deviation increase in the independent variable.

Controls include: municipal competition, candidate demographics, campaign spending limit, and runoff possibility.

Standard errors clustered at municipality level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

7 Conclusion

This paper studies how electoral institutions shape candidates' digital campaign decisions, using data from Brazil's 2024 municipal elections. We exploit the country's 200,000-voter runoff threshold in a regression discontinuity design, combining official campaign finance records with high-frequency advertising data from Meta's Marketing API to provide novel evidence on strategic digital campaigning in a developing democracy.

Our findings deliver a coherent picture of digital advertising as a strategically flexible instrument. Three descriptive patterns stand out. Ads are deployed almost instantaneously after creation. Despite the availability of sophisticated targeting tools, the vast majority of ads pursue broad demographic reach, resembling broadcast media more than the micro-targeted strategies commonly associated with digital campaigns.Finally advertising intensity escalates sharply in the campaign's final stretch, consistent with candidates treating digital boosting as a late-stage

mass-mobilization tool rather than a sustained persuasion effort.

Against this backdrop, our main result shows that runoff eligibility induces a systematic reallocation away from digital spending in the first round. Candidates in municipalities above the 200,000-voter threshold reduce their digital boosting share by approximately 4 p.p, with the effect concentrated in the final two weeks of the campaign and driven entirely by competitive candidates — those with a realistic prospect of advancing to a potential second round. Non-competitive candidates show no response, and no other campaign expenditure category exhibits a statistically significant discontinuity at the threshold. This pattern points to a strategic calculus unique to digital advertising: its near-zero marginal deployment cost and instantaneous scalability create intertemporal trade-offs that traditional media — with its production lags and upfront costs — cannot accommodate.

Examining the mechanism, we find that the runoff rule reduces the scale of digital advertising rather than its characteristics. Candidates above the threshold accumulate substantially fewer impressions and reach a smaller share of the local electorate, but their individual ads are indistinguishable in terms of content, format, duration, and cost efficiency. The behavioral response, in other words, operates through exposure — how many voters a candidate reaches — not through what those voters see. This is consistent with suggestive evidence on effectiveness: within digital advertising, total reach is the only characteristic significantly associated with vote share. Candidates strategically curtail their digital reach in the first round, where advancing to a runoff — rather than winning outright — is the relevant margin.

Our results carry broader implications. For the political economy of electoral institutions, they show that the structure of an election — not merely its competitiveness — shapes how candidates allocate resources before votes are cast. Runoff systems alter intertemporal incentives in ways that candidates respond to rationally, and these responses are detectable precisely because digital advertising's distinctive characteristics make strategic timing feasible. For the literature on digital political communication, our findings suggest that the adoption of online advertising is not uniform: candidates use these tools strategically, conditioning their intensity on institutional stakes in ways that purely supply-side accounts of platform adoption would not predict.

Several limitations and avenues for future research are worth noting. Our estimates are local, applying to candidates in municipalities near the 200,000-voter threshold; whether similar patterns hold in very large or very small municipalities remains an open question. Our effectiveness results are associational rather than causal and should be interpreted accordingly. Finally, the matching between TSE candidates and Meta pages, while carefully validated, introduces measurement error that we cannot fully eliminate.

In sum, the evidence presented here points to digital advertising as a qualitatively distinct form of campaign communication — not merely because of its reach or cost, but because its flexibility enables a form of strategic intertemporal allocation that traditional media cannot. As digital platforms become ever more central to electoral competition worldwide, understanding how candidates leverage these tools in response to institutional incentives is essential for assessing their implications for voter information and democratic representation.

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A Appendix

Table A.1: Municipalities by Voter Range - 2024

Voter Range	Number of Municipalities
Up to 10,000 voters	2,924
From 10,001 to 200,000 voters	2,542
Above 200,000 voters	103

Table A.2: Definition of Weeks and Number of Days (2024)

Week	**Period**	**Number of Days**
1	16/08/2024 to 22/08/2024	7
2	23/08/2024 to 29/08/2024	7
3	30/08/2024 to 05/09/2024	7
4	06/09/2024 to 12/09/2024	7
5	13/09/2024 to 19/09/2024	7
6	20/09/2024 to 26/09/2024	7
7	27/09/2024 to 03/10/2024	7

Notes: The table defines the weeks based on the campaign phases for the 2024 election. The first round campaign runs from Week 1 to Week 7.

Table A.3: Number of Candidates 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

Notes. Table reports the number of candidates with positive spending in each category.

Figure A.1: Spatial Distribution of Sample Municipalities



Table A.4: Balance Test: Candidate Characteristics

	Mean (<200k)	Mean (>200k)	t-stat
White	0.69	0.67	0.51
	(0.04)	(0.03)	
Married	0.69	0.74	-1.16
	(0.05)	(0.03)	
Male	0.85	0.83	0.83
	(0.04)	(0.03)	
Incumbent	0.12	0.10	0.72
	(0.03)	(0.02)	
Education Level	7.60	7.62	-0.32
	(0.83)	(0.54)	
Age	51.08	52.04	-0.99
	(11.24)	(7.27)	
Campaign Spending (thousands)	619.14	1081.69	-6.76***
	(795.74)	(515.08)	
Observations	223	505	

Table A.5: Number of Advertisements by Week

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

Notes: A total of 57,677 unique advertisements were placed during the campaign.

Figure A.2: Municipal Characteristics Around the 200,000-Voter Threshold

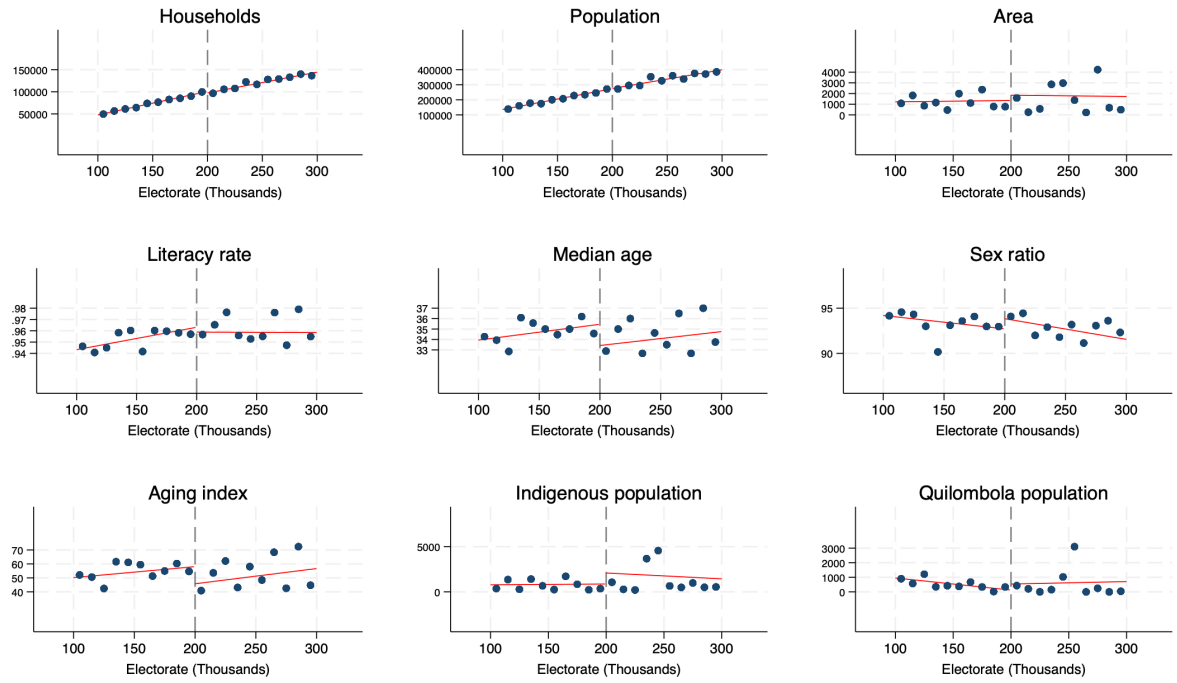


Figure A.7: Daily Ad Volume and Smoothed Trend

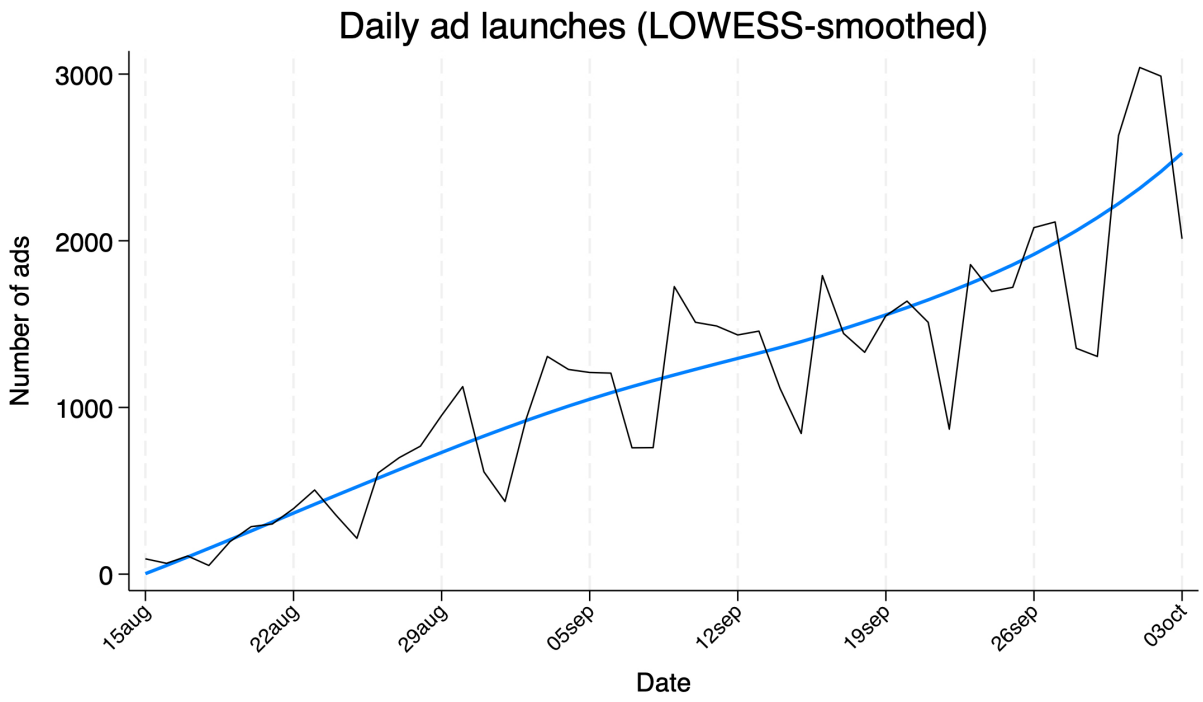


Figure A.3: Candidates Characteristics Around the 200,000-Voter Threshold

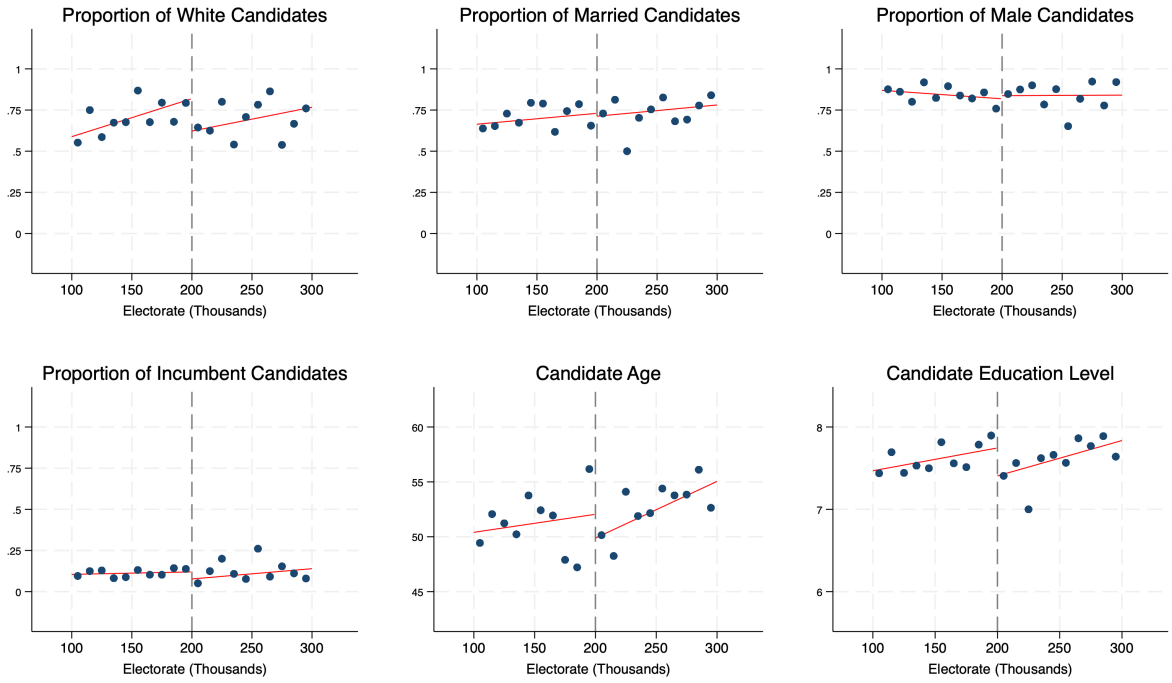


Table A.6: Gender Targeting of Online Advertisements

Category	Number of Ads	Percent
Not gender-targeted	52,812	91.57
Targeted at Men only	1,829	3.17
Targeted at Women only	3,036	5.26
Total	57,677	100.00

Figure A.4: Spending During Electoral Campaign (All Categories)

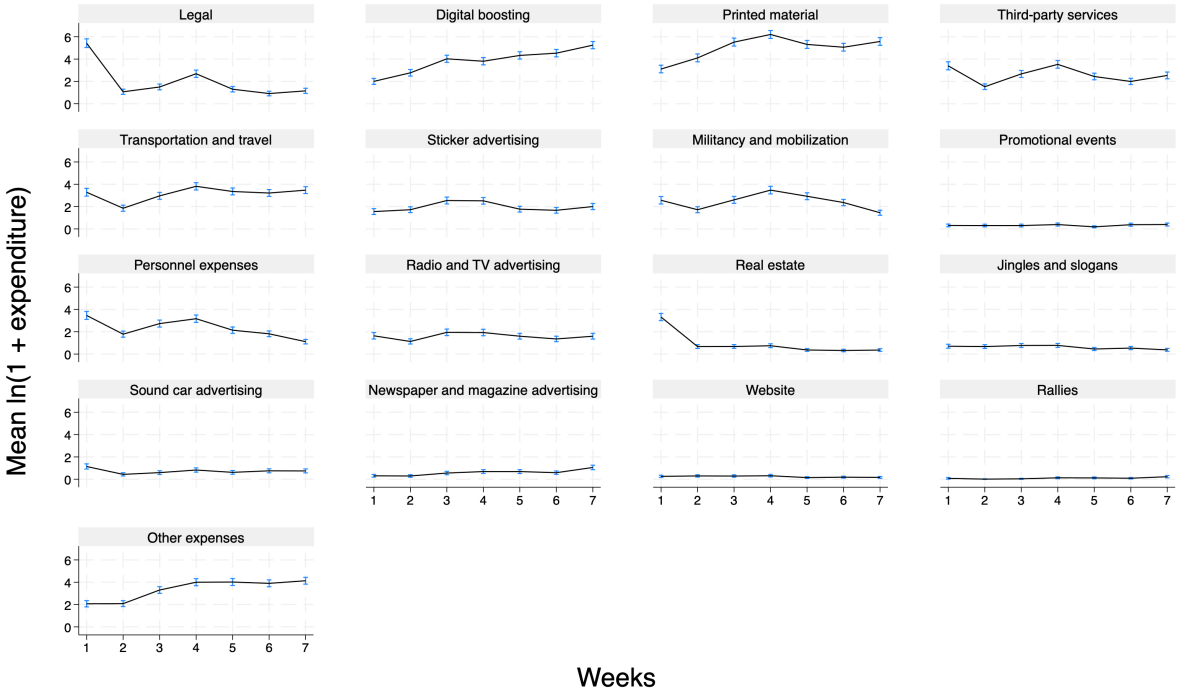


Figure A.5: Word Cloud of Campaign Ad Creatives



Figure A.6: Distribution of price per reach (BRL)

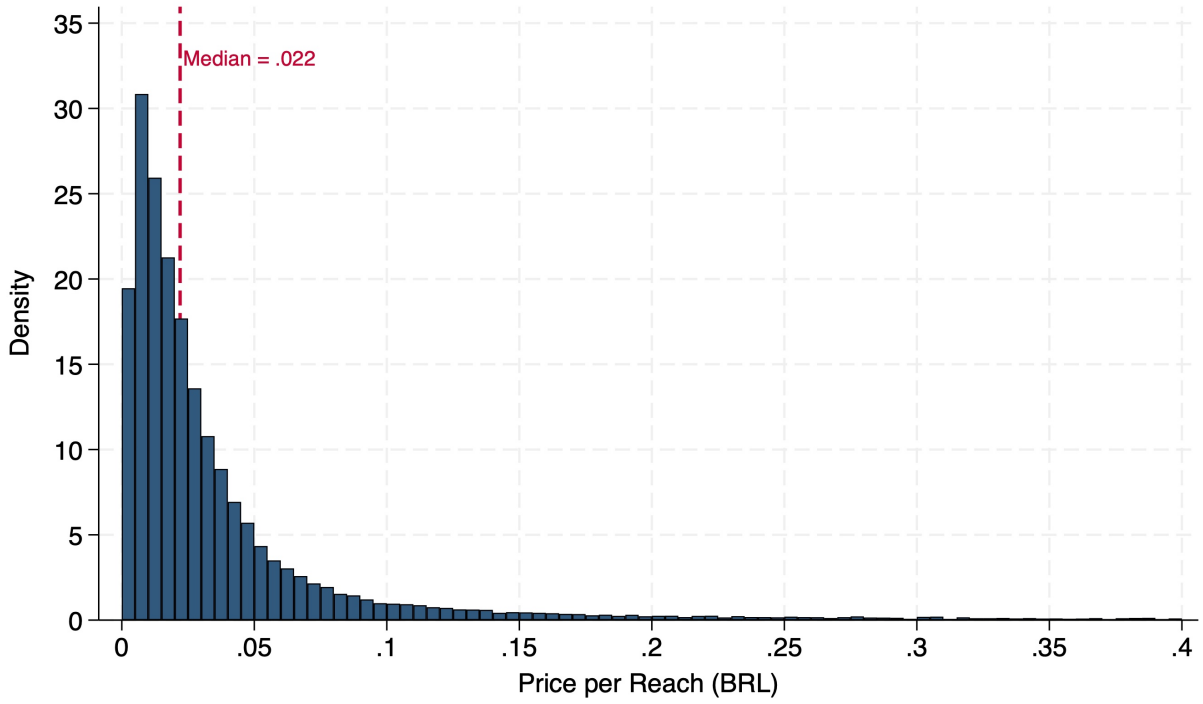


Table A.7: Regression Discontinuity Estimates First 5 Weeks

	Share of Spending		Spending (Level)	
	(1)	(2)	(3)	(4)
	Digital Boosting	Others	Digital Boosting	Others
RD_Estimate	-0.02	-0.03	-1674.87	7490.80
	(0.069)	(0.016)	(1524.02)	(10091.96)
p-value	0.788	0.049	0.272	0.458
N (Left)	505	505	505	505
N (Right)	223	223	223	223
Bandwidth	100000	100000	100000	100000

Local linear RD estimates with triangular kernel.

Robust bias-corrected standard errors clustered at the municipality level in parentheses.

Figure A.8: Age Distribution of Targeted Advertisements

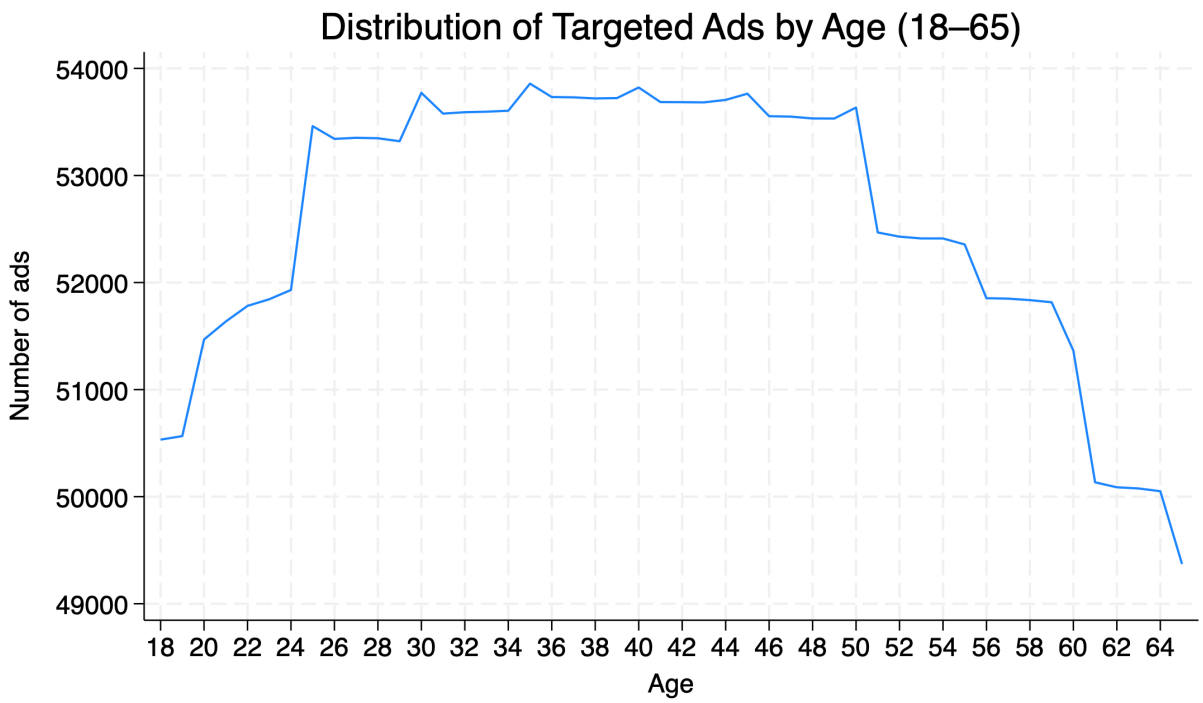


Table A.8: Competitive versus non-competitive (Competitive ex post 1-2-3)

	Total Campaign Spending		Digital Boosting (Level)		Digital Boosting (Share)	
	(1)	(2)	(3)	(4)	(5)	(6)
	Non-comp.	Competitive	Non-comp.	Competitive	Non-comp.	Competitive
RD Estimate	194269.61	358527.41	-4543.53	-22548.99	-0.06	-0.03
	(78091.96)	(477131.10)	(5568.09)	(8369.51)	(0.042)	(0.011)
p-value	0.074	0.357	0.458	0.049	0.221	0.013
N (Left)	155	331	155	331	155	331
N (Right)	88	132	88	132	88	132
Bandwidth	100000	100000	100000	100000	100000	100000

Local linear RD estimates with triangular kernel.

Robust bias-corrected standard errors clustered at the municipality level in parentheses.