Money and Politics:
The Effects of Campaign Spending Limits on Political Entry and Competition*

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Abstract

This paper studies the effects of campaign spending limits on the political entry, selection, and behavior of local politicians in Brazil. We analyze a reform that limits campaign spending for mayoral elections. The limits were implemented with a discontinuity that we exploit for causal identification. We find that stricter limits reduce reelection rates and increase political competition by attracting more candidates who are also less wealthy and rely less on self-financing. Despite their effects on electoral outcomes, stricter limits did not lead to significant short-run improvements in policy outcomes, such as in education and health.

Keywords: Political Entry, Political Selection, Campaign Finance, Campaign Contributions, Incumbency Advantage

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1 Introduction

Among the many factors critical for a properly functioning democracy, few have been as widely debated as campaign financing. For some, money in politics serves as an expression of free speech and an effective instrument for informing voters and building an inclusive democracy. For others, the unrestrained use of money in politics can erode the functioning of democracy as it can lead to excessive campaigning, unequal access to power, and politicians who are beholden to special interest groups.[1]

In practice, almost every country with political pluralism has adopted some type of political finance regulation ranging from information and disclosure requirements to limits on campaign contributions and/or expenditures (Scarrow, 2007). Countries such as Canada and the UK have been limiting campaign spending by parties and individuals for many decades.[2] More recently Belgium, Chile, France, Israel, New Zealand, South Korea and many others have also adopted campaign spending caps to limit the role of money in elections.[3]

Despite the widespread adoption of spending limits, our understanding of how they impact the political process is limited. As we show theoretically in a contest model with endogenous entry of heterogeneous candidates, spending limits can affect both who enters politics and who gets elected. But because the decision to run for office depends not only on a candidate's own characteristics, but those of his opponents, the effects of spending limits on electoral outcomes can be ambiguous. Empirically, to estimate these effects presents some difficult challenges. Campaign finance reform is usually applied uniformly across elections and jurisdictions, which makes it difficult to identify an appropriate comparison group. In addition, few countries provide information on the characteristics and campaign spending of both their elected and non-elected candidates. It is important to have data on both types of candidates if, as theory suggests, spending caps affect not only the identity of who is elected, but also who chooses to run.

In this paper, we provide causal estimates of the short-run effects of campaign spending limits on the political entry, selection, and behavior of local politicians in Brazil. We do so in the context of a recent campaign finance reform that limits campaign spending in future elections. The

[1] For example, see Coate (2004), Prat (2002), Prat (2006), and Scarrow (2007).

[2] Currently, political parties in Canada can spend only 73.5 cents for every voter in districts in which they are competing. In the United Kingdom, legislation regulating expenditures has been in place since the Corrupt and Illegal Practices Prevention Act 1883. In the 2005 general election, campaign expenditure at the national level were limited to approximately US$42,000 per constituency contested.

[3] Two thirds of the OECD countries have introduced campaign spending limits for parties or candidates (Speck, 2013). One of the few exceptions among rich countries is the U.S. where the Supreme Court ruled mandatory spending limits as an unconstitutional curtailment of free speech.

spending caps vary by municipality and create a discontinuity of about 24 percent in the amount candidates can spend in local elections. We exploit this discontinuity together with a rich dataset on all candidates elected and non-elected to explore how spending limits affect the entry decisions of candidates, their characteristics, and electoral results for mayors.

Our analysis shows that spending caps do affect political entry and selection. In municipalities with a higher spending cap, campaign contributions are 11 percent higher, with 68% of this difference coming from self-financing. We find that municipalities subject to higher spending limits are less politically competitive as measured by the total number candidates or the effective number of candidates (i.e. the total number of candidates weighted by their vote shares). Our estimates suggest that a 24 percent increase in spending caps leads to a 8 percent decrease in the number of individuals who run for office. Higher spending limits also affect the composition of the candidate pool by attracting wealthier candidates who are better able to self-finance their campaigns as well as fewer candidates from small parties.

For political selection, we find that incumbents are 12 percentage points more likely to get re-elected in places with higher spending caps. Two factors can explain this effect on incumbency rates. First, as we have already mentioned, incumbents face fewer challengers in municipalities with higher spending limits. Second, we find suggestive evidence that incumbents, who on average are wealthier and raise more campaign contributions, benefited disproportionately more than challengers from an increase in the spending cap. Independent of incumbency status, we also find that places with higher limits elected mayors who were wealthier and relied on more self-financing, and that the vote share of small party candidates decreases when limits are high.

A natural question to ask in the context of a developing country is to what extent were the campaign spending limits enforced. While it is difficult to test this directly, we collected data to test whether the caps affected the use of undeclared campaign funds. Because politicians are monitored and accounts are audited, we can examine the share of candidates' campaign accounts that were rejected or found to be irregular by independent electoral judges. We also examine whether politicians shift resources towards in-kind contributions, which do not have formal receipts and are difficult to monitor. We do not find any evidence that spending caps affected the share of accounts judged as irregular or the share of in-kind campaign contributions. Finally, it is important to note that had the candidates found a way to circumvent the caps then it is unlikely we would have found any effects on our political outcomes.

We care about who gets elected because it can matter for what policies are selected and how well they are implemented (e.g. Chattopadhyay and Duflo (2004); Jones and Olken (2005); Meyersson

(2014)). Given the political selection effects, we also estimate the impacts of spending limits on the behavior of elected politicians. Using data during their first three years in office, we estimate the effects of spending limits on economic outcomes and public goods provision. Overall, we do not find any evidence that higher spending limits reduce welfare; if anything, municipalities with higher caps tend to have slightly better outcomes, in particular for education. Of course, these are only short-term effects and only time will tell whether campaign spending limits can affect political behavior and welfare more generally.

Our findings contribute to a large but mostly theoretical literature on the effects of campaign finance policy on electoral outcomes. Most of the models in this literature study the welfare effects of campaign finance reform in an environment in which candidate entry is fixed and campaign contributions provide valuable information about candidates (e.g. Austen-Smith (1987); Prat (2002); Coate (2004); Ashworth (2006)). In our paper, we draw from a different class of models that abstracts from why campaign spending affects voting to instead focus on the effects of spending limits on the entry decisions of candidates and electoral outcomes. We build on the extensive literature studying contests and all-pay auctions in the context of political lobbying and campaigning (e.g. Che and Gale (1998); Fang (2002); Pastine and Pastine (2012); Cotton (2012)). Relative to this previous literature, we incorporate candidate heterogeneity, which allow us to characterize the conditions under which spending limits affect the size and quality of the candidate pool.

The empirical literature on campaign finance policy is much less developed, especially when focused on spending limits. The majority of empirical studies have instead studied contribution limits mostly within the U.S. and rely on the fact that these limits vary by state and across time for identification (e.g. Stratmann and Aparicio-Castillo (2006); Barber (2016)). This type of identifying variation, however, can be problematic. The decision to impose contribution limits is itself endogenous and a function of many of the electoral outcomes that limits presumably impact.

To our knowledge, there are only two other empirical investigations on the effects of campaign spending limits. Milligan and Rekkas (2008) use spending caps as an instrument to estimate the effects of campaign spending on electoral outcomes in Canada's federal elections. The instrument is based on a formula that specifies spending limits as a function of the number of electorates and the size of the district. Although the focus of their paper is on estimating the elasticity of spending on votes, they also find that higher limits are associated with fewer candidates, lower voter turnout, and larger win margins. Fouirnaies (2020) also relies on a similar formula-based spending limit to estimate the effects on electoral competition in the British House of Commons elections during the period 1885-2010. Again consistent with our findings, he finds that spending limits are associated with less competition and a candidate pool with a higher proportion of upper class candidates.

Different from these studies, our research design requires much weaker assumptions to identify the causal effect of spending limits. These previous studies rely on variation that was determined according to the size and density of the electoral district. But the concern is that in both the cross-section and over time, these variables are likely to be correlated with other factors that directly impact the political process. In contrast, our regression discontinuity approach exploits an unexpected law change that created a sharp discontinuity in spending limits among otherwise similar municipalities. In addition, we also study the effects of spending limits on a broader set of outcomes, including detailed candidate characteristics for both the elected and non-elected, electoral performance, as well as policy outcomes.

Our study also relates to a large literature on the effects of campaign spending on electoral outcomes (e.g Levitt (1994); Gerber (1998); Erikson and Palfrey (2000); Da Silveira and De Mello (2011)). A central finding in this literature is that the elasticity of vote share with respect to campaign spending is larger for challengers than for incumbents. This has led several studies to conclude that the introduction of spending limits may reinforce incumbency advantage (Levitt, 1994; Jacobson, 1990). Our findings suggest that this is not necessarily the case, once we account for the entry and compositional effects of spending caps.

Finally, our work also speaks to research on the identity of politicians and whether limits to campaign spending might level out the playing field between richer and poorer candidates. There is a growing literature following the citizen-candidate models of Osborne and Slivinski (1996) and Besley and Coate (1997) suggesting that identity matters for policy implementation (e.g. Chattopadhyay and Duflo (2004); Besley et al. (2011); Corvalan et al. (2018)). In countries where inequality is high, access to political power might be easier for richer candidates and this might have direct consequences on who gets elected and which types of policies are implemented. Our work suggests that higher spending caps increase, at least in the short-run, the average wealth of candidates that run for and are elected as mayor, but we do not find strong evidence of different policies and outcomes.

The rest of the paper is organized as follows. Section 2 describes Brazil's campaign financing laws and presents the data used in the empirical analysis. Section 3 presents the theoretical framework. Section 4 discusses our research design and in Section 5 we present our findings. Section 6 concludes.

2 Background and Data

In this section, we describe campaign financing in Brazil and the 2015 campaign finance reform. The new law limits how much candidates from different municipalities can spend. These spending limits form the basis of our identification strategy. We then discuss our data and present some basic descriptive statistics.

2.1 Municipal Elections and Campaign Financing

Local elections in Brazil are held every four years. Candidates need to be registered as a member of a political party in order to run for a political office. The elections are held to elect a municipal mayor and a local council. For municipalities with less than 200,000 registered voters, which represents 98 percent of all municipalities, mayors are elected based on simple plurality. For municipalities with 200,000 or more registered voters, candidates for mayor must be elected with at least 50 percent of the votes or a second round runoff is held. Once elected, mayors then face a two-term limit. In contrast, local legislators are elected based on an open-list proportional representation system and can be reelected indefinitely. Mayors are important political figures in Brazil. Each year, 5,570 municipalities receive approximately 20 percent of total revenue to provide basic public services such as primary education, health care, and sanitation. The mayor sets the agenda for how resources are spent and allocated.

Political parties are financed yearly by private contributions and public funds (Fundo Partidário) that are distributed across parties based on the share of votes a party received in the previous election for Congress. Parties use these resources to fund individual candidates. On top of public funding, candidates can receive private contributions after they have officially registered their candidacy (before August 15^{th}) up until the day of the election. Citizens can contribute up to 10% of their annual income, unless contributing to their own campaign, in which case there are no limits. Prior to 2015, corporations could contribute up to 2% of gross annual revenues, and there were no restrictions on either total contributions or total campaign spending. Political action committees do not exist in Brazil and independent organizations cannot spend resources to campaign for candidates or parties. Campaign spending has to be made by individual candidates or political parties on their behalf.

Similar to the U.S., both street campaigns and media advertisements are important forms of campaigning. But different from the U.S., candidates do not need to buy time on TV or radio. In Brazil, TV and radio advertisements are free and air at predetermined times of the day for 35 days before the election as determined by Brazil's electoral law. Airtime is distributed according to the share of votes that the candidate for mayor's coalition has in Congress (see Da Silveira and De Mello (2011)). While airtime is free, candidates do spend a significant amount of resources on producing the advertisements.[4] Since 2010, candidates can also use the internet to campaign, including social media – although prior to 2018, they could not purchase advertisements on social media outlets.

2.2 The 2015 Campaign Finance Reform

On March 2014, Brazil's Federal Police launched an investigation into a local money laundering scheme involving gas stations. This investigation, which became known as "Lava Jato", exposed a system of collusion between construction companies and government agencies that has since become one of the largest corruption scandals in the world. Most policymakers and civil society organizations blamed the increasing costs of political campaigns as one of the principal causes of the corruption. This discourse quickly pressured Congress to take up campaign finance reform to curb the role of private money in elections. It also gave Brazil's National Bar Association the opportunity to reintroduce a motion presented to the Supreme Court in 2011 that argued for campaign contributions from corporations to be deemed unconstitutional on the basis on unequal political influence. In September 2015, Brazil's Supreme Court ruled that campaign contributions from private firms would no longer be legal starting with the 2016 election.

Following this ruling, and a long debate that took place in Congress since early 2015, the Brazilian Congress passed an electoral reform aimed at reducing the cost of political campaigns. The new electoral law reduced the length of political campaigns from 90 to 45 days and established, for the first time, a limit for campaign spending in future elections.[5] The spending limits apply to any: i) spending made directly by the candidate, ii) spending made by the party on behalf of the candidate, iii) transfers made by the candidate to other candidates (within or across parties) or to political parties, iv) campaign donations estimated in kind or computed as gifts. Candidates that spend more than the limit are subject to severe punishments including a fee of 100% the amount that exceeds the limit. To partially compensate for the ban on corporate contributions, the Congress also increased by a factor of 4, the amount of public campaign funds available to political parties.

The reform also stated that candidates running for mayor can only spend the maximum of either R$100,000 (approximately $30,000) or 70% of the highest amount spent by a candidate in the same municipality in the previous 2012 election. As stated, the law creates a kink in the amount

[4] For the municipalities in our particular context (near the RD threshold), radio advertising is more relevant since TV advertising is only regularly used in large municipalities.

[5] See law no. 13165, September 29th 2015.

that candidates can spend at around R$142,858 (70% of R$142,858 is R$100,000.6). For any value lower than R$142,858 the cap is given by R$100,000 while for higher values the cap is given by 70% of the largest value spent in the previous election.

The law also stipulated that the caps, disclosed to all municipalities in December 2015, should be inflation adjusted in 2016 (see Figure A.1 for a time line of the events leading up the 2016 elections). For municipalities capped at R$100,000, they increased the limit by 8.04 percent, which corresponds to the increase in the price index between October 2015 (the month the law was issued) and October 2016. But for municipalities capped at 70 percent of the maximum amount spent in the 2012 election, the cap was adjusted by 33.7 percent, which corresponds to the increase in the price index that took place between October 2012 and June 2016. As a result, the inflation-adjusted caps created a discontinuity in the campaign spending limits of about 24 percent, which is what our research design will exploit (see Figure A.2).[6]

Campaign contributions and expenditures are tightly regulated in Brazil. Prior to the election, all candidates and parties have to open a bank account to be used exclusively for campaign purposes. All individual contributions and expenditures should be reported to the Electoral Commission within 72 hours and must identify all the entities involved. The electoral court monitors and makes public every transaction as soon as it is received. Candidates can declare as contributions, loans coming from their own resources, but these loans must come from official financial institutions certified by the Central Bank.

After the elections, candidates and parties have 30 days to submit their final accounts to electoral judges and the incentives to report truthfully are high. The electoral commission makes the accounts available online and allows any candidate, political party, or public prosecutors to check and contest the accounts of other candidates within 3 working days. After this period, the commission rules whether the accounts of the candidates and parties are considered to be: i) regular and approved, ii) approved with some problems but without irregularities, iii) rejected due to significant irregularities. If rejected, candidates could be banned from running for office in the future.

A more severe violation is the use of undeclared resources, which includes for instance vote buying. In extreme cases, the electoral commission can cancel a candidate's registration during the election or bar them from taking office. Many candidates have lost their mandates in Brazil for buying votes with undeclared resources. Parties and party leaders can also be punished for irregularities in their campaign finance accounts. Parties can lose access to public funds for up to one year, and party

[6]The information on the spending caps is publicly available and can be assessed at the Electoral Court webpage at: http://www.tse.jus.br/eleicoes/eleicoes-2016/prestacao-de-contas/divulgacao-dos-limites-legais-de-campanha.

leaders can be prosecuted in civil and criminal courts for irregularities associated with diversion of resources for personal gains or other forms of corrupt practices.

2.3 Data

For this paper, we use data from several sources. The election data come from Brazil's Electoral Commission and are available online at the level of an individual candidate (TSE, 2017a,b). Our data covers all candidates that ran for mayor in 2012 and 2016. In addition to their election results, for each candidate we know a basic set of demographic characteristics, such as their gender, age, education level, and self-reported wealth, as well as their campaign contributions and expenditures. For campaign contributions we know the source of the contribution (individual or party) and the amount. For campaign expenditures we have a description of the type of spending in large categories and the tax code of the firm that received the transfer for the good or service (e.g. candidate A rented a car from rent-a-car company B and spent X). Based on this information, we compute at the municipal level, our main political outcomes: campaign contribution and spending (total and by categories), the number of candidates that ran for mayor, characteristics of the candidate pool, and re-election rates. We complement these data with information from the 2010 population census, aggregated at the municipality level (UNDB, 2013). The census data include basic demographic and socio-economic characteristics of the municipality, such as: population size, average income, literacy rates, and share of the urban population.

Descriptive statistics for the 2016 elections appear in Table 1. On average, elections for mayor attract 3 candidates. Only 13 percent of candidates are female, and 51 percent of candidates have a college degree. On average, incumbents tend to self-declare higher asset holdings than challengers ($p < 0.001$), yet this comparison masks a lot of heterogeneity as the maximum amount declared by a candidate in a municipality ranges from R$43,600 to R$24.2 million. In Brazil, incumbents do not enjoy much of an advantage. Conditional on running for reelection, incumbents were only re-elected in 48 percent of municipalities, and received on average 47 percent of the votes. In the analysis, we keep open seats elections (i.e. elections where the incumbent cannot run because of term-limits) except when we consider the effects of spending limits on incumbents. As we will discuss in Section 5, our results are robust to this sample selection.

3 Theoretical Framework

In this section, we present a simple model of electoral competition to motivate our empirical strategy. Our model builds on the literature studying contests and all-pay auctions in the context of political lobbying and campaigning.[7] We adapt the n-player contest model with generalized technologies of Cornes and Hartley (2005) to an environment in which campaigning efforts are constrained by a spending cap. In order to incorporate the possibility that caps are not fully enforced, we allow the players to exceed them through less efficient means of campaigning.

We consider an environment in which $I \geq 2$ candidates compete in an election. Each candidate, indexed by i, chooses how much to spend across two technologies: she chooses an amount x_i to spend through formal channels, which is reported to the election commission, and an amount z_i to spend through informal channels. Informal spending can include any activity which is not constrained by the spending cap, such as effort spent campaigning on social media accounts. The candidate's total *input* into the electoral contest is the weighted sum $y_i = a_i x_i + b_i z_i$, where a_i and b_i are measures of each technology's effectiveness in producing votes. We assume that $0 \leq b_i < a_i$ for all candidates, so that spending through formal channels is more efficient.[8] We will refer to a_i as the candidate's inherent campaign effectiveness or *popularity*.

After each candidate simultaneously chooses her campaign expenditures, the voters select their preferred candidate in the election. We assume that a candidate's probability of winning is given by the contest function

$$s_i = \frac{y_i}{\sum_{k=1}^{I} y_k}, \tag{1}$$

and if $y_i = 0$ for all candidates, we assume that no candidate wins the contest. Each candidate seeks to maximize her probability of winning the election net of the costs of campaigning.[9] Normalizing the benefits of winning to 1, we write the candidate's utility function as

$$u_i(x_i, z_i) = s_i(x_i, z_i) - c_i(x_i + z_i) \tag{2}$$

[7] For example, see Tullock (1980), Siegel (2009), Jia et al. (2013), Kang (2015). Although the contest model has not, to our knowledge, been applied to study campaign spending caps, it has been extended to consider the effect of public campaign spending laws (Klumpp et al., 2015). For a review of the literature, see Corchón (2007) and Konrad (2009).

[8] If $b_i > a_i$, then a cap on formal spending would trivially have no effect as candidates would only spend informally. In practice, informal spending may be less efficient than formal spending because of the additional effort required to reduce the risk of detection and punishment. The special case $b_i = 0$ captures the scenario where caps are fully enforced.

[9] Equivalently, we can assume that politicians seek to maximize vote shares net of the costs of campaigning by letting equation (1) denote the politician's vote share.

where we assume that the marginal cost to raising campaign contributions is c_i. We will refer to the parameter c_i as *the cost of fundraising* of a candidate.[10]

A strategy for player i is an expenditure pair (x_i, z_i). While her formal spending is limited to a spending cap $\bar{x}$, a politician can spend an unlimited amount informally. The solution concept we use is the pure strategy Nash equilibrium: a strategy profile in which each candidate's expenditures maximize her payoff given the expenditures of her opponents. We show that there exists a unique pure strategy Nash equilibrium.

Proposition 1. *There is a unique pure strategy Nash equilibrium for the simultaneous-move game played by the candidates.*

Proof. See Appendix A.1 □

Given the uniqueness of the equilibrium, we next explore how a change in the expenditure cap affects equilibrium outcomes. In Appendix A.1, we provide a formal treatment where we prove propositions relating to the effects of spending caps. In the following, we highlight the empirically testable hypotheses of our model.

Hypothesis 1 (Impacts on Campaign Spending)**.** *An increase in the spending cap:*

a) increases total inputs in the electoral contest
b) increases spending for candidates who are constrained by the cap
c) has an ambiguous effect on spending for all other candidates

Although total equilibrium inputs are increasing in the cap, each individual candidate's expenditures is not necessarily increasing in the cap. This result is an extension to previous findings in the literature studying contests and all-pay auctions, which has found mixed results for the effects of caps on spending.[11] In our case, we can only say that an increase in the cap increases spending for those candidates who are constrained by the cap, that is, whose equilibrium formal spending is equal to the cap. To illustrate why spending is not necessarily increasing in the cap for all candidates, consider a situation where there are two high-popularity candidates whose spending

[10] We discuss the shape of the contest function in further detail in Appendix A.1.

[11] Che and Gale (1998) consider a two-player all-pay auction and show that bid caps may increase total expenditures. On the other hand, considering an n-player contest, Fang (2002) finds that imposing an exogenous cap never increases total expenditures. In contrast, our model also allows for heterogeneity in bidder abilities to convert expenditures into inputs in the contest function, and hence that although caps reduce total inputs, they do not necessarily reduce a candidate's nor total spending.

is constrained and one low-popularity candidate who is unconstrained. Whereas the constrained candidates will increase their formal spending with an increase in the cap, it will only be profitable for the non-binding candidate to increase her spending if the effectiveness of her campaign expenditures is sufficiently high relative to her cost of fundraising. Otherwise, her best response to the increase in spending of her competitors will be to reduce her own campaign expenditures.

We next consider how spending caps affect the entry of political candidates. We define an entrant as any candidate whose equilibrium spending is strictly positive.

Hypothesis 2 (Impacts on Political Entry)**.** *An increase in the spending cap:*

a) reduces the number of entrants
b) induces exit of candidates with low popularity (a_i)
c) induces exit of candidates with high fundraising costs (c_i)

We find that increasing the spending cap decreases the number of entrants. Intuitively, this is because in equilibrium, total inputs into the contest are increasing in the spending limit. Thus, with higher spending limits, candidates must make more expenditures to achieve the same probability of winning. On the other hand, the candidate's fundraising cost is the same for any cap, and hence she is less likely to enter when the cap is high.

An increase in the spending limit will also alter the composition of the pool of entrants. Entry into the electoral contest will depend on a threshold which is given by the ratio of the candidate's popularity a_i to her marginal cost c_i. As the spending cap increases, the entrants with the lowest ratios will exit first. This implies that all else equal, increasing the cap will cause less (ex-ante) popular candidates to drop out of the race. Therefore, we predict that candidates whose characteristics make them less likely to win a race will be less likely to run under a higher spending cap.

Finally, all else equal, increasing the cap will cause the exit of candidates with the highest fundraising costs. Since a significant portion of campaign spending is self-financed, it is likely that the cost to fundraising is lower for wealthier candidates. Therefore, we predict that higher spending caps create a wealthier pool of entrants.

Hypothesis 3 (Impacts on Political Selection)**.** *Increasing the spending cap decreases the probability of winning of the candidates whose equilibrium spending is less than the cap, and increases the probability of winning of the candidates whose equilibrium spending equals the cap.*

An increase in the spending limit may either increase or decrease an entrant's probability of winning the election. The main finding is intuitive: the candidates who spend less than the cap will face stiffer competition when the cap is increased. This result implies that candidates who are more likely to be high spenders, i.e. with those who are wealthier or more (ex-ante) popular, will benefit electorally from an increase in the cap. This also has implications regarding the effect of spending limits on incumbency advantage. If incumbent characteristics are such that they are more likely to be binding spenders than challengers, then incumbency advantage will increase in the spending cap. In our setting, since incumbents tend to be wealthier than challengers (see Table 1), we expect that higher spending caps will improve the electoral outcomes of incumbents.

4 Research Design

We are interested in estimating the causal effects of campaign spending limits on political entry and selection. As we discussed in Section 2, prior to the 2016 municipal elections the Brazilian government imposed a cap on the amount of money a candidate could spend in the election. The law created a discontinuity in the spending cap for municipalities with a candidate that spent above R$142,857 in the 2012 elections.

Visually, the effects of the law on candidate spending for the 2016 elections can be clearly seen in Figure 1. For municipalities that did not have a 2012 candidate who spent above R$142,857, their candidates were capped at R$108,039. For the municipalities above this threshold, the spending cap jumps up by about 24 percent and then increases linearly as determined by the rule. It is also clear from Figure 1 that the caps were not binding for many of the municipalities. As a point of comparison, absent any endogenous responses in spending, the caps would have been binding in 2012 for every single municipality to the right of the cutoff and for 14.3 percent of municpalities to the left of the cutoff (those where maximum spending was between R$108,039 and R$142,857). Although this proportion may appear small, it is worth noting that our RD design estimates a local treatment effect for a municipality situated near the cutoff, in which case the cap would have been binding under 2012 spending levels.

To identify the effects of spending limits, we exploit the discontinuity at R$142,857 using a standard regression discontinuity design approach. Let $S_{m,2012}$ denote the maximum amount spent by a candidate in municipality m during the 2012 elections. The treatment effect on outcome $Y_{m,2016}$ of the spending cap is given by:

$$\text{Treatment Effect} = \lim_{s \downarrow 142{,}857} E[Y_{m,2016}|S_{m,2012} = s] - \lim_{s \uparrow 142{,}857} E[Y_{m,2016}|S_{m,2012} = s]. \qquad (3)$$

The first conditional expectation measures the expected outcome at the threshold for municipalities in which candidates' campaign spending is capped at R$133,700. The second conditional expectation function measures the expected outcome at the threshold for municipalities in which candidates' campaign spending is capped at R$108,039. Under the assumption that these two conditional expectations are continuous in s, this difference estimates the causal effect of campaign spending limits on political outcomes, at the point of discontinuity.

We estimate these conditional expectations by local linear regression using only data within a bandwidth h of the threshold. The running variable in our main specifications is the distance in log points between the threshold 142,857 and $S_{m,2012}$. Formally, we estimate the following model within a bandwidth of the threshold:

$$Y_{m,2016} = \alpha + \beta \mathbb{1}\{S_{m,2012} > 142,857\} + \delta_0 log(S_{m,2012}) + \delta_1 log(S_{m,2012}) \mathbb{1}\{S_{m,2012} > 142,857\} + \varepsilon_{m,2016} \quad (4)$$

where $\mathbb{1}\{S_{m,2012} > 142,857\}$ is an indicator equal to 1 when $S_{m,2012} > 142,857$, and $\varepsilon_{m,2016}$ represents the error term. The parameter β measures the treatment effect. For our choice of bandwidth h, we rely on the approach developed by Calonico et al. (2014). This optimal bandwidth choice is a function of the data and is thus different for each outcome, $Y_{m,2016}$. We also explore the robustness of our results to alternative bandwidth sizes. We use a triangular kernel to place more weight on observations close to the cutoff. We verify that our results are similar with a rectangular kernel. Finally, we also explore the robustness of our results to the use of spending levels instead of log points as the running variable.[12]

Before presenting our results, it is important to test the validity of our research design. In Panel (a) of Figure 2 we plot the density of our "running variable", $S_{m,2012}$. Unsurprisingly, we do not find any evidence of manipulation or endogenous sorting around the discontinuity threshold. This is completely expected: campaign expenditures are made public immediately following each election, and no one could have anticipated the recent law change back in 2012. As a point of comparison, Panel (b) of Figure 2 plots the distribution of campaign spending for the 2016 election. In contrast to the previous plot, Panel (b) does exhibit substantial bunching at the spending cap of R$108,039.

Another concern associated with regression discontinuity designs is the possibility that other determinants of our outcomes of interest vary discontinuously at the cutoff point. Although we cannot

[12] We prefer measuring the running variable in logs rather than levels for two reasons. First, the running variable is highly skewed, and second, it is censored on the left by zero. In the Online Appendix, we provide robustness checks where the running variable is measured in levels. Tables A.18-A.22 replicate the findings for the full sample and A.23-A.27 for the subsample excluding open seats. As expected, the number of observations is typically larger under the log specification and the point estimates, although similar in magnitude, tend to be more precise.

directly test this assumption for unobserved characteristics, we can examine whether observable characteristics of the municipality exhibit discontinuous jumps at the cutoff point. In Figure 3, we present a series of plots, exploring various municipal characteristics that are correlated with our political outcomes of interest, such as GDP per capita, illiteracy, and the share of the urban population. In each graph, we plot a bin scatter of the municipal characteristic against the maximum amount a candidate spent in the municipality during the 2012 elections in logs (i.e. our running variable). In addition to these binned averages, we also fit a first-order polynomial on each side of the point of discontinuity. We do not find any evidence of other characteristics jumping at the cutoff point. All the differences are close to zero in magnitude and statistically insignificant. Importantly, these comparisons also include our main political outcomes of interest but measured for the 2012 elections (i.e. the "pre-treatment period"). These plots represent only a subset of the characteristics for which we tested. Table 2 presents the entire set. Out of the 19 municipality characteristics tested, only one displayed a discontinuous jump at the cutoff point (female). But whether or not we control for candidate characteristics does not affect any of our point estimates.

5 Results

5.1 Effects of Spending Caps on Campaign Expenditures and Contributions

In this section, we estimate the causal effects of the spending caps on candidates' campaign spending and contributions. We begin with the graphical evidence. In Panel A of Figure 4, we plot binned averages of candidates' expenditures in the 2016 elections against our running variable (the maximum amount spent by a candidate during the 2012 elections centered at R$142,857, in logs). We also fit a first-order polynomial, separately estimated on each side of the discontinuity. The discontinuity at zero provides an estimate of the gap in candidates' campaign spending imposed by the law. The estimated discontinuity implies that a 23.8 percent increase in the spending cap increased maximum campaign spending by approximately 12 percent during the 2016 elections for municipalities near the discontinuity. In Panel B, we reproduce the graph presented in Panel A, but for average expenditures. We see a similar increase of approximately 14 percent, which further suggests that the caps affected the spending choices of many candidates.

We refine the graphical analysis in Table 3. Each row corresponds to a different dependent variable, and each numbered column presents the estimated impact for a different regression specification. In column 1, we present our main estimates of Equation 4, using the optimal bandwidth for a local linear specification. For each dependent variable, we report its estimated mean at the point of discontinuity, the optimal bandwidth and the associated number of observations.

In columns 2-4, we explore the robustness of our results to varying specification choices. In column 2, we test for the sensitivity of the estimates to the inclusion of municipal characteristics (GDP per capita, illiteracy, share urban, gini coefficient and population). Note that we recompute optimal bandwidths for this specification using the methods proposed in Calonico et al. (2018). In column 3, we further explore the robustness of the results by fitting a local quadratic polynomial on each side of the discontinuity instead of a local linear polynomial. To validate this specification's identifying assumption, we test whether covariates and pre-treatment outcomes vary continuously at the point of discontinuity in Table A.1. In column 4, we estimate the difference in means in outcomes for a narrow bandwidth of 0.2 (approximately R$30,000). We test for this specification's identifying assumption by verifying that covariates and pre-treatment outcomes are balanced around the point of discontinuity in Table A.2.

Our results are robust to these various modeling choices. In our baseline specification, the highest-spending candidate just to the left of the discontinuity spent on average R$84,387 to become mayor, compared to R$92,800 for candidates in municipalities just to the right of the discontinuity. This represents a 10.0 percent increase in spending. The point estimates in columns 2-4 are similar: they indicate increases in maximum spending ranging from 10.6 to 19.9 percent. The estimates on average spending are also consistent across specifications. They imply that the higher spending cap led to increases in mean spending ranging from 11.4 to 18.7 percent. To benchmark these magnitudes, with an additional R$10,000 a candidate could hire 10 full time workers at minimum wage to knock on voters' doors for 1 full month. An additional R$5,000 to R$8,000 would be enough to hire a digital marketing professional for one month to manage a campaign's digital platform and social media.

The theory does not provide clear predictions on the effects of a spending cap on the minimum or total amount spent in an election. In some cases, a higher spending cap will induce the minimum-spending candidate to reduce spending further, or even exit the race. Thus increasing the spending cap does not necessarily lead to an increase in the minimum or total spending within a race. Empirically, the results are somewhat mixed as they are not robust to our modeling choices. In our baseline specification, we estimate that the caps increased minimum spending by 6 percent, but the effects are not significant. The estimated effects on total spending range from 8 to 16 percent, but are statistically significant in only two of the specifications.

In Panel B, we investigate campaign contributions. In Brazil, total spending and total contributions are virtually the same because candidates are not permitted to accumulate war chests. So in this panel, we focus on the composition of the candidates' campaign contributions. We find that a modest fraction of the increase in spending comes from party contributions; as we discussed, political parties saw a 4-fold increase in the amount of public funds available to them. The majority of the increase in spending, however, comes in the form of candidates self-financing their own campaigns, which might be tied to the law's ban on corporate donations. In 2012, candidates received on average 16 percent of their contributions from corporations, and self-financed 25 percent of their campaigns. In contrast, 2016 candidates self-financed 40 percent of their campaign expenditures. We can interpret these results in two ways. On the one hand, because of the corporate ban, the higher caps induced the existing candidates to contribute more to their own campaigns. On the other hand, higher caps may have attracted a wealthier pool of candidates with greater financial means to run for office. We examine this possibility in the next section.

5.2 Do Spending Caps Affect Candidate Entry?

According to Hypothesis 2 of our model, the number of candidates who enter the race should decrease as spending limits increase. Additionally, higher spending limits should attract individuals who have a higher ex-ante probability of winning as well as those who are wealthier and have lower costs to fundraising. We test these predictions in Table 4. As before, the rows indicate different dependent variables, and the numbered columns present the estimated effects of the caps for different modeling choices.

Spending caps affect the entry decisions of potential candidates. On average, 0.24 fewer candidates ran for office in municipalities just to right of the threshold compared to those just on the left. Given that, on average, 3.1 candidates run for mayor, this effect represents a 8 percent decrease in the size of the candidate pool. This result is presented visually in Figure 5. In contrast to the plot presented in Panel C of Figure 3, which displayed the effects on the number of candidates who participated in the 2012 elections, we see a significant jump in the number candidates at the point of discontinuity.

We also find that higher caps decrease the competitiveness of the elections, as measured by the effective number of candidates. This measure computes the inverse of the sum of squared vote shares of each running candidate within an electoral race. If all candidates have the same vote share, then this measure is equal to the actual number of candidates. At the other extreme, if a single candidate receives every vote, then the effective number of candidates is one. If higher spending caps discourages only candidates who receive few or no votes from entering the race, then we should not see an effect on the effective number of candidates. Instead, we find that the spending cap decreases the effective number of candidates by 0.10.

According to our theory, the decrease in political competition should stem from the exit of less popular candidates. As an indirect test of this hypothesis, we study the effect of the caps on party composition. Consistent with the theory, we find that the decrease in political competition appears to have mostly come from the exit of smaller parties. We find that higher caps reduced the proportion of candidates from smaller parties by around 10 percent and that of challengers from smaller parties by 15 percent.[13] We also tested whether higher caps affected the type of the parties that entered the contest based on their ideology, but found no effects on the average ideological score of the candidate pool.[14]

To further examine whether higher spending limits induce greater participation from individuals with a higher ex-ante propensity to get elected, we first estimate the probability of winning the 2016 election based on the follow set of observable characteristics: gender, age, race, education level, political experience[15], party affiliation and self-reported assets. We estimate this propensity score for the sample of candidates that are outside the bandwidth of the RD regressions. The results, which are reported in Appendix Table A.3, suggest that candidates who are male, wealthier, incumbents, or have more political experience are more likely to win. Based on these estimates, we then impute a candidate's ex-ante probability of winning the election. We find that individuals with higher expected winning probabilities are more likely to participate in municipalities with a higher spending limit. For a 24 percent increase in the spending limits, high-propensity types are 2.1 percentage points more likely to enter, which represents a 6 percent increase.

To see where these effects are coming from, we estimate the effects on each individual characteristic separately. Although the estimates tend to be fairly noisy across the various attributes, consistent with Hypothesis 2 from our model, higher limits do appear to attract wealthier candidates. In our baseline specification, the average level of assets among candidates is 40 percent higher in municipalities with a higher spending cap. This result is consistent with the fact that the majority of the extra spending under the high-cap is self-funded.

[13]We define the "small" parties to be all political parties except for the six most successful in the 2012 municipal elections: the PMDB, PP, PSB, PDB, PSDB and PT. Together, these six parties won the majority of mayoral elections in 2012. In total, there are thus 30 small parties in the 2016 elections. Our results are robust to the choice of party classification.

[14]To measure ideology, we rely on a measure of party position along a left-to-right scale as created by Power and Zucco (2012). The index, which ranks parties from 1 (="left") to 10 (="right"), is constructed from a survey of federal legislators elected in 2006.

[15]The number of times a candidate was elected to any political position since the 2000 election.

5.3 Spending Caps and Political Selection

Whether stricter spending caps affect political selection is an empirical question. They increase political competition, but attract individuals with a lower ex-ante propensity to be elected. The graphical evidence presented in Figure 6a suggest that they do. Here, we plot binned averages of re-election rates against the maximum amount spent in the municipality during the 2012 elections. In this graph, we restrict the sample to the incumbents who were eligible for re-election. We see a positive jump in the reelection rate at the point of discontinuity.[16]

In Table 5, we refine the analysis further by considering alternative specifications and conditioning on whether the mayor ran for re-election. For the results presented in Panel A, the sample includes all incumbents who were eligible for reelection. For this sample, re-election rates increased by 12 percentage points at the point of discontinuity. This is a sizable effect when we consider that the baseline re-election rate is only 23 percent. Incumbents were not more likely to run as a result of a higher cap, but given the size of the standard errors we admittedly cannot reject reasonably large effect sizes. In Panel B, we restrict the sample to incumbents who ran for reelection. The effects are similar for this sample: we estimate a 14 percentage point increase in the re-election rate from a baseline of 39 percent. We also find that incumbent vote shares increase by 2 percentage points under the higher cap, although this increase is not significant for some of the specification.

When interpreting the results in panel B, it is important to note that we are using a sample that is potentially selected endogenously. Although not statistically significant across all specifications, higher spending caps did increase the probability that the incumbent ran for reelection by about 5 percentage points. To account for this, we can estimate bounds for the effect of the higher cap on winning, conditional on running for reelection. Following the methodology proposed by Anagol and Fujiwara (2016) and using the estimates from the RDD specification with a linear optimal bandwidth (Table 5, Column 1), we estimate a lower bound of 13.4 percentage points and the upper bound is 17.7 percentage points. Therefore, we conclude that the higher spending limit increased the probability of reelection beyond its effect on the selection of incumbents who choose to run again.

Why do incumbents benefit from the higher spending limit? According to the model, a candidate's electoral success depends on her share of inputs into the contest. Increasing the cap will benefit the incumbent if it induces fewer challengers to enter the race, or if challengers, due to their

[16]On the other hand, the graph shows a negative correlation between re-election rates and spending limits when we move away from the discontinuity. This correlation is likely driven by the fact that municipalities with higher spending limits tend to be larger, have more candidates and, consequently, have more competitive elections.

higher fundraising costs, cannot match the incumbent's increase in spending. We find that the incumbent's share of spending increases by approximately 4 percentage points under the higher cap. Moreover, we derived Hypothesis 3, which states that a candidate will only benefit electorally from an increase in the cap if their spending is binding. To test this hypothesis, we split incumbents into two subsamples, based on whether their 2012 spending is above or below R$ 108,039.[17] Consistent with the model's prediction, we find that only high-spending incumbents benefit from increases in the spending cap (Table 5, Panels C and D).

In Table 6, we explore whether the spending caps also affected the characteristics of the winners, beyond being an incumbent. Consistent with our political entry effects, we find that the caps led to the election of wealthier candidates. We plot the effect on the wealth of the winner in Figure 6b. We also find that higher spending caps reduced the total vote share of small parties, and that this decrease is driven by challengers. We do not, however, find that the spending caps affected the election rate of candidates from small parties.[18] A potential explanation is that challengers from smaller parties, whose probability of winning are ex-ante relatively low, do not necessarily seek to win the election, but instead try to gain influence by maximizing their vote shares.

Finally, in Appendix Table A.6, we investigate the effects of the spending caps on the contributions of the winning candidates. We find that the winners under the high cap raised more campaign funds on average than those under the low cap. Moreover, our results suggest that the entirety of this difference is explained by the difference in the amount of funds that candidates self-finance. Indeed, we do not find evidence that winners under the high cap have raised more individual, party, or other donations. Thus, together with our evidence of the effect of caps on candidate assets, our results suggest that high spending limits benefit wealthier candidates, who spend their own funds to get elected.

How did the ban on corporate donations impact the effects of spending limits? As we discussed in Section 2, the Supreme Court instituted a ban on corporation donations prior to the Congress imposing spending limits. Because the ban was implemented uniformly across the entire country, we unfortunately cannot estimate the direct effects of the corporate ban on electoral outcomes. We can, however, study whether the spending caps had a differential effect in races that relied more heavily on corporate financing during the past elections. Specifically, we computed for each incumbent the share of campaign revenues from firms in the previous elections. We then

[17]An incumbent whose spending in 2012 is below R$ 108,039 will not face a binding cap in the following election under the hypothesis that their campaign expenditures remain constant between 2012 and 2016.

[18]We do not find effects along the other attributes as well (see Table A.5).

estimated the effects of the spending caps separately for incumbents above and below the median. We present the results in Appendix Table A.4. The results suggest that reelection outcomes and changes in vote share are not statistically distinguishable across the two groups of incumbents.

There are at least three explanations for why the effects of the spending caps did not differ by the ban on corporate donations, at least in the short run. First, while some local politicians do rely on corporate donations, they mostly compete in the capitals and larger cities. The variation we are using to identify the effects of the spending limits comes mostly from smaller to mid-size municipalities. If you look at the summary statistics for our estimation sample in Table 2, corporate donations only represent about 16% of the contributions that politicians receive. Second, as we had discussed, Congress increased the amount of public funds available to parties to compensate for the ban on corporate contributions. And as we documented above, part of the increase in campaign spending from candidates to the right of the discontinuity relative to those on the left do in fact come from party donations (see panel B in Table 3). Third, although we do not have data on this, there is anecdotal evidence that corporate executives increased their personal contributions to make up for the lack of corporate donations.[19]

5.4 Additional Robustness Checks

So far, we have tested the robustness of our estimates to various specification choices. Notably, we have varied the order of the polynomial estimated on each side of the discontinuity and have tested for sensitivity to the inclusion of additional control variables. In this section we further explore the robustness of the results.

Robustness to the choice of bandwidth The choice of optimal bandwidth varies for each of specifications (1), (2) and (3) in each table. In columns 1 and 3, we compute optimal bandwidths proposed by Calonico et al. (2014) for linear and quadratic local regressions respectively. In column 2, we select the optimal bandwidth using covariates proposed by Calonico et al. (2018). Moreover, optimal bandwidths are computed separately for each outcome variable. Therefore, a potential concern is that each treatment effect is estimated using a different sample. To address this concern, we estimate the treatment effects for a fixed set of bandwidths for each outcome under the local linear specification. We depict the point estimates together with 95 percent confidence intervals for varying bandwidths measured in logs in Figures A.4, A.5, A.6, and A.7 and measured in levels in

[19] See for example: https://noticias.uol.com.br/politica/eleicoes/2018/noticias/2018/09/14/empresarios-doacoes-de-campanha-eleicoes-2018.htm (Retrieved: December 27, 2020)

Figures A.8, A.9, A.10, and A.11. Our results are generally significant at the 5 percent level for a wide range of bandwidths.

Robustness to the choice of sample For the results on campaign spending, entry and selection, we included the full sample of municipalities, whereas for the results on incumbents, we were restricted to municipalities which did not have open seats in the 2016 elections. Hence, another concern is that, depending on the outcome, we are estimating effects on different samples. We address this concern by replicating all our results for the sample excluding municipalities with open seats in Tables A.13-A.17. We find very similar estimates for each of our outcomes of interest. Of particular interest are the results on political entry, where the effects on the number of candidates and effective number of candidates are more significant when open seats are excluded.

5.5 Spending Caps, Campaign Technologies, and Information

Candidates who face a stricter cap may resort to other forms of campaigning that do not count against their spending limit, such as relying on social media, expenditures by the party, or using "dark money". In this section we investigate whether these types of substitutions occurred once the new campaign finance law was introiduced in Brazil.

Social Media To test whether politicians are substituting towards more social media use, we estimate the impact of spending limits on Facebook campaigning activity by mayoral candidates.[20] To find a candidate's Facebook page, we searched on Google for the "Candidate's Ballot Name + Candidate's Number + City name + Facebook" and scraped the link of the first Google search result using the Facebook API (Facebook, 2017).[21] This procedure indicates that 35% of mayoral candidates had a Facebook page during the election period.[22] For each candidate, we count the number of Facebook posts and the number of reactions that followers had for each post (likes and comments). Table A.7 in presents our estimates of the effect of spending limits on the probability that a candidate had a Facebook page, the number of posts, and the number of reactions. We do not find any evidence that spending limits affected the likelihood that a candidate had or used Facebook during the campaign.

[20]Brazil is one of the largest users of Facebook in the world.

[21]A candidate was coded as not having a Facebook page if: i) the first search result was not a Facebook page, ii) the Facebook page was of a news web site, iii) the search for two different candidates yielded the same Facebook page.

[22]Similar results were found by manually searching a small sample of candidates' Facebook pages.

Party Spending When parties spend on behalf of their candidates, this expenditure counts against the candidate's spending totals and is thus subject to the limits. In some cases, however, it is difficult to determine the exact amount of the party's contribution. A common example is when the party hosts an event or produces an advertisement for several of its candidates. Given that we observe party expenditures, we can investigate whether parties exploit this loophole by testing for whether party expenditures at the municipal level respond to the spending caps. But as the Figure A.3b depicts, we do not find any evidence that parties are substituting for the lack of spending in the municipalities with the lower limit.

Dark money and irregularities in accounts Politicians who are constrained by the cap might also resort to the use of dark money. Although dark money is difficult to measure, we have two different proxies for the use of undeclared campaign funds. A common vehicle for dark money to appear in politics is for the politician to claim the donation (and hence the expenditure) as in-kind rather than a cash expenditure. In these cases there is no formal receipt of the contribution (i.e. no paper trail) and the candidate estimates the value of the amount spent. An example is the use of a restaurant to host a fund-raising event where the candidate self-reports the cost of renting the restaurant. In this case, it is easy to under-declare the amount spent. Because we have data on which expenditures have receipts and which are self-declared values, we can test whether candidates are more likely to declare in-kind spending when a municipality has a lower spending cap.

In Table A.8, we estimate the effects of the spending caps on the amount of contributions, distinguishing between cash contributions versus in-kind. We present the estimates for both the pool of candidates, as well as the election winners. In both cases, the effects of the caps are on cash contributions, as opposed to the in-kind contributions. Although politicians may channel dark money in other ways, we do not find any evidence that spending caps impacted the types of contributions politicians receive.

Candidates who are subject to tighter spending limits might want to manipulate their accounts and spend in ways that go against the rules imposed by the electoral commission. To test this, we assembled a dataset on the decisions of the electoral judges who evaluated the candidates' accounts.[23] In total, we collected judges' decisions on the campaign finances of 10,735 candidates, and of these 67% were approved. Among the rejected accounts, commonly cited irregularities included acts of vote buying or use of undeclared funds.

In Figure A.3a, we test whether the spending caps affected the share of candidates who campaign

[23]These data were scraped from the website www.jusbrasil.com.br for decisions published after September 2016 (Jusbrasil, 2018).

finances were found to be irregular. We do not find any significant difference in the share of irregular accounts when comparing municipalities near the discontinuity. The point estimate is -0.002 (s.e. = 0.03). This suggests that mayors did not change their behavior and commit more (observable) irregularities when faced with a stricter spending limit.

Voter Knowledge A key argument against imposing spending caps is that with less spending, voters may become less informed. In this section we use two alternative, albeit imperfect, proxies for voter knowledge to test this hypothesis. First, several studies have documented a strong association between political knowledge and both turnout and invalid votes (e.g. Lassen (2005)). We test whether turnout is lower and invalid votes are higher when candidates face a lower spending cap. Second, we use a direct measure of information by counting the number of times candidates' names are searched on Google.

In Appendix Table A.9, we report estimates of the effects of spending caps on turnout and the share of blank or invalid votes. Although these are imperfect proxies for voter information, we find no evidence to support the hypothesis that lower spending caps will lead to less informed voters. In both cases, our estimates are precisely estimated zeros.

To further evaluate the impact of spending limits on voters' knowledge, we estimate its impact on the number of times candidates names are searched on Google. If a higher spending limit increases electorate knowledge, it is likely that more voters will search for mayoral candidates by their names online. We used Google Adwords too construct the number of monthly searches each candidate received (Google, 2017).[24] Google Adwords only gives ranges on the number of searches: 0-10, 10-100, 100 - 1k, 1k - 10k, 10k-100k, etc. Hence, we created an index of Google searches. Table A.10 shows the distribution of this index across candidates in September 2016.

Figure A.12 plots the evolution of the number of Google searches for candidates' names. The plot clearly shows that voters interest on candidates grows as the election becomes closer, peaking in September, the month just before the election. We use average index of Google searches across candidates to test whether spending caps affect searches. Table A.11 reports the impact of the high spending cap on the average index of Google searches across candidates in a municipality. Results suggest that a higher spending limit does not lead to an increase in the number of searches for candidates' names. In fact, the point estimates suggest a decrease in the number of searches under the high cap, although these results are not significant at usual levels of confidence. If voters were to become more informed under the high cap, challengers were the ones who would probably get

[24]First, we drop all candidates that in the same state have the same ballot name (978 candidates). After that, Adwords gives us the number of searches candidates ballot name had in the states where they are running.

a larger increase in searches since they are less well known in the beginning of the race. When we break the results by incumbents' and challengers' searches, results suggest that a higher spending limit does not affect incumbents' names searches and, if anything, reduces searches for challengers' names.

An alternative interpretation of the analysis above is that more information about a candidate leads to less Google searches because voters already know about the candidate. To test whether Google searches are complements or substitutes with information, we correlate Google searches with TV and radio advertising time across candidates. Radio and TV political advertising is regulated and candidates' air time is a function of the representativeness of their party coalition in Congress.[25] Results in Table A.12 show that candidates' ad time share is positively correlated with his Google searches after controlling for municipality fixed effects and several candidates' characteristics. This can be interpreted as evidence that as voters get more informed about candidates they search more about them on Google. In sum, we do not find evidence that the spending limits affected voters' knowledge based on our different proxies of access to information.

5.6 Political Behavior

The primary responsibility of mayors in Brazil is to provide local public goods such as primary education, health, and urban infrastructure. But mayors can also affect local economic activity through specific policies such as giving tax-breaks to attract firms or spending in infrastructure projects. Given our findings that campaign spending caps affect the selection of wealthier candidates and the reelection of incumbents, we might expect to find an effect on policies and economic outcomes.

But how spending caps might affect outcomes is subject to different theories. On the one hand, our findings on political competition suggest that electoral accountability might be lower in places with higher spending limits, which theory predicts would lead to lower public goods provision. On the other hand, incumbents tend to be positively selected on average and their reelection reduces bureaucratic turnover, which recent studies have shown to be costly, particularly for education (e.g. Akhtari et al. (2020)).

In Table 7, we show the effects of campaign spending limits on different measures of economic activity and public service delivery, such as local GDP, health outcomes measured by prenatal care, birth weight, and infant mortality rate, and educational outcomes as measured by test scores and approval rates (Datasus, 2020a,b; INEP, 2020a,b; IBGE, 2017). Education outcomes were mea-

[25] 10% of airtime is splited equally among all candidates in the municipality and 90% is split according to the seat share of their coalition in Congress.

sured in 2019 and infant mortality rate in 2018, which as some studies have shown (e.g. Fujiwara (2015)), can respond relatively quickly to new policies. All other outcomes were measured in 2017, only one year into the new term. Overall, we do not find any evidence that higher spending limits reduces welfare; if anything, municipalities with higher caps tend to have better outcomes, in particular for education. One interpretation of these results is candidates who benefited from the higher spending caps do not necessarily differ in their ability and/or policy preferences. Or alternatively, these effects are only short term and a longer horizon is needed to properly measure the effects of campaign limits on political behavior.

6 Conclusion

The role of money in politics is widely debated in many democracies. This paper examines the effects of limiting how much candidates can spend on their campaigns. We exploit a natural experiment induced by an electoral reform in Brazil that set a lower spending cap for some municipalities compared to others. Using data on the number of candidates, their characteristics, and voting outcomes we find that setting a more stringent limit on campaign spending increases political competition, reduces the chances of richer candidates getting elected, and reduces reelection rates. But despite these political selection effects, stricter limits did not lead to significant short-run improvements in policy outcomes, such as in education and health.

These findings suggest that in countries where high levels of spending have become an equilibrium outcome due to corruption and the influence of special interests, setting a spending limit might increase political competition and allow for new entrants into politics. In countries where political elites come disproportionately from richer families, this policy might also reduce the concentration of political power in the hands of richer individuals. These effects might have direct and indirect consequences for policy outcomes in the medium to long term.

When interpreting our findings, it is important to emphasize that our estimated effects are for the short-run. It is quite likely that politicians and firms will adjust to these laws in ways that we cannot observe yet, given the timing of the reform. For example, dark money may become an even bigger concern as candidates may learn new ways to bypass the campaign spending caps. Or alternatively, campaigns may become cheaper, less corrupt, and more competitive as the law intended. While we cannot know for sure what the equilibrium will look like, we believe that identifying these future political responses are important topics future research.

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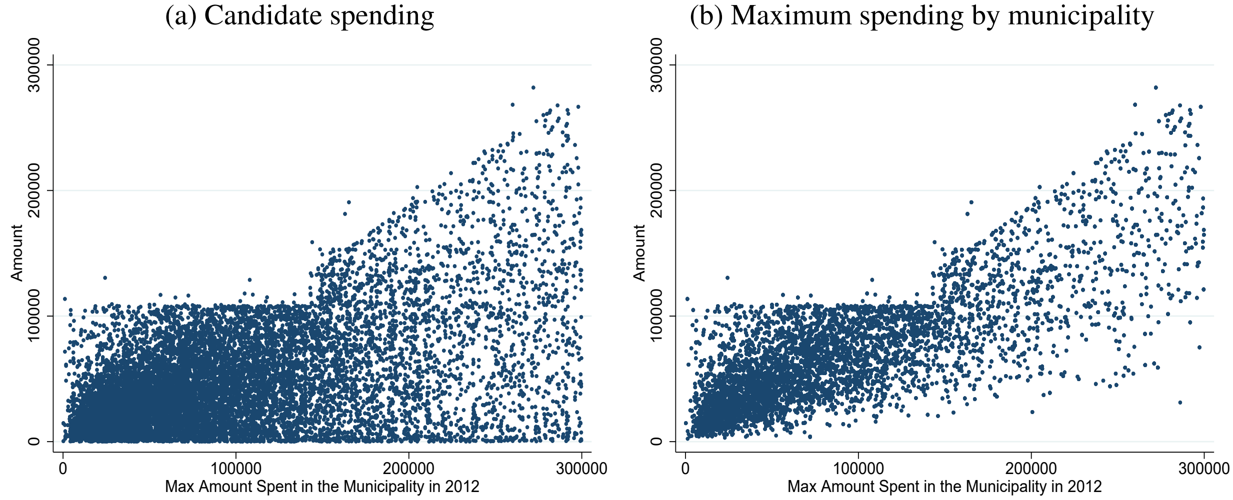

Figure 1: Campaign Spending in the 2016 Elections

Notes: In panel (a), each point denotes the amount spent by a candidate in the 2016 elections. In panel (b), each point denotes the maximum amount spent by a candidate by municipality in the 2016 elections.

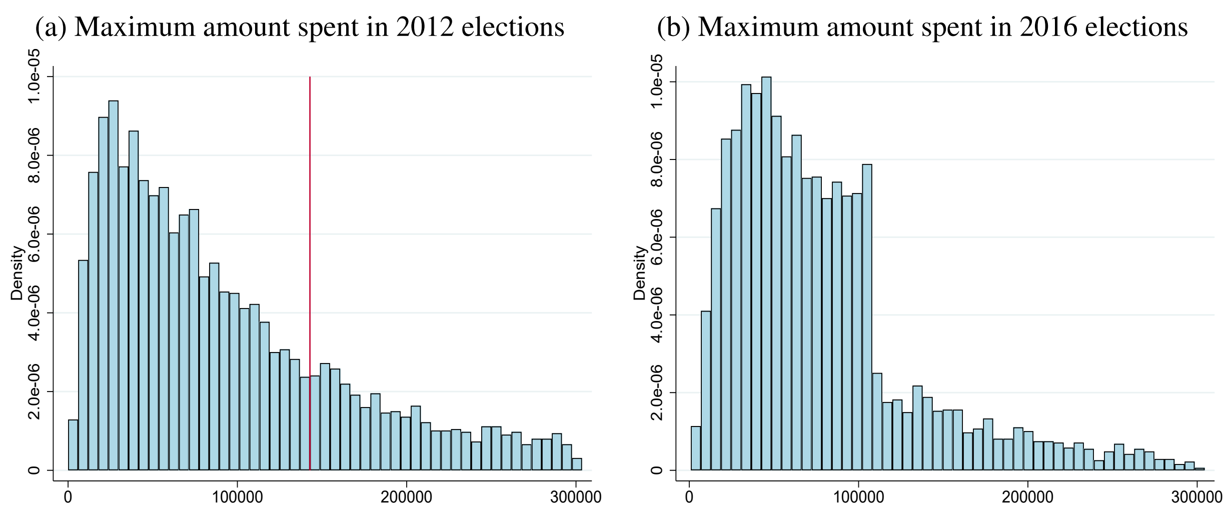

Figure 2: Campaign Spending in the 2012 and 2016 Elections

Notes: Panel (a) plots the distribution of the running variable, the maximum amount spent by a candidate within a municipality in the 2012 elections. The red line denotes the discontinuity of the rule at R$142,857. Panel (b) plots the distribution of the maximum spent on campaigning by a candidate within a municipality in the 2016 elections.

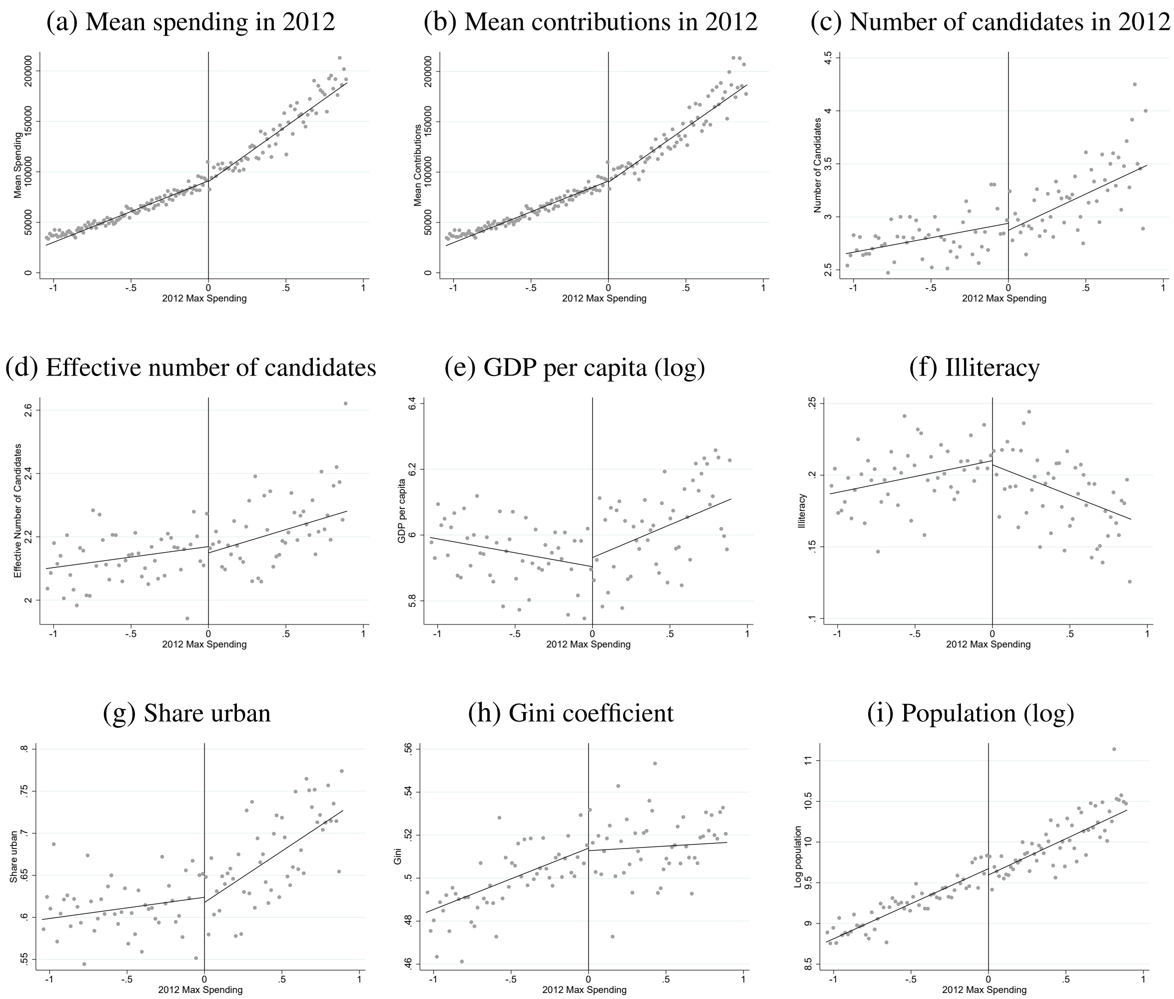

Figure 3: Discontinuities in Municipal-level Baseline Covariates

Notes: These figures plot the results of RD regressions of various municipal characteristics on maximum spending in 2012 (the running variable). The horizontal axis denotes the difference in the running variable relative to the discontinuity at R$142,857, in logs. In each regression, a first-order polynomial is estimated on each side of the discontinuity. Each point denotes the sample-average within a bin. The number of bins is chosen optimally according to Calonico et al. (2015).

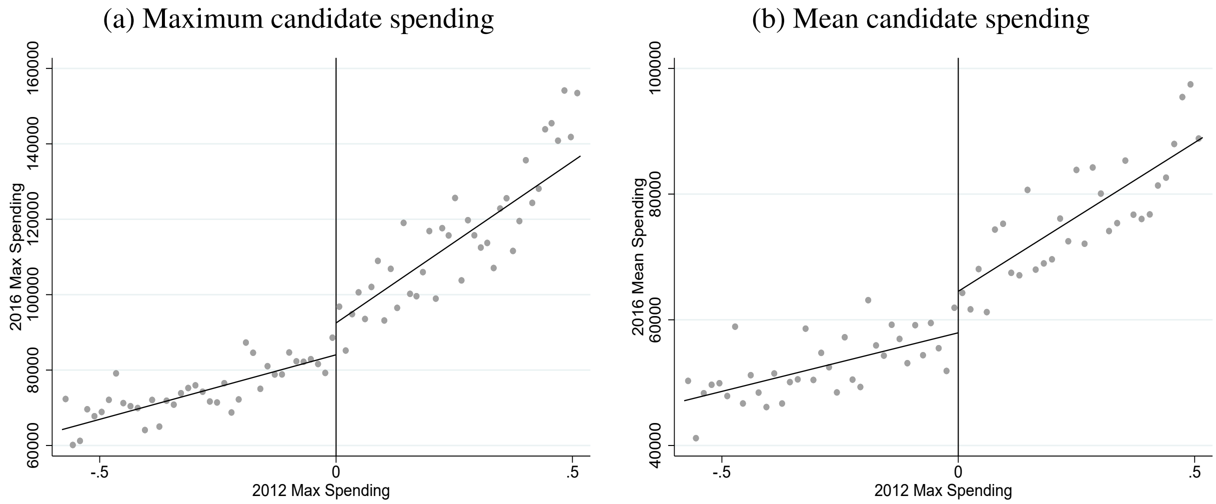

Figure 4: Effects of Spending Limits on Campaign Expenditures

Notes: This figure plots the results of the regression discontinuity design, where the dependent variable is respectively (a) the maximum spending by candidates and (b) the mean spending by candidates. The horizontal axis denotes the difference in maximum spending relative to the discontinuity at R$142,857, in logs. In each regression, a first-order polynomial is estimated on each side of the discontinuity. Each point denotes the sample-average within a bin. The number of bins is chosen optimally according to Calonico et al. (2015).

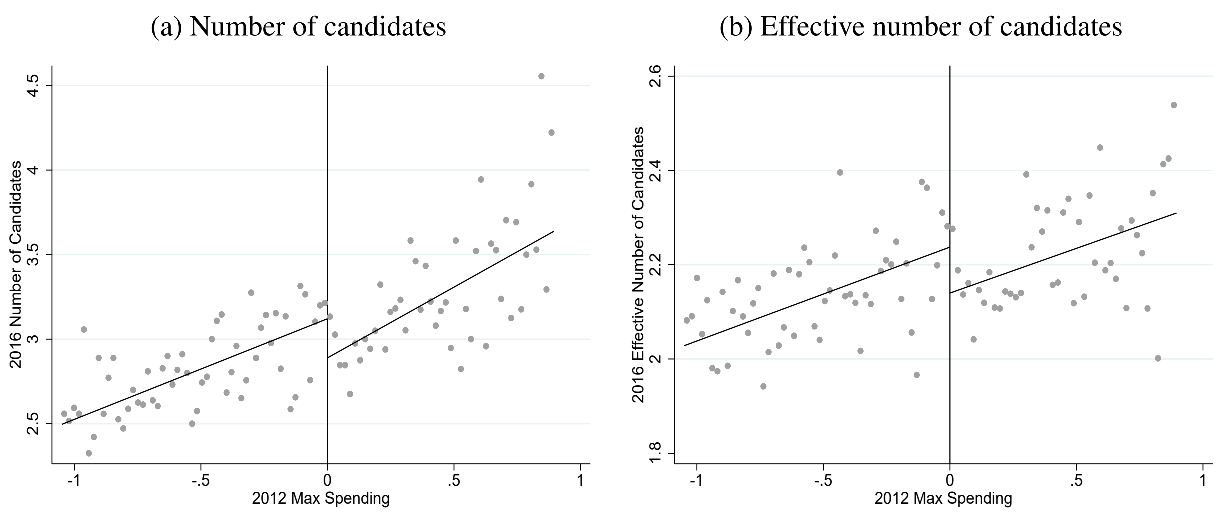

Figure 5: Effects of Campaign Spending Limits on Political Competition

Notes: This figure plots the results of the regression discontinuity design, where the dependent variable is (a) the number of candidates, and (b) the effective number of candidates. The horizontal axis denotes the difference in maximum spending relative to the discontinuity at R$142,857, in logs. In each regression, a first-order polynomial is estimated on each side of the discontinuity. Each point denotes the sample-average within a bin. The number of bins is chosen optimally according to Calonico et al. (2015).

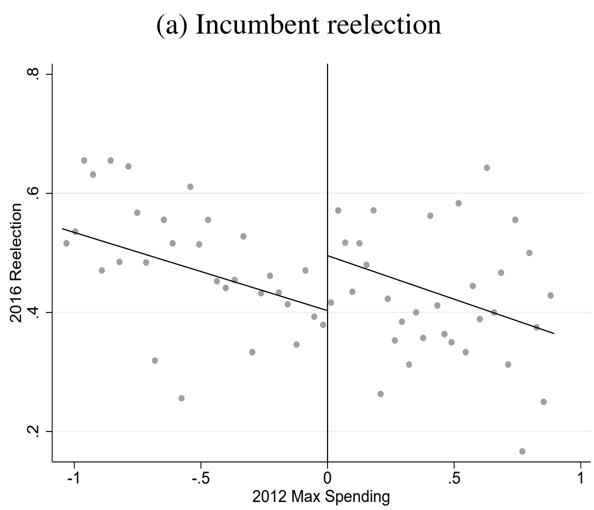

Figure 6: Effects of Campaign Spending Limits on Political Selection

Notes: This figure plots the results of the regression discontinuity design, where the dependent variable is (a) a dummy for whether the incumbent is reelected, and (b) the log wealth of the winner. In panel (a), state and party fixed effects are included and the sample is restricted to incumbents who run for reelection in 2016. In panel (b), the sample is restricted to candidates which win in the 2016 election. The horizontal axis denotes the difference in maximum spending relative to the discontinuity at R$142,857, in logs. In each regression, a first-order polynomial is estimated on each side of the discontinuity. Each point denotes the sample-average within a bin. The number of bins is chosen optimally according to Calonico et al. (2015).

Table 1: Summary Statistics

	Mean (1)	Standard Deviation (2)	Observations (3)
Panel A: Within-Municipality Average Candidate Characteristics			
Campaign spending (R$1000)	77.13	145.66	5562
Campaign contributions (R$1000)	74.79	121.84	5562
Own funds	29.81	53.69	5562
Individual donations	31.07	50.18	5562
Party donations	11.30	49.64	5562
All other donations	0.15	2.09	5562
Female	0.13	0.21	5562
Age	48.98	7.84	5562
High school	0.83	0.25	5562
College	0.51	0.33	5562
Political experience	0.94	0.62	5562
Wealth (log)	11.60	2.28	5562
Propensity to win	0.37	0.08	5562
Panel B: Municipality Characteristics			
Number of candidates	2.98	1.38	5562
GDP per capita	6.08	0.50	5544
Illiteracy	0.17	0.11	5544
Share urban	0.64	0.22	5544
Gini coefficient	0.49	0.07	5544
Population (log)	9.41	1.15	5562
Open seat	0.24	0.43	5562
Panel C: Incumbent Outcomes			
Reelection	0.48	0.50	2721
Incumbent vote share	0.47	0.18	2721
Incumbent wealth (log)	12.24	3.12	2721

Notes: This table displays means and standard deviations of various characteristics computed for the municipality and incumbent samples. In panel A, statistics on campaign spending, female gender, age, high school and college completion, assets, and propensity to win are computed for municipality-level means. In panel B, the statistics are calculated for municipality-level characteristics. The "open seat" variable is a dummy for whether the seat in 2012 is occupied by a term-limited mayor. In panel C, statistics for reelection and the incumbent vote share are computed for the sample of incumbents who rerun in 2016.

Table 2: Covariate Smoothness

Dependent Variable	Mean (1)	BW (2)	Observations (3)	Estimate (4)
Panel A: Municipal Characteristics in 2010				
GDP per capita (log)	5.906	0.888	2930	0.026
	(0.030)			(0.038)
Illiteracy	0.210	0.864	2855	-0.003
	(0.007)			(0.008)
Share Urban	0.626	0.930	3049	-0.008
	(0.013)			(0.016)
Gini Coefficient	0.513	0.923	3034	-0.000
	(0.004)			(0.005)
Population (log)	9.682	0.824	2750	-0.082
	(0.049)			(0.061)
Panel B: Mean Candidate Characteristics in 2012				
Number of Candidates	2.963	0.780	2657	-0.077
	(0.075)			(0.095)
Effective Number of Candidates	2.169	0.968	3149	-0.023
	(0.032)			(0.038)
Small Party	0.415	0.869	2886	-0.006
	(0.019)			(0.024)
Female	0.123	1.312	3901	0.033**
	(0.011)			(0.014)
Age	48.055	0.915	3018	-0.317
	(0.420)			(0.520)
High School Degree	0.841	0.887	2940	0.002
	(0.016)			(0.020)
College Degree	0.485	0.841	2813	0.032
	(0.022)			(0.027)
Campaign Spending	93195.86	0.431	1540	413.94
	(2154.66)			(2632.22)
Campaign Contributions	93398.22	0.434	1548	-108.73
	(2116.15)			(2635.41)
Own Funds	26484.05	0.568	1959	1687.04
	(1592.17)			(2357.99)
Individual Donations	34471.15	0.698	2397	189.16
	(1432.38)			(1987.91)
Party Donations	9495.90	0.352	1255	-1763.25
	(1519.36)			(1796.54)
Corporate Donations	14984.50	0.509	1770	521.41
	(1273.19)			(1853.62)
Wealth (log)	11.54	0.954	3116	-0.02
	(0.14)			(0.17)

Notes: The mean in column (1) is the estimated value of the dependent variable for a municipality at the left of the cutoff point with a spending limit of R$108,039 in 2016. Running variable measured in logs. The optimal bandwidth (Calonico et al., 2014) is reported in column (2) and the number of observations in column (3). Each figure in column (4) reports the estimate and standard error for the treatment effect from a separate regression. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Effects of Spending Limits on Campaign Expenditures

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Panel A: Campaign expenditures							
Maximum Spending	84387.70	0.384	1376	8413.33***	9858.61***	10198.79***	16254.30***
	(2185.60)			(2974.45)	(2849.83)	(3277.40)	(2042.27)
Mean Spending	57574.96	0.410	1462	6596.05***	6546.45***	8188.88***	10770.81***
	(1757.24)			(2450.73)	(2385.64)	(2675.57)	(1792.69)
Minimum Spending	33274.29	0.831	2783	2021.60	921.22	3167.07	4060.53*
	(1648.78)			(2400.86)	(2405.40)	(3320.19)	(2336.41)
Total Spending	164769.76	0.374	1346	13047.45	19232.49**	15562.66	26978.12***
	(6278.65)			(8594.78)	(8076.65)	(9762.75)	(5485.42)
Panel B: Mean campaign contributions by source							
Own Funds	23961.72	0.544	1884	4580.90**	3431.46*	5163.75**	4969.91***
	(1334.74)			(1971.86)	(1892.73)	(2330.30)	(1599.18)
Individual Donations	25254.35	0.578	2006	901.61	1221.55	1447.38	3839.91***
	(1204.97)			(1646.27)	(1622.32)	(1995.66)	(1391.68)
Party Donations	6984.99	0.493	1716	1228.46	1875.04*	1341.67	1785.02**
	(861.98)			(1152.31)	(1139.63)	(1281.87)	(887.33)
All Other Donations	99.07	0.485	1692	-24.92	-12.35	-31.68	-24.70
	(41.34)			(53.25)	(53.77)	(62.40)	(40.61)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: Each figure in columns (1)-(4) reports the estimate of a separate regression. Standard errors are in parentheses. The Mean is the estimated value, based on specification (1), of the dependent variable for a municipality at the left of the cutoff point with spending limit R$108,039. In Panel A, the dependent variables are respectively the mean, maximum, minimum, and total campaign expenditures by candidates computed at the municipality-level. In Panel B, the dependent variables are the four categories of campaign contributions: own funds, individual donations, party donations, and all other donations. Running variable measured in logs. The optimal bandwidth is selected with the optimal procedure by Calonico et al. (2014) and is reported for specification (1) together with the associated number of observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Effects of Campaign Spending Limits on Candidate Entry

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Party Characteristics							
Number of Candidates	3.122	1.027	3273	-0.235***	-0.180**	-0.265**	-0.163*
	(0.075)			(0.089)	(0.085)	(0.117)	(0.096)
Effective Number of Candidates	2.239	0.905	2993	-0.099**	-0.085**	-0.112*	-0.081
	(0.038)			(0.045)	(0.043)	(0.057)	(0.050)
Small Party	0.487	0.921	3044	-0.053**	-0.046**	-0.070**	-0.049*
	(0.019)			(0.024)	(0.023)	(0.031)	(0.027)
Small party (excluding incumbent)	0.434	0.738	2517	-0.065**	-0.057**	-0.078**	-0.051**
	(0.021)			(0.026)	(0.024)	(0.031)	(0.026)
Ideology Index	5.189	0.933	2995	-0.029	-0.064	-0.122	-0.125
	(0.075)			(0.093)	(0.094)	(0.127)	(0.101)
Candidate Characteristics							
Propensity to Win	0.345	0.827	2772	0.021***	0.018***	0.024***	0.018***
	(0.005)			(0.006)	(0.006)	(0.008)	(0.006)
Wealth (log)	11.456	0.653	2237	0.427**	0.180	0.607**	0.401**
	(0.164)			(0.202)	(0.162)	(0.244)	(0.186)
Political Experience	0.821	0.955	3120	0.071	0.080*	0.086	0.067
	(0.034)			(0.045)	(0.047)	(0.054)	(0.050)
Female	0.139	0.863	2866	-0.005	-0.000	-0.022	-0.006
	(0.013)			(0.017)	(0.016)	(0.022)	(0.018)
Age	48.874	0.838	2807	-0.414	-0.543	-0.302	-0.684
	(0.435)			(0.536)	(0.487)	(0.691)	(0.560)
College Degree	0.545	0.866	2871	-0.025	-0.023	-0.025	-0.008
	(0.021)			(0.026)	(0.025)	(0.032)	(0.026)
White	0.595	0.827	2771	0.014	0.002	0.017	0.003
	(0.024)			(0.028)	(0.025)	(0.030)	(0.026)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variables are two measures of the number of candidates who run for office, followed by municipality-level averages of various candidate characteristics. The "Propensity to Win" denotes the propensity for a candidate to win an election based on his observable characteristics (see Table A.3). See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Effects of Campaign Spending Limits on Incumbents

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Panel A: All incumbents							
Rerun	0.616	0.919	2325	0.057*	0.061*	0.050	0.029
	(0.026)			(0.031)	(0.033)	(0.050)	(0.027)
Reelection	0.227	0.607	1596	0.119***	0.121***	0.111***	0.102***
	(0.025)			(0.040)	(0.040)	(0.043)	(0.028)
Panel B: All incumbents who rerun in 2016							
Reelection (conditional on running)	0.388	0.532	895	0.137***	0.139***	0.145**	0.117***
	(0.025)			(0.044)	(0.046)	(0.062)	(0.024)
Change in Vote Share	-0.107	0.831	1367	0.017	0.052**	0.048	0.049***
	(0.012)			(0.017)	(0.023)	(0.030)	(0.012)
Incumbent Share of Spending	0.461	0.890	1462	0.043**	0.027	0.040	0.036**
	(0.010)			(0.019)	(0.020)	(0.026)	(0.015)
Panel C: Incumbents with high spending in 2012							
Reelection (conditional on running)	0.377	0.504	440	0.229***	0.207***	0.284***	0.168***
	(0.052)			(0.061)	(0.059)	(0.082)	(0.032)
Change in Vote Share	-0.150	0.453	418	0.112***	0.108***	0.115***	0.077***
	(0.021)			(0.027)	(0.026)	(0.032)	(0.015)
Incumbent Share of Spending	0.468	0.534	463	0.074***	0.054**	0.086***	0.044**
	(0.020)			(0.026)	(0.026)	(0.032)	(0.019)
Panel D: Incumbents with low spending in 2012							
Reelection (conditional on running)	0.434	0.313	194	-0.060	-0.172	-0.087	-0.056*
	(0.053)			(0.093)	(0.105)	(0.132)	(0.034)
Change in Vote Share	-0.071	0.253	147	-0.132***	-0.166***	-0.204***	-0.039***
	(0.028)			(0.033)	(0.035)	(0.050)	(0.014)
Incumbent Share of Spending	0.428	0.253	149	0.008	-0.024	0.002	-0.019
	(0.030)			(0.050)	(0.047)	(0.069)	(0.018)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: Each figure in columns (1)-(4) reports the estimate and standard error of a separate regression. Standard errors in parentheses, clustered by party. Includes state and party fixed effects. The mean is the estimated value, based on specification (1), of the dependent variable for a municipality at the cutoff point whose spending limit is R$ 108,039. In Panel A, the sample consists of all incumbents who are not term-limited. In Panel B, the sample consists of incumbents who choose to rerun in 2016. The sample is further restricted to incumbents with 2012 spending over R$ 108,039 in Panel C and below this amount in Panel D. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Effects of Campaign Spending Limits on Political Selection

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Propensity to Win	0.373	0.875	2892	0.017*	0.017*	0.020*	0.022**
	(0.007)			(0.009)	(0.009)	(0.012)	(0.010)
Wealth (log)	11.769	1.245	3739	0.426*	0.426	0.546*	0.508*
	(0.194)			(0.236)	(0.263)	(0.320)	(0.297)
Total vote share of small parties	0.428	0.955	3109	-0.041	-0.036	-0.062*	-0.056*
	(0.021)			(0.027)	(0.026)	(0.035)	(0.030)
Total vote share of small parties	0.361	1.157	3563	-0.039*	-0.053**	-0.073**	-0.055**
(excluding incumbent)	(0.018)			(0.023)	(0.027)	(0.034)	(0.028)
Small Party	0.389	1.013	3233	-0.002	0.003	-0.006	-0.013
	(0.029)			(0.036)	(0.036)	(0.047)	(0.041)
Political Experience	0.855	0.823	2748	0.026	0.037	0.023	0.052
	(0.065)			(0.082)	(0.083)	(0.088)	(0.087)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The "Propensity to Win" dependent variable denotes the propensity for a candidate to win an election based on his observable characteristics (see Table A.3). See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Effects of Spending Limits on Economic Outcomes

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Per Capita GDP Growth	6.07	1.043	3278	0.00	0.03	0.66	1.28
	(0.90)			(1.29)	(1.23)	(1.88)	(1.43)
Share of Low-Weight Births	7.98	1.129	3477	-0.16	-0.17	-0.17	-0.16
	(0.16)			(0.20)	(0.20)	(0.29)	(0.23)
Share with Few Prenatal Consultations	32.11	0.868	2856	-0.55	0.24	-0.90	0.86
	(0.99)			(1.30)	(0.95)	(1.63)	(1.11)
Infant Mortality Rate	12.92	0.766	2588	-0.33	-0.25	-0.13	-0.10
	(0.73)			(0.86)	(0.85)	(1.07)	(0.85)
Approval Rate 1 to 5	93.44	0.934	2952	0.43	0.29	0.58	0.28
	(0.35)			(0.44)	(0.39)	(0.55)	(0.45)
Mathematics (1 to 5)	214.61	0.750	2419	4.07**	2.93**	4.67*	1.72
	(1.57)			(2.03)	(1.49)	(2.46)	(1.61)
Portuguese (1 to 5)	200.72	0.695	2254	4.10**	2.78*	4.60**	1.84
	(1.55)			(1.95)	(1.42)	(2.33)	(1.42)
Approval Rate 6 to 9	85.70	0.734	1657	1.78**	1.54*	2.96**	2.07**
	(0.73)			(0.88)	(0.84)	(1.15)	(0.83)
Mathematics (6 to 9)	249.87	1.146	2107	3.73**	3.00*	4.95*	2.88
	(1.52)			(1.89)	(1.62)	(2.74)	(1.82)
Portuguese (6 to 9)	247.56	0.867	1745	3.41*	2.68*	3.76	2.17
	(1.61)			(1.88)	(1.52)	(2.40)	(1.74)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: Per capita GDP growth is measured from 2016 to 2017. Share of low-weight births and share with few prenatal consultations are measured in 2017. Infant mortality rate is measured in 2018. Education outcomes are measured in 2019. See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A Online Appendix for "Money and Politics: The Effects of Campaign Spending Limits on Political Entry and Competition" by Eric Avis, Claudio Ferraz, Frederico Finan and Carlos Varjao.

A.1 Additional details for the model section

Note on the shape of the contest function We first describe the marginal utility of a dollar spent for a candidate i. The derivative of candidate i's utility with respect to his spending is:

$$\frac{\partial u_i}{\partial x_i} = \frac{a_i \tilde{Y}_i}{Y^2} - c_i \tag{5}$$

where Y denotes total inputs into the contest, and $\tilde{Y}_i$ denotes all inputs other than i's into the contest. We differentiate this function with respect to the spending of some other candidate j, where $j \neq i$. We obtain the following:

$$\frac{\partial^2 u_i}{\partial x_i \partial x_j} = \frac{a_i a_j (y_i - \tilde{Y}_i)}{Y^3} \tag{6}$$

Therefore, we see that the effect of an increase in spending by another contender on the marginal utility of a dollar for candidate i depends on the difference between his inputs into the contest y_i and the total inputs of all other candidates $\tilde{Y}_i$.

Proof of proposition 1 We first note that given any pair of spending vectors (x_{-i}, z_{-i}), candidate i's marginal utility is always higher with respect to formal spending compared to informal spending. Therefore, the candidate will only spend through informal channels when she is binding at the cap. Second, given the structure of the game, candidate i's best response (x_i, z_i) can be written as a function of the aggregate input of other candidates $\tilde{Y}_i := \sum_{k \neq i} y_k$. Since the objective function is globally concave in spending, the unique best response function to $\tilde{Y}_i$ is:

$$(x_i, z_i) = \begin{cases} (0,0) & \text{if } x_i^* \leq 0 \\ (x_i^*, 0) & \text{if } 0 < x_i^* < \bar{x} \\ (\bar{x}, 0) & \text{if } x_i^* \geq \bar{x} \text{ and } z_i^* \leq 0 \\ (\bar{x}, z_i^*) & \text{otherwise} \end{cases} \tag{7}$$

where $x_i^* = \frac{1}{a_i}\left[\sqrt{\frac{a_i}{c_i}\tilde{Y}_i} - \tilde{Y}_i\right]$, and $z_i^* = \frac{1}{b_i}\left[\sqrt{\frac{b_i}{c_i}\tilde{Y}_i} - \tilde{Y}_i\right] - \frac{a_i \bar{x}}{b_i}$. Equation 7 distinguishes between four cases. In the first, the candidate does not enter the race because the costs of doing so outweighs her benefits. In the second case, the candidate enters the race and spends exclusively through formal means some amount under the cap. In the third, she spends the exact amount of the cap through formal channels, but does not spend additional funds informally. In the fourth and final case, the candidate spends up to the cap through formal channels, and then spends on top of this through informal channels.

We rewrite the best response function $\left(x_i(\tilde{Y}_i), z_i(\tilde{Y}_i)\right)$ into the input $y_i(\tilde{Y}_i)$ chosen by each candidate as a best response of the aggregate inputs of other candidates. The best response function $\left(x_i(\tilde{Y}_i), z_i(\tilde{Y}_i)\right)$ can be transformed to the best response function $y_i(\tilde{Y}_i)$ as follows:

$$y_i = \begin{cases} 0 & \text{if } y_i^+ \leq 0 \\ y_i^+ & \text{if } 0 \leq y_i^+ \leq \bar{y}_i \\ \bar{y}_i & \text{if } y_i^- \leq \bar{y}_i \leq y_i^+ \\ y_i^- & \text{if } \bar{y}_i \leq y_i^- \end{cases} \tag{8}$$

where $y_i^+ = \sqrt{\frac{a_i}{c_i}\tilde{Y}_i} - \tilde{Y}_i$, $y_i^- = \sqrt{\frac{b_i}{c_i}\tilde{Y}_i} - \tilde{Y}_i$, and $\bar{y}_i = a_i\bar{x}$.

Then, transform these best response functions into share functions $s_i(Y)$ which represent the share of total inputs that a candidate will spend as a best response when total spending by other candidates is $\tilde{Y}_i \equiv Y - y_i$. We derive this function to be

$$s_i(Y) = \max\left\{\min\left\{\max\left\{1 - \frac{c_iY}{a_i}, 0\right\}, \frac{a_i\bar{x}}{Y}\right\}, 1 - \frac{c_iY}{b_i}\right\} \tag{9}$$

We can then sum the individual share functions into an aggregate share function: $S(Y) = \sum_{k=1}^{I} s_k(Y)$. This function is greater than 1 for sufficiently small values of Y, equal to zero for sufficiently large values of Y, is strictly decreasing whenever positive, and is continuous. Thus, there is a unique Y^* such that $S(Y^*) = 1$, which is the aggregate input in equilibrium. This value pins down the unique equilibrium spending (x_i, z_i) of each candidate.

Comparative Statics We next consider how the spending cap $\bar{x}$ affects equilibrium outcomes. For the remainder of this section, we assume that there is at least one candidate whose formal spending is binding at the cap (otherwise, there are trivially no effects from a marginal change in the cap). For expositional purposes, we also assume that no candidate is at a knife-edge case whenever computing derivatives (i.e. we ignore the special cases $x_i^* = 0$, $x_i^* = \bar{x}$, and $z_i^* = 0$).

Lemma 1 *Total equilibrium inputs in the contest are increasing in the spending cap, i.e.* $\frac{\partial Y^*}{\partial \bar{x}} > 0$.

Proof: By equation (9), we have $\frac{\partial s_k(Y)}{\partial \bar{x}} > 0$ for $Y > 0$ if k is binding and $\frac{\partial s_j(Y)}{\partial \bar{x}} = 0$ for $Y > 0$ if j is not binding. Therefore, since at least one candidate is binding, $\frac{\partial S(Y)}{\partial \bar{x}} > 0$ for $Y > 0$. Recall that equilibrium total inputs Y^* is given by $S(Y^*) = 1$. Hence it follows that $\frac{\partial Y^*}{\partial \bar{x}} > 0$.

Proposition 2 *(The effects of spending limits on campaign expenditures.)*

$$\frac{\partial x_i^*}{\partial \bar{x}} = \begin{cases} \frac{1}{a_i}\frac{\partial Y^*}{\partial \bar{x}}\left(1-\frac{2c_iY^*}{a_i}\right) & \text{if } 0 < x_i^* < \bar{x} \\ 1 & \text{otherwise} \end{cases}$$

$$\frac{\partial z_i^*}{\partial \bar{x}} = \begin{cases} \frac{1}{b_i}\left[\frac{\partial Y^*}{\partial \bar{x}}\left(1-\frac{2c_iY^*}{b_i}\right)-a_i\right] & \text{if } z_i^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

Proof: Suppose that $0 < x_i^* < \bar{x}$. Then $s_i(Y) = 1 - \frac{c_iY}{a_i}$, and $x_i(Y) \equiv \frac{Ys_i(Y)}{a_i} = \frac{Y}{a_i} - \frac{c_iY^2}{a_i^2}$. Then the first result follows by differentiating $x_i(Y)$ with respect to $\bar{x}$. Suppose instead that $x_i^* > \bar{x}$. Then $x_i = \bar{x}$ and the result follows immediately.

Now suppose that $z_i^* > 0$. Then $s_i(Y) = 1 - \frac{c_iY}{b_i}$, $y_i(Y) = Y - \frac{c_iY^2}{b_i}$ and $x_i(Y) = \bar{x}$. Therefore, since $y_i \equiv a_ix_i(Y) + b_iz_i(Y)$, we have $z_i(Y) = \frac{Y}{b_i} - \frac{c_iY^2}{b_i^2} - \frac{a_i\bar{x}}{b_i}$. The result then follows by differentiating $z_i(Y)$ with respect to $\bar{x}$. Finally, suppose that $z_i^* < 0$. Then $z_i = 0$ and the result follows immediately.

Proposition 3 *(The effects of spending limits on political entry.) A candidate enters the race if and only if*

$$\frac{a_i}{c_i} > Y^*$$

Therefore, the number of entrants in equilibrium decreases in the spending limit.

Proof: From Lemma 1, we have that $\frac{\partial Y^*}{\partial \bar{x}} > 0$, that is, total inputs are increasing in the spending cap. From equation (9), the condition for strictly positive spending (and hence by definition, entry) is $\frac{a_i}{c_i} > Y^*$. Therefore the number of candidates for which this condition holds is decreasing in Y^*, and hence decreasing in the spending limit $\bar{x}$.

Proposition 4 *(The effects of spending limits on electoral outcomes.) Increasing the spending limit decreases the probability of winning of the candidates whose equilibrium formal spending is less than the cap, and increases the probability of winning of the candidates whose equilibrium formal spending equals the cap.*

Proof: Let $\mathscr{J}$ denote the set of candidates who are non-binding and let j index elements of this set. Then $s_j(Y) = 1 - \frac{c_jY}{a_j}$. Since $\frac{\partial Y^*}{\partial \bar{x}} > 0$ by Lemma 1, we have $\frac{\partial s_j(Y^*)}{\partial \bar{x}} < 0$ for all $j \in \mathscr{J}$. Therefore $\frac{\partial \sum_{j\in\mathscr{J}} s_j(Y^*)}{\partial \bar{x}} < 0$, i.e. the probability of winning of non-binding candidates is decreasing in the spending limit.

Let $\mathscr{B}$ denote the set of candidates who are binding and index the elements of this set by b. These are candidates whose formal spending is equal to the spending limit, and whose informal spending may or may not be strictly positive. We have $S(Y) = \sum_{j \in \mathscr{J}} s_j(Y) + \sum_{b \in \mathscr{B}} s_b(Y)$. Since in equilibrium we must have $S(Y^*) = 1$, we have $\frac{\partial S(Y^*)}{\partial \bar{x}} = 0$. Therefore $\frac{\partial \sum_{b \in \mathscr{B}} s_b(Y^*)}{\partial \bar{x}} > 0$, that is the probability of winning of binding candidates is increasing in the spending limit.[26]

[26]Note that this not necessarily imply that the probability of winning is increasing for *each* binding candidate.

A.2 Additional Tables and Figures

09/29/2015	Law 13.165 establishes preliminary limits on campaign spending for the 2016 election
07/05/2016	Beginning of intra-party campaign for mayor candidate
07/20/2016	Establish final limits on campaign spending valid for 2016 election
07/20/2016-08/05/2016	Parties chose candidates
08/15/2016	Last day for candidacy registration
08/16/2016- 09/30/2016	Campaign period
10/02/16	Municipal elections

Figure A.1: Timeline

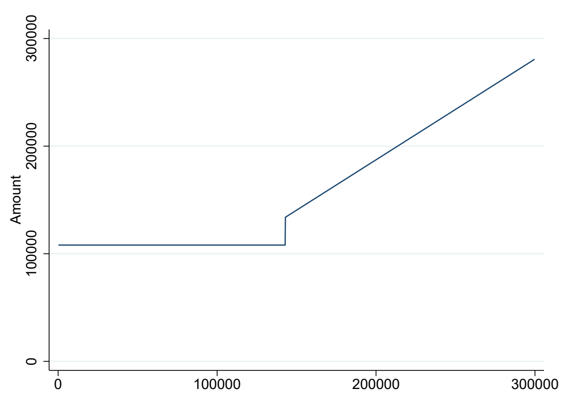

Figure A.2: Campaign Spending Limits in 2016

(a) Rejected Accounts

(b) Party Spending

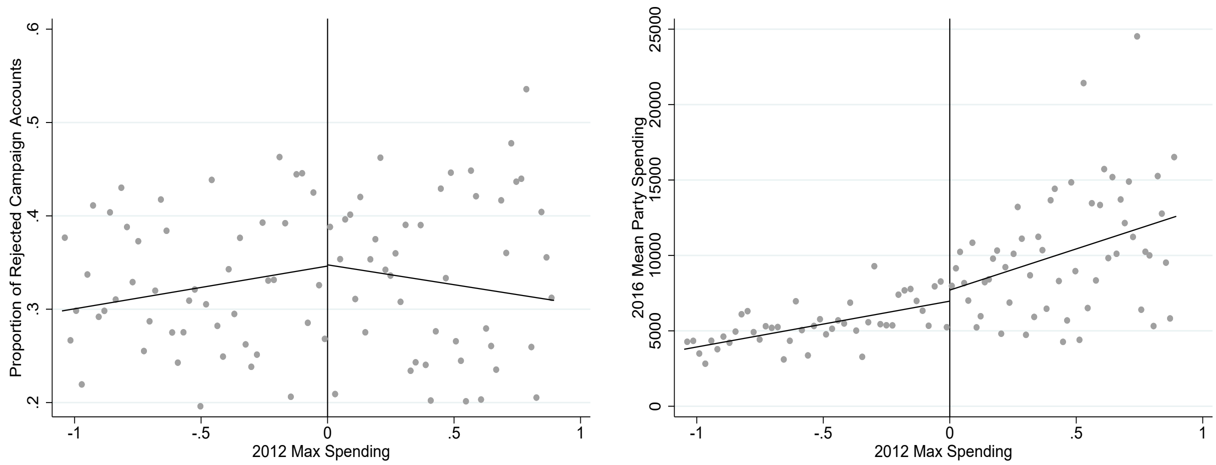

Figure A.3: Effects of Campaign Spending Limits on Other Forms of Spending

Notes: This figure plots the results of the regression discontinuity design, where the dependent variable is (a) the share of candidates who campaign finances were found to be irregular, and (b) the mean spending by parties. The horizontal axis denotes the difference in maximum spending relative to the discontinuity at R$142,857, in logs. In each regression, a first-order polynomial is estimated on each side of the discontinuity. Each point denotes the sample-average within a bin. The number of bins is chosen optimally according to Calonico et al. (2015).

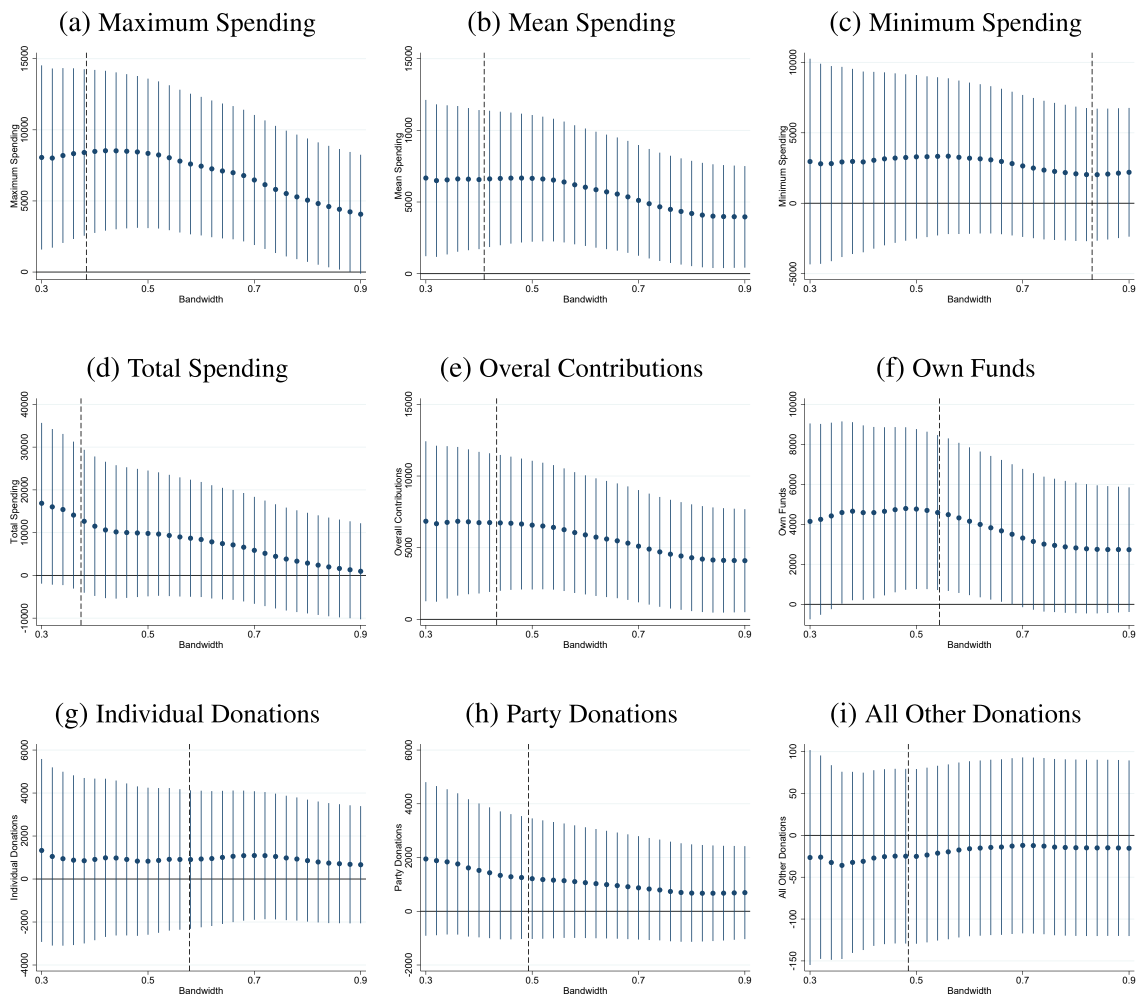

Figure A.4: Robustness to Bandwidth Choice: Campaign Spending and Contributions

Notes: Each circle reports the point estimate of a separate RD regression, for varying bandwidths, with its 95 percent confidence interval. The running variable is measured in logs. The optimal bandwidth is computed using the methodology in Calonico et al. (2014) and is depicted by the dashed line.

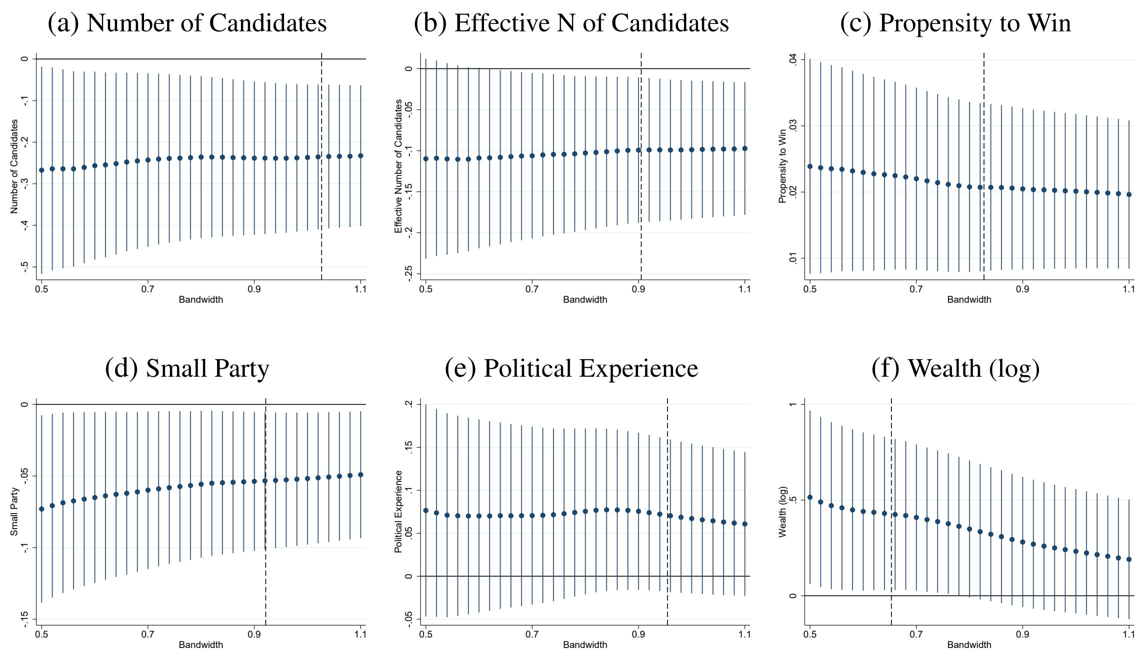

Figure A.5: Robustness to Bandwidth Choice: Candidate Entry

Notes: Each circle reports the point estimate of a separate RD regression, for varying bandwidths, with its 95 percent confidence interval. The running variable is measured in logs. The optimal bandwidth is computed using the methodology in Calonico et al. (2014) and is depicted by the dashed line.

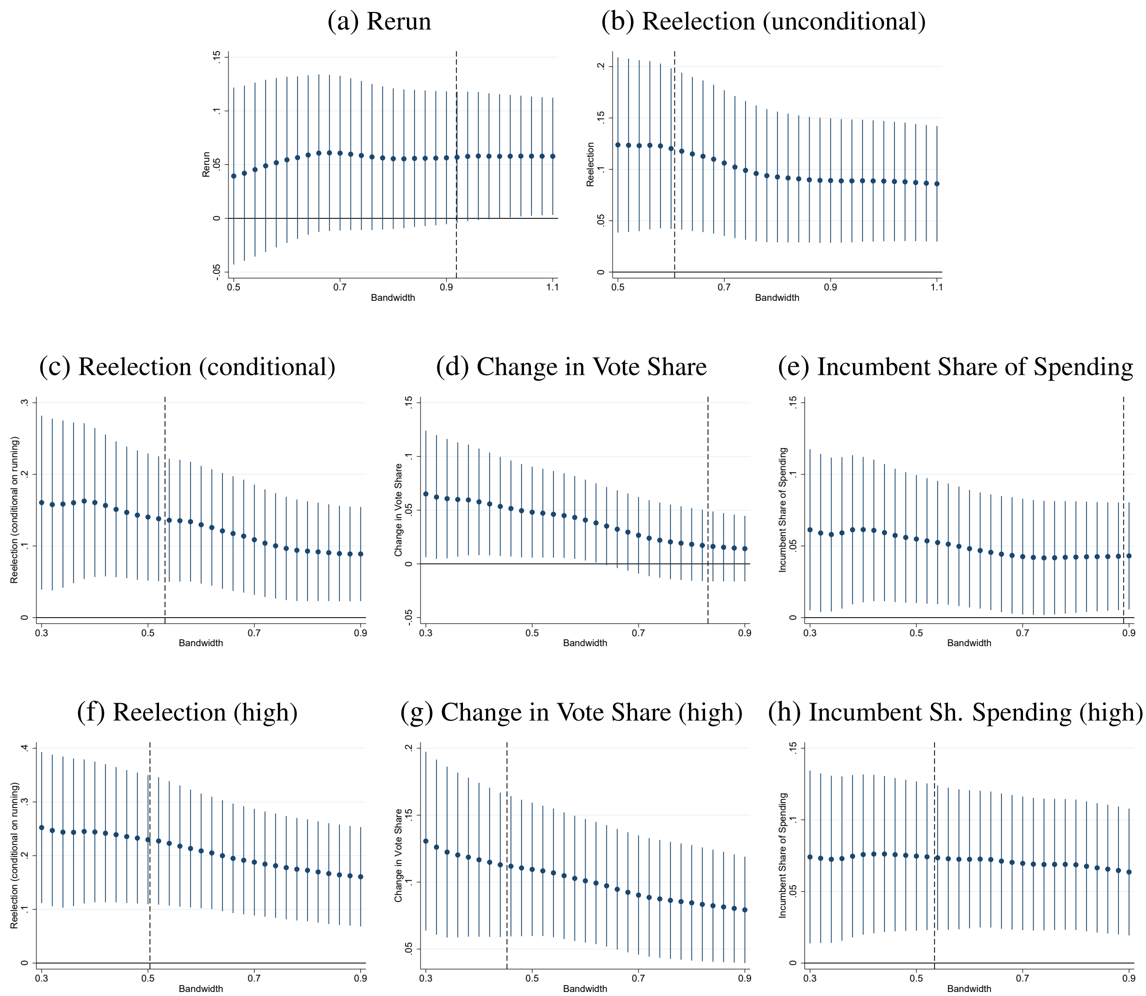

Figure A.6: Robustness to Bandwidth Choice: Incumbent Outcomes

Notes: Each circle reports the point estimate of a separate RD regression, for varying bandwidths, with its 95 percent confidence interval. The running variable is measured in logs. The optimal bandwidth is computed using the methodology in Calonico et al. (2014) and is depicted by the dashed line. Panels (f), (g) and (h) restrict the sample to incumbents with high levels of spending in 2012.

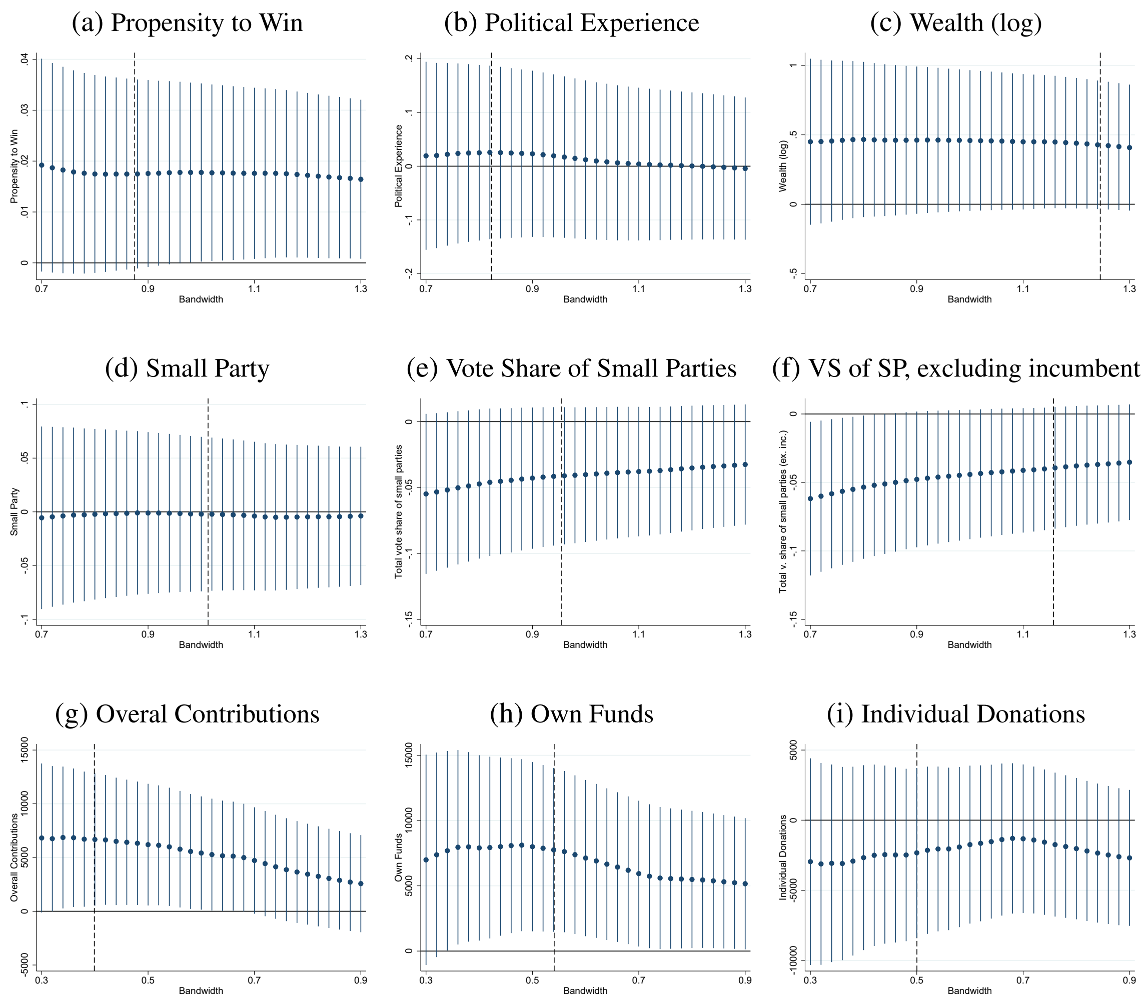

Figure A.7: Robustness to Bandwidth Choice: Political Selection

Notes: Each circle reports the point estimate of a separate RD regression, for varying bandwidths, with its 95 percent confidence interval. The running variable is measured in logs. The optimal bandwidth is computed using the methodology in Calonico et al. (2014) and is depicted by the dashed line.

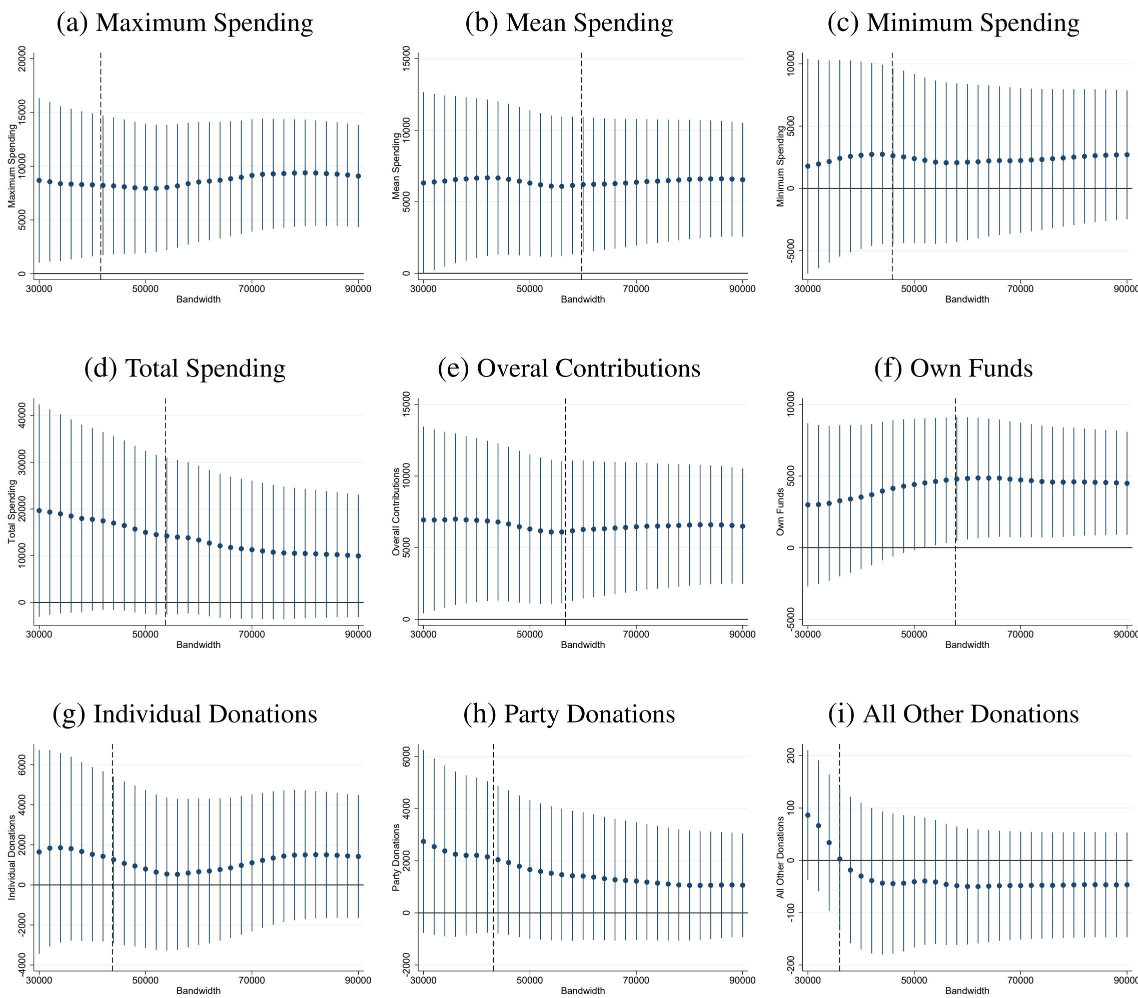

Figure A.8: Robustness to Bandwidth Choice: Campaign Spending and Contributions

Notes: Each circle reports the point estimate of a separate RD regression, for varying bandwidths, with its 95 percent confidence interval. The running variable is measured in levels. The optimal bandwidth is computed using the methodology in Calonico et al. (2014) and is depicted by the dashed line.

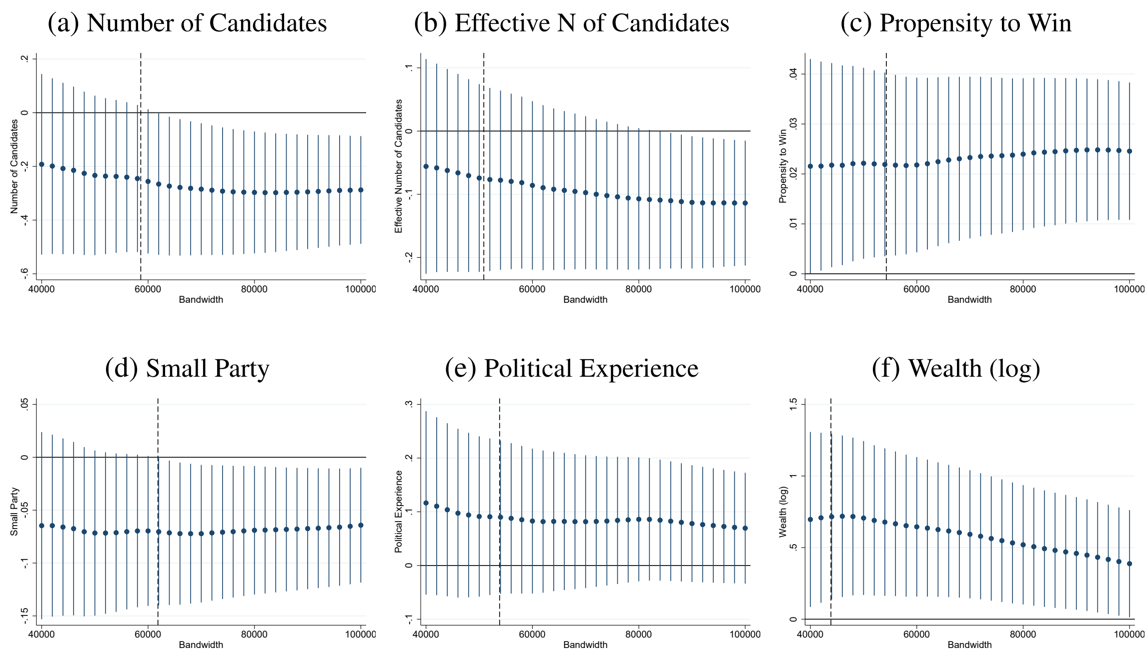

Figure A.9: Robustness to Bandwidth Choice: Candidate Entry

Notes: Each circle reports the point estimate of a separate RD regression, for varying bandwidths, with its 95 percent confidence interval. The running variable is measured in levels. The optimal bandwidth is computed using the methodology in Calonico et al. (2014) and is depicted by the dashed line.

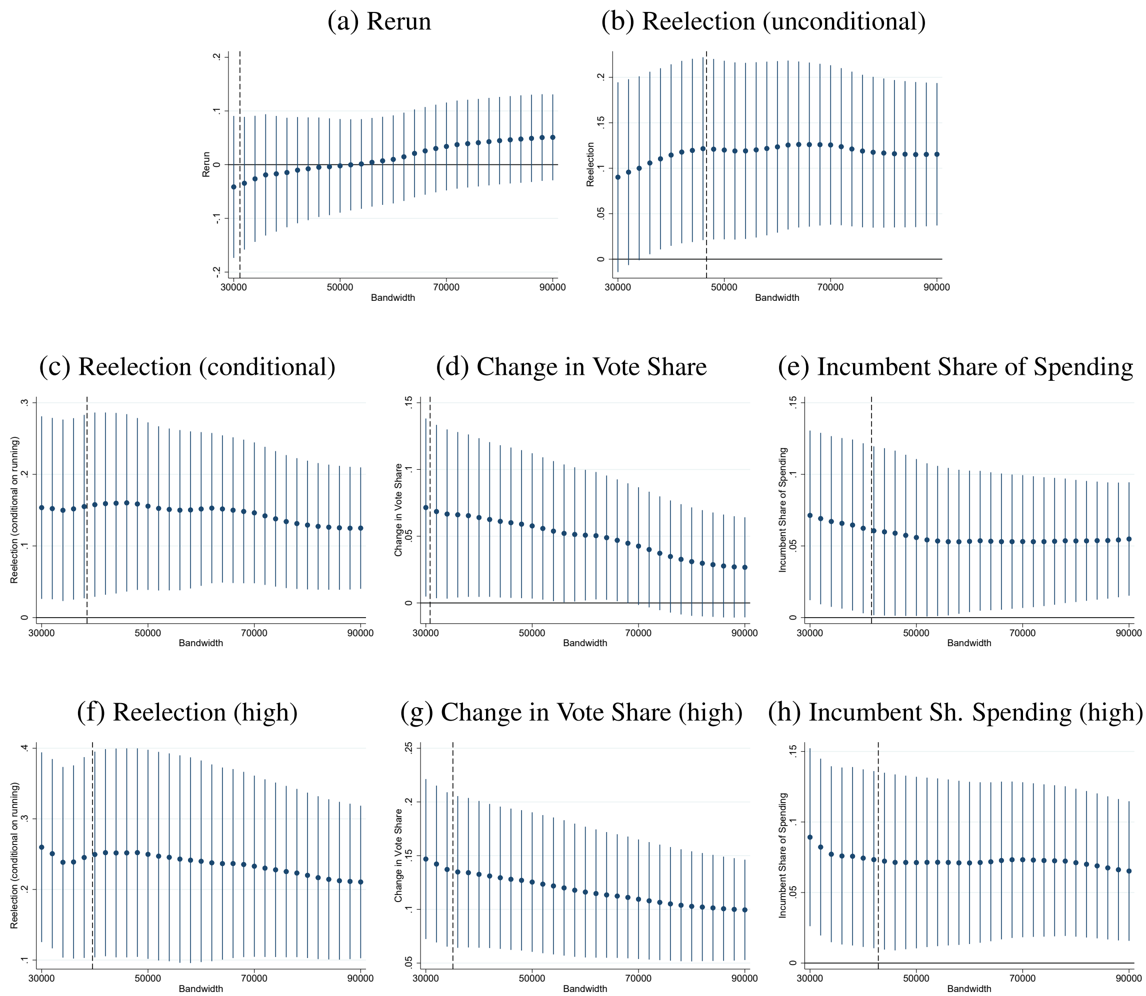

Figure A.10: Robustness to Bandwidth Choice: Incumbent Outcomes

Notes: Each circle reports the point estimate of a separate RD regression, for varying bandwidths, with its 95 percent confidence interval. The running variable is measured in levels. The optimal bandwidth is computed using the methodology in Calonico et al. (2014) and is depicted by the dashed line. Panels (f), (g) and (h) restrict the sample to incumbents with high levels of spending in 2012.

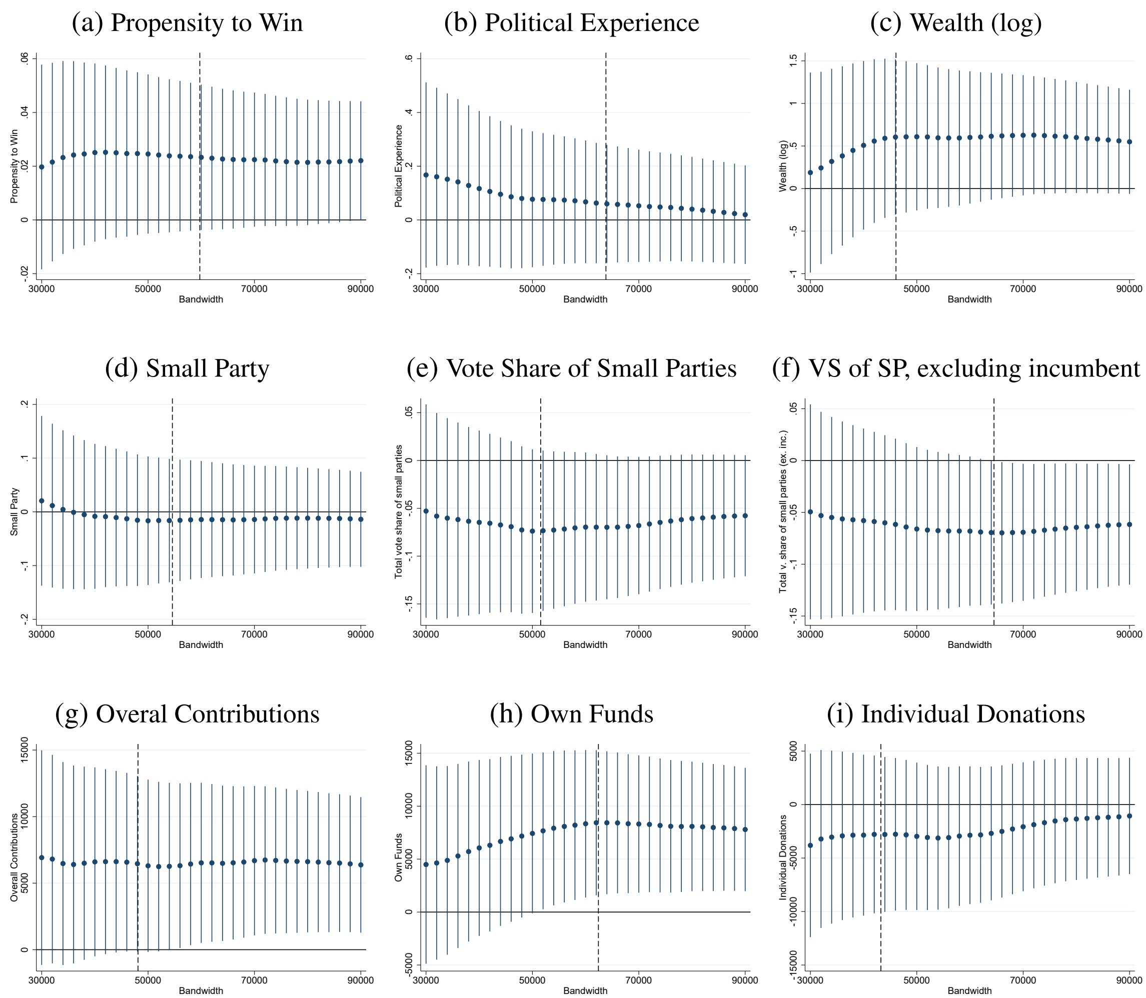

Figure A.11: Robustness to Bandwidth Choice: Political Selection

Notes: Each circle reports the point estimate of a separate RD regression, for varying bandwidths, with its 95 percent confidence interval. The running variable is measured in levels. The optimal bandwidth is computed using the methodology in Calonico et al. (2014) and is depicted by the dashed line.

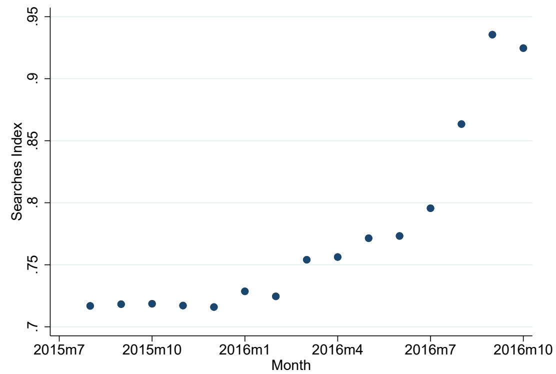

Figure A.12: Google Searches Index

Notes: Each dot on the plot represents the average Google Searches Index across all mayoral candidates in a given month

Table A.1: Covariate Smoothness (Quadratic Specification)

Dependent Variable	Mean (1)	BW (2)	Observations (3)	Estimate (4)
Panel A: Municipal Characteristics in 2010				
GDP per capita (log)	5.909	1.105	3435	0.045
	(0.038)			(0.051)
Illiteracy	0.210	1.161	3571	-0.007
	(0.008)			(0.011)
Share Urban	0.627	1.349	3959	-0.004
	(0.015)			(0.020)
Gini Coefficient	0.513	1.531	4264	-0.001
	(0.004)			(0.006)
Population (log)	9.706	1.268	3790	-0.100
	(0.055)			(0.073)
Panel B: Mean Candidate Characteristics in 2012				
Number of Candidates	2.999	1.109	3464	-0.081
	(0.088)			(0.118)
Effective Number of Candidates	2.176	1.267	3802	-0.026
	(0.042)			(0.050)
Small Party	0.419	1.520	4265	-0.009
	(0.020)			(0.027)
Female	0.116	1.446	4159	0.042
	(0.015)			(0.020)
Age	48.064	1.349	3975	-0.322
	(0.490)			(0.629)
High School Degree	0.847	1.243	3751	0.003
	(0.018)			(0.025)
College Degree	0.489	1.435	4142	0.036
	(0.023)			(0.031)
Campaign Spending	93534.51	0.805	2724	1261.06
	(2167.23)			(2877.15)
Campaign Contributions	93771.07	0.798	2701	806.22
	(2149.25)			(2897.30)
Own Funds	25840.72	0.819	2751	2679.75
	(1915.99)			(2874.04)
Individual Donations	35047.98	1.125	3500	362.51
	(1570.04)			(2364.91)
Party Donations	9745.69	0.618	2120	-2264.32
	(1621.73)			(2013.38)
Corporate Donations	15044.33	0.925	3051	444.68
	(1287.54)			(2063.97)
Wealth (log)	11.55	1.389	4052	-0.03
	(0.16)			(0.20)

Notes: The mean in column (1) is the estimated value of the dependent variable for a municipality at the cutoff point with a spending limit of $R108,039 in 2016. The optimal CCT bandwidth is reported in column (2) and the number of observations in column (3). Each figure in column (4) reports the estimate and standard error for the treatment effect from a separate regression. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.2: Covariate Balance (Means Specification)

Dependent Variable	Mean (1)	BW (2)	Observations (3)	Estimate (4)
Panel A: Municipal Characteristics in 2010				
GDP per capita (log)	5.902	0.2	703	0.051
	(0.057)			(0.041)
Illiteracy	0.212	0.2	703	-0.010
	(0.013)			(0.009)
Share Urban	0.629	0.2	703	-0.000
	(0.025)			(0.018)
Gini Coefficient	0.511	0.2	703	0.003
	(0.007)			(0.005)
Population (log)	9.662	0.2	703	-0.009
	(0.089)			(0.065)
Panel B: Mean Candidate Characteristics in 2012				
Number of Candidates	2.988	0.2	708	-0.038
	(0.133)			(0.096)
Effective Number of Candidates	2.178	0.2	708	-0.013
	(0.075)			(0.044)
Small Party	0.446	0.2	708	-0.039
	(0.036)			(0.026)
Female	0.127	0.2	708	0.028
	(0.029)			(0.019)
Age	48.118	0.2	708	-0.132
	(0.735)			(0.562)
High School Degree	0.843	0.2	708	0.004
	(0.023)			(0.021)
College Degree	0.491	0.2	708	0.026
	(0.039)			(0.028)
Wealth (log)	11.491	0.2	708	0.145
	(0.287)			(0.189)

Notes: The mean in column (1) is the estimated value of the dependent variable for a municipality at the cutoff point with a spending limit of $R108,039 in 2016. The bandwidth is reported in column (2) and the number of observations in column (3). Each figure in column (4) reports the estimate and standard error for the treatment effect from a separate regression. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Probability of Winning the Election

	(1) Winner of the Election
Age	-0.0166***
	(0.00295)
Age Squared	0.0000219***
	(0.00000342)
Female	-0.212**
	(0.0856)
White	-0.191
	(0.382)
Black	-0.575
	(0.431)
Brown	-0.328
	(0.386)
High School	-0.114
	(0.0822)
College	-0.0388
	(0.0620)
Log Assets	0.0322***
	(0.00837)
Incumbent	0.583***
	(0.0723)
Political Experience	0.0536**
	(0.0260)
Party Fixed Effects	Yes
Observations	6525

Notes: Robust standard errors are in parentheses. The sample is restricted to observations that are excluded from the main RD regressions. The dependent variable is equal to one if the candidate wins the election and zero otherwise. The regression also controls for party fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Effects on Incumbents, Heterogeneity by 2012 Corporate Donation Share

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Panel A: Incumbents with high corporate donations in 2012							
Reelection	0.452	0.641	502	0.131*	0.181**	0.142	0.128***
	(0.057)			(0.073)	(0.072)	(0.089)	(0.040)
Change in Vote Share	-0.147	0.501	391	0.060*	0.074**	0.078*	0.082***
	(0.027)			(0.033)	(0.033)	(0.044)	(0.019)
Panel B: Incumbents with low corporate donations in 2012							
Reelection	0.339	0.504	459	0.182***	0.142***	0.173***	0.124***
	(0.035)			(0.044)	(0.047)	(0.066)	(0.022)
Change in Vote Share	-0.105	0.527	476	0.043*	0.041	0.039	0.023**
	(0.021)			(0.025)	(0.025)	(0.035)	(0.010)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The sample is split between incumbents with an above-median share of corporate donations in 2012 (Panel A) and incumbents with a below-median share (Panel B) . See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Additional Effects of Campaign Spending Limits on Political Selection

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Ideology Index	5.334	0.933	2425	-0.049	-0.054	-0.015	0.002
	(0.114)			(0.133)	(0.137)	(0.174)	(0.145)
Female	0.120	1.044	3295	0.033	0.030	0.021	0.019
	(0.019)			(0.026)	(0.027)	(0.034)	(0.030)
Age	49.003	0.931	3050	-0.345	-0.304	-0.720	-0.910
	(0.689)			(0.880)	(0.839)	(1.215)	(0.950)
White	0.616	0.907	2983	0.026	0.016	0.026	0.006
	(0.031)			(0.038)	(0.033)	(0.049)	(0.040)
College Degree	0.563	0.875	2894	-0.016	-0.015	0.007	0.014
	(0.032)			(0.040)	(0.037)	(0.054)	(0.041)
Worker's Party (PT)	0.033	1.251	3748	-0.005	-0.008	-0.002	-0.008
	(0.010)			(0.013)	(0.013)	(0.017)	(0.016)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variables are characteristics of the winning candidates. See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Effects of Campaign Spending Limits on the Campaign Contributions of Winners

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Overall Contributions	76425.62	0.399	1425	6672.96**	8883.47***	7545.58**	14230.77***
	(2313.86)			(3143.04)	(3108.65)	(3641.51)	(2257.39)
Own Funds	30248.90	0.541	1871	7749.12**	7484.31**	8089.07**	9067.23***
	(2123.25)			(3201.00)	(3204.85)	(3714.39)	(2677.34)
Individual Donations	37812.22	0.500	1732	-2326.42	-1403.69	-595.04	3192.90
	(2299.56)			(3087.72)	(3023.49)	(3411.30)	(2432.40)
Party Donations	8188.13	0.441	1559	1028.52	2630.49	2592.98	2031.94
	(1400.88)			(1961.47)	(1908.50)	(2368.41)	(1441.69)
All Other Donations	207.59	0.723	2463	-31.50	-21.88	-79.38	-61.30
	(100.33)			(142.66)	(143.71)	(160.92)	(115.76)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variable "Overall Contributions" is equal to the sum of the four contribution categories: own funds, individual donations, party donations, and all other donations. See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7: Effects of Spending Limits on Facebook Campaign Activity

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Has Facebook Page	0.332	0.943	3093	-0.016	-0.022	-0.032	-0.034
	(0.020)			(0.025)	(0.026)	(0.032)	(0.027)
Number of Posts (log)	1.164	1.004	3228	-0.058	-0.063	-0.099	-0.076
	(0.072)			(0.093)	(0.098)	(0.123)	(0.105)
Number of Reactions (log)	2.219	0.962	3140	-0.072	-0.093	-0.139	-0.116
	(0.140)			(0.181)	(0.191)	(0.230)	(0.201)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variables are respectively, the proportion of candidates with a Facebook Page, the log plus one of the average number of candidates' posts and the log plus one of the average number of reactions candidates' posts, computed at the municipality-level between the beginning of the campaign period and election day. See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: Effects of Spending Limits on In-Kind versus Cash Contributions

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Panel A: Candidates							
Estimated Donations	10854.61	0.728	2497	1186.53	1036.90	1603.16	1657.00**
	(550.28)			(782.91)	(780.55)	(1042.54)	(767.74)
Money Donations	46894.64	0.456	1615	5235.97**	5320.99**	6446.42**	9092.59***
	(1720.27)			(2321.34)	(2255.09)	(2692.31)	(1782.29)
Panel B: Winners							
Estimated Donations	14482.01	0.704	2397	-236.35	-105.50	97.56	820.15
	(954.78)			(1246.23)	(1222.98)	(1548.31)	(1200.21)
Money Donations	61914.02	0.420	1488	6208.42*	8150.90**	7166.69*	13410.62***
	(2356.67)			(3344.30)	(3328.71)	(3861.30)	(2451.34)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: For each panel, the dependent variables are respectively the amount of contributions given in kind (Estimated Donations) and the amount of contributions given in cash (Money Donations). See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.9: Effects of Campaign Spending Limits on Voter Information

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Turnout	0.840	1.110	3464	-0.003	-0.006	-0.003	-0.004
	(0.003)			(0.004)	(0.004)	(0.005)	(0.004)
Share of Blank or Invalid Votes	0.069	1.162	3586	0.004	0.005	0.007	0.002
	(0.004)			(0.006)	(0.006)	(0.008)	(0.007)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The “Turnout” dependent variable is the number of votes divided by the number of eligible voters. The “Share of Blank or Invalid Votes” dependent variable denotes the number of votes cast which are either blank or invalid divided by the number of eligible voters. See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.10: Distribution of Candidates' Number of Searches in September 2016

Number of Searches	Index Value	Number of Candidates
0 -10	0	5,796
11 - 100	1	5,532
101 - 1,000	2	2,796
1,001 - 10,000	3	834
10,001 - 100,000	4	116
100,001 - 1,000,000	5	3
Total		15,077

Notes: This table displays the distribution of Candidates' Google searches in September 2016.

Table A.11: Effects of Spending Limits on Google Searches

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Google Searches	0.894	0.879	2896	-0.049	-0.048	-0.049	-0.029
	(0.039)			(0.046)	(0.044)	(0.053)	(0.050)
Incumbents' Google Searches	0.430	1.019	3259	0.062	0.069	0.082	0.094
	(0.043)			(0.056)	(0.059)	(0.080)	(0.067)
Challengers' Google Searches	0.823	0.743	2540	-0.093*	-0.098*	-0.104*	-0.072
	(0.043)			(0.052)	(0.052)	(0.061)	(0.052)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variables are respectively the average September Google searches index for all mayoral candidates, for incumbents, and for challengers computed at the municipality-level. See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.12: Correlation Between September Google Search and Candidates' Ad Time Share

	September Google Search
	(1)
Ad Share	0.18**
	(0.08)
Ln(Campaign Spending)	0.09***
	(0.01)
Incumbent	0.09***
	0.03
Political Experience	0.06***
	(0.01)
Female	0.03
	(0.03)
Age	-0.00
	(0.00)
College	-0.02
	(0.02)
Race FE	Yes
Party FE	Yes
City FE	Yes
Obs	14,590

Notes: Robust standard errors are in parentheses. The dependent variable is the September Google Search Index for the mayoral candidate. Ad Share is the advertisement time share of the mayoral candidate in the municipality. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A.3 Robustness: Excluding Open Seats

Table A.13: Effects of Spending Limits on Campaign Expenditures (Excluding Open Seats)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Maximum Spending	84802.04	0.390	1080	7470.90**	9752.40***	8602.71**	16280.25***
	(2450.71)			(3337.97)	(3252.12)	(3867.83)	(2296.07)
Mean Spending	58399.78	0.477	1279	5416.69**	5506.84**	6294.37**	10405.53***
	(1864.22)			(2570.82)	(2545.51)	(2949.83)	(1989.34)
Minimum Spending	32773.85	0.699	1844	2758.60	1063.35	2258.73	3543.66
	(2147.98)			(2903.68)	(2841.53)	(3818.84)	(2617.11)
Total Spending	169003.91	0.428	1180	-1520.55	6621.29	2709.86	21302.86***
	(6404.44)			(8512.94)	(8296.58)	(9489.85)	(6062.96)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: Each figure in columns (1)-(4) reports the estimate of a separate regression. Standard errors are in parentheses. The Mean is the estimated value, based on specification (1), of the dependent variable for a municipality at the cutoff point with spending limit $R108,039. The dependent variables are respectively the mean, maximum, minimum, and total campaign expenditures by candidates computed at the municipality-level. The optimal bandwidth is selected with the optimal procedure by Calonico et al. (2014) and is reported for specification (1) together with the associated number of observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.14: Effects of Spending Limits on Campaign Contributions (Excluding Open Seats)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Overall Contributions	58203.54	0.504	1339	5800.29**	5843.39**	7017.53**	10660.87***
	(1859.99)			(2548.68)	(2535.35)	(3097.10)	(2031.91)
Own Funds	23850.45	0.545	1446	5885.10**	4571.19**	5731.49**	6024.13***
	(1542.33)			(2321.79)	(2206.29)	(2664.18)	(1885.74)
Individual Donations	25736.49	0.559	1481	-807.84	-410.32	-701.73	2759.63*
	(1378.68)			(1809.95)	(1777.03)	(2247.99)	(1486.15)
Party Donations	7041.15	0.575	1527	679.17	1419.89	703.37	1570.07
	(923.35)			(1151.49)	(1119.55)	(1382.45)	(954.71)
All Other Donations	114.29	0.647	1701	10.35	26.31	-3.99	-15.98
	(45.21)			(63.11)	(63.35)	(67.74)	(47.67)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variable "Overall Contributions" is equal to the sum of the four contribution categories: own funds, individual donations, party donations, and all other donations. See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.15: Effects of Campaign Spending Limits on Candidate Entry (Excluding Open Seats)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Number of Candidates	3.184	0.803	2092	-0.367***	-0.278***	-0.419***	-0.262**
	(0.099)			(0.110)	(0.100)	(0.130)	(0.109)
Effective Number of Candidates	2.252	0.906	2302	-0.167***	-0.153***	-0.203***	-0.150***
	(0.042)			(0.050)	(0.049)	(0.062)	(0.055)
Small Party	0.486	0.951	2393	-0.045*	-0.039	-0.060*	-0.046
	(0.021)			(0.027)	(0.027)	(0.034)	(0.030)
Small Party (excluding incumbent)	0.417	0.788	2063	-0.057**	-0.052*	-0.073**	-0.048*
	(0.022)			(0.027)	(0.027)	(0.034)	(0.028)
Propensity to Win	0.352	0.801	2089	0.024***	0.021***	0.028***	0.020***
	(0.005)			(0.007)	(0.007)	(0.009)	(0.007)
Wealth (log)	11.483	0.656	1719	0.506**	0.378*	0.674**	0.451**
	(0.185)			(0.229)	(0.215)	(0.273)	(0.209)
Political Experience	0.878	0.987	2466	0.047	0.054	0.062	0.037
	(0.039)			(0.048)	(0.050)	(0.065)	(0.054)
Ideology Index	5.157	1.284	2892	0.117	0.078	0.124	-0.028
	(0.071)			(0.092)	(0.101)	(0.117)	(0.112)
Female	0.151	0.797	2076	-0.021	-0.020	-0.043	-0.021
	(0.016)			(0.020)	(0.019)	(0.026)	(0.020)
Age	49.025	0.833	2150	-0.326	-0.436	-0.256	-0.600
	(0.506)			(0.604)	(0.544)	(0.774)	(0.619)
College Degree	0.560	0.805	2098	-0.033	-0.025	-0.038	-0.009
	(0.023)			(0.029)	(0.028)	(0.032)	(0.028)
White	0.608	0.801	2089	0.001	-0.006	-0.002	-0.002
	(0.025)			(0.031)	(0.028)	(0.036)	(0.027)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variables are two measures of the number of candidates who run for office, followed by municipality-level averages of various candidate characteristics. The "Propensity to Win" denotes the propensity for a candidate to win an election based on his observable characteristics (see Table A.3). See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.16: Effects of Campaign Spending Limits on Political Selection (Excluding Open Seats)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Propensity to Win	0.383	0.909	2292	0.018*	0.017	0.022*	0.023**
	(0.008)			(0.011)	(0.011)	(0.013)	(0.011)
Wealth (log)	11.775	1.129	2683	0.540*	0.443*	0.568*	0.569*
	(0.244)			(0.278)	(0.255)	(0.334)	(0.337)
Total vote share of small parties	0.426	0.947	2373	-0.024	-0.020	-0.043	-0.050
	(0.024)			(0.030)	(0.029)	(0.039)	(0.033)
Total v. share of small parties (ex. inc.)	0.344	0.990	2461	-0.027	-0.037	-0.060	-0.049
	(0.022)			(0.026)	(0.028)	(0.038)	(0.030)
Small Party	0.395	1.007	2484	0.003	0.003	0.000	-0.021
	(0.033)			(0.041)	(0.039)	(0.047)	(0.046)
Political Experience	0.919	0.806	2087	0.016	0.034	0.031	0.051
	(0.074)			(0.092)	(0.094)	(0.101)	(0.096)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The "Propensity to Win" dependent variable denotes the propensity for a candidate to win an election based on his observable characteristics (see Table A.3). See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.17: Effects of Spending Limits on Winners' Contributions (Excluding Open Seats)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Overall Contributions	76164.99	0.403	1103	5808.56	8588.64**	6958.63	14225.27***
	(2561.62)			(3561.93)	(3610.42)	(4233.14)	(2602.74)
Own Funds	29576.67	0.524	1388	10399.19***	10281.50***	11795.52***	11405.56***
	(2573.19)			(3711.28)	(3721.55)	(4569.15)	(3059.62)
Individual Donations	38681.81	0.440	1201	-4706.61	-3534.62	-5321.34	1391.66
	(2675.98)			(3535.94)	(3436.55)	(4226.09)	(2655.86)
Party Donations	8133.98	0.462	1243	-263.89	1524.61	1405.87	1501.49
	(1565.52)			(2072.85)	(2029.99)	(2493.05)	(1578.82)
All Other Donations	245.62	0.709	1862	-14.95	10.79	-89.01	-73.44
	(123.24)			(176.16)	(177.13)	(197.17)	(141.54)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	0.2
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variable "Overall Contributions" is equal to the sum of the four contribution categories: own funds, individual donations, party donations, and all other donations. See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A.4 Robustness: Running Variable in Levels

Table A.18: Effects of Spending Limits on Campaign Expenditures (Levels Specification)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Maximum Spending	84454.35	41580.582	1110	8235.61**	9337.77***	8724.72**	16184.34***
	(2490.74)			(3331.09)	(3058.53)	(4442.97)	(1987.01)
Mean Spending	58068.69	59736.914	1655	6199.29**	6133.09**	6830.90*	10623.51***
	(1720.63)			(2421.39)	(2539.12)	(3642.22)	(1744.25)
Minimum Spending	31482.36	45861.894	1228	2626.42	986.30	2571.75	3868.98*
	(2765.58)			(3606.44)	(3548.01)	(4776.47)	(2277.14)
Total Spending	166284.94	53776.482	1460	14242.20*	16167.09**	22121.77*	26830.00***
	(5947.88)			(8565.18)	(7157.44)	(12553.76)	(5321.94)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	30000
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: Each figure in columns (1)-(4) reports the estimate of a separate regression. Standard errors are in parentheses. The Mean is the estimated value, based on specification (1), of the dependent variable for a municipality at the cutoff point with spending limit $R108,039. The dependent variables are respectively the mean, maximum, minimum, and total campaign expenditures by candidates computed at the municipality-level. The optimal bandwidth is selected with the optimal procedure by Calonico et al. (2014) and is reported for specification (1) together with the associated number of observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.19: Effects of Spending Limits on Campaign Contributions (Levels Specification)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Overall Contributions	57973.83	56689.653	1548	6114.49**	6212.22**	7493.57*	10576.56***
	(1819.28)			(2521.34)	(2649.23)	(3833.14)	(1775.46)
Own Funds	24063.44	57743.518	1581	4779.79**	3574.50*	3210.69	5046.46***
	(1578.96)			(2209.55)	(2124.65)	(2952.25)	(1567.94)
Individual Donations	25046.60	43771.447	1170	1285.08	1472.41	2457.30	3768.22***
	(1687.09)			(2130.20)	(2090.59)	(3096.03)	(1354.36)
Party Donations	6654.75	43127.859	1148	2092.90	3078.59**	2722.18	1651.53*
	(1053.83)			(1461.78)	(1506.24)	(1878.66)	(871.51)
All Other Donations	56.60	35953.476	949	3.21	29.51	24.32	-33.44
	(38.14)			(69.52)	(69.05)	(83.08)	(41.12)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	30000
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variable "Overall Contributions" is equal to the sum of the four contribution categories: own funds, individual donations, party donations, and all other donations. See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.20: Effects of Campaign Spending Limits on Candidate Entry (Levels Specification)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Number of Candidates	3.135	58628.986	1615	-0.248*	-0.180	-0.125	-0.158*
	(0.122)			(0.139)	(0.129)	(0.228)	(0.092)
Effective Number of Candidates	2.266	50864.353	1391	-0.076	-0.063	-0.029	-0.075
	(0.059)			(0.075)	(0.076)	(0.113)	(0.048)
Small Party	0.500	61856.395	1719	-0.070**	-0.063*	-0.070	-0.043*
	(0.028)			(0.036)	(0.037)	(0.047)	(0.026)
Small Party (excluding incumbent)	0.442	55003.412	1498	-0.073**	-0.069**	-0.068	-0.047*
	(0.030)			(0.036)	(0.035)	(0.047)	(0.025)
Propensity to Win	0.343	54276.775	1472	0.022**	0.018**	0.019	0.017***
	(0.007)			(0.009)	(0.009)	(0.013)	(0.006)
Wealth (log)	11.462	43863.675	1172	0.715**	0.626**	0.804**	0.404**
	(0.250)			(0.295)	(0.288)	(0.337)	(0.179)
Political Experience	0.806	53828.064	1462	0.090	0.094	0.099	0.058
	(0.055)			(0.073)	(0.073)	(0.092)	(0.049)
Ideology Index	5.224	53587.517	1422	-0.182	-0.237	-0.232	-0.130
	(0.113)			(0.148)	(0.149)	(0.233)	(0.098)
Female	0.140	49435.657	1345	-0.019	-0.014	-0.011	-0.005
	(0.022)			(0.027)	(0.026)	(0.038)	(0.018)
Age	49.360	40714.478	1083	-1.108	-0.967	-1.309	-0.657
	(0.748)			(0.873)	(0.867)	(1.177)	(0.543)
College Degree	0.553	51594.978	1412	-0.009	0.003	-0.003	-0.007
	(0.031)			(0.039)	(0.039)	(0.051)	(0.025)
White	0.596	47938.578	1299	0.017	0.002	0.021	0.001
	(0.037)			(0.044)	(0.040)	(0.061)	(0.025)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	30000
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variables are two measures of the number of candidates who run for office, followed by municipality-level averages of various candidate characteristics. The "Propensity to Win" denotes the propensity for a candidate to win an election based on his observable characteristics (see Table A.3). See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.21: Effects of Campaign Spending Limits on Political Selection (Levels Specification)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Propensity to Win	0.369	59732.678	1648	0.023*	0.025*	0.023	0.021**
	(0.010)			(0.014)	(0.014)	(0.020)	(0.010)
Wealth (log)	11.813	46094.093	1234	0.605	0.554	0.510	0.529*
	(0.415)			(0.465)	(0.455)	(0.548)	(0.285)
Total vote share of small parties	0.461	51551.129	1404	-0.074*	-0.072	-0.059	-0.050*
	(0.034)			(0.043)	(0.044)	(0.061)	(0.029)
Total v. share of small parties (ex. inc.)	0.388	64519.956	1805	-0.070**	-0.070*	-0.046	-0.051*
	(0.029)			(0.035)	(0.036)	(0.058)	(0.027)
Small Party	0.407	54572.131	1472	-0.016	-0.015	-0.008	-0.010
	(0.046)			(0.058)	(0.060)	(0.072)	(0.040)
Political Experience	0.837	63823.230	1787	0.060	0.075	0.125	0.034
	(0.083)			(0.112)	(0.112)	(0.164)	(0.084)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	30000
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The "Propensity to Win" dependent variable denotes the propensity for a candidate to win an election based on his observable characteristics (see Table A.3). See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.22: Effects of Spending Limits on Winners' Contributions (Levels Specification)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Overall Contributions	76527.34	48105.822	1297	6457.20*	8622.28***	6212.30	14012.97***
	(2475.63)			(3360.34)	(3336.40)	(4849.12)	(2197.25)
Own Funds	30312.46	62409.703	1734	8440.75**	7953.71**	3399.74	9174.49***
	(2334.55)			(3484.42)	(3671.26)	(5187.05)	(2626.10)
Individual Donations	38149.78	43248.266	1148	-2791.88	-2208.84	-3487.50	3300.56
	(2822.12)			(3719.59)	(3638.19)	(4540.37)	(2377.85)
Party Donations	5067.53	28039.652	720	6822.26**	8571.44***	7517.30**	1617.10
	(1733.28)			(2654.97)	(2534.54)	(3034.28)	(1433.06)
All Other Donations	163.46	41575.339	1106	-122.72	-90.87	22.90	-79.18
	(93.47)			(204.03)	(208.13)	(246.93)	(120.70)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	30000
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variable "Overall Contributions" is equal to the sum of the four contribution categories: own funds, individual donations, party donations, and all other donations. See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A.5 Robustness: Running Variable in Levels, Excluding Open Seats

Table A.23: Effects of Spending Limits on Campaign Expenditures (Levels, No Open Seats)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Maximum Spending	85371.22	57825.142	1208	7277.50**	9310.35***	7811.67	16206.91***
	(2245.42)			(3278.77)	(3095.98)	(5134.41)	(2235.68)
Mean Spending	57332.73	43672.851	898	5394.85*	5265.89*	5778.77	10150.19***
	(2325.50)			(3079.73)	(3076.00)	(4242.44)	(1936.09)
Minimum Spending	30981.54	43577.313	895	1311.75	-1430.93	1687.63	3195.77
	(3271.76)			(4183.88)	(4160.60)	(5500.03)	(2540.82)
Total Spending	170124.82	61578.135	1307	823.65	8433.40	8866.78	21198.61***
	(6056.81)			(8419.72)	(8241.09)	(12550.93)	(5848.52)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	30000
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: Each figure in columns (1)-(4) reports the estimate of a separate regression. Standard errors are in parentheses. The Mean is the estimated value, based on specification (1), of the dependent variable for a municipality at the cutoff point with spending limit $R108,039. The dependent variables are respectively the mean, maximum, minimum, and total campaign expenditures by candidates computed at the municipality-level. The optimal bandwidth is selected with the optimal procedure by Calonico et al. (2014) and is reported for specification (1) together with the associated number of observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.24: Effects of Spending Limits on Campaign Contributions (Levels, No Open Seats)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Overall Contributions	57055.87	44862.302	921	5823.44*	5698.47*	6799.12	10383.77***
	(2337.17)			(3116.85)	(3148.08)	(4431.33)	(1976.24)
Own Funds	23796.71	55246.885	1144	5561.92**	3477.44	3628.09	6067.92***
	(1850.46)			(2689.18)	(2834.97)	(3773.68)	(1848.47)
Individual Donations	25673.73	49854.178	1050	-474.59	82.83	2992.50	2634.20*
	(1668.84)			(2186.31)	(2165.98)	(3546.09)	(1442.64)
Party Donations	6892.79	46013.358	949	845.30	2062.43	889.09	1431.64
	(1180.13)			(1476.11)	(1459.23)	(1762.66)	(932.70)
All Other Donations	72.77	38627.222	792	-34.99	-15.08	-6.22	-22.94
	(43.03)			(89.13)	(90.16)	(105.76)	(48.14)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	30000
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variable "Overall Contributions" is equal to the sum of the four contribution categories: own funds, individual donations, party donations, and all other donations. See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.25: Effects of Campaign Spending Limits on Candidate Entry (Levels, No Open Seats)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Number of Candidates	3.263	43966.374	903	-0.378**	-0.254	-0.366	-0.247**
	(0.163)			(0.177)	(0.177)	(0.243)	(0.104)
Effective Number of Candidates	2.273	64009.789	1379	-0.194***	-0.175**	-0.180	-0.143***
	(0.062)			(0.070)	(0.073)	(0.113)	(0.053)
Small Party	0.504	57660.904	1202	-0.060	-0.054	-0.048	-0.040
	(0.033)			(0.041)	(0.041)	(0.057)	(0.029)
Small Party (excluding incumbent)	0.430	52884.556	1097	-0.065	-0.062	-0.058	-0.044
	(0.034)			(0.040)	(0.040)	(0.052)	(0.027)
Propensity to Win	0.348	47599.604	983	0.025**	0.019*	0.020	0.019***
	(0.008)			(0.011)	(0.010)	(0.014)	(0.007)
Wealth (log)	11.525	45650.244	935	0.731**	0.629**	0.797**	0.465**
	(0.266)			(0.329)	(0.312)	(0.391)	(0.203)
Political Experience	0.864	63463.948	1363	0.039	0.039	0.042	0.025
	(0.055)			(0.069)	(0.069)	(0.098)	(0.052)
Ideology Index	5.119	46136.879	932	-0.026	-0.119	-0.035	-0.034
	(0.138)			(0.179)	(0.175)	(0.242)	(0.109)
Female	0.160	49300.518	1029	-0.038	-0.033	-0.009	-0.019
	(0.024)			(0.031)	(0.030)	(0.047)	(0.020)
Age	49.680	38378.228	784	-1.173	-0.878	-1.505	-0.544
	(0.842)			(0.988)	(0.959)	(1.254)	(0.598)
College Degree	0.564	44672.481	917	-0.028	0.004	-0.023	-0.010
	(0.037)			(0.047)	(0.046)	(0.062)	(0.028)
White	0.610	48601.658	1011	-0.000	-0.011	-0.012	-0.004
	(0.036)			(0.048)	(0.043)	(0.070)	(0.026)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	30000
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variables are two measures of the number of candidates who run for office, followed by municipality-level averages of various candidate characteristics. The "Propensity to Win" denotes the propensity for a candidate to win an election based on his observable characteristics (see Table A.3). See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.26: Effects of Campaign Spending Limits on Political Selection (Levels, No Open Seats)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Propensity to Win	0.377	57564.112	1191	0.027*	0.025	0.014	0.023**
	(0.012)			(0.016)	(0.016)	(0.025)	(0.011)
Wealth (log)	11.847	48031.071	994	0.602	0.557	0.327	0.606*
	(0.455)			(0.529)	(0.504)	(0.718)	(0.325)
Total vote share of small parties	0.456	50543.288	1055	-0.065	-0.063	-0.020	-0.045
	(0.039)			(0.049)	(0.049)	(0.073)	(0.032)
Total v. share of small parties (ex. inc.)	0.374	59070.149	1230	-0.060	-0.066	-0.025	-0.046
	(0.034)			(0.041)	(0.041)	(0.068)	(0.029)
Small Party	0.404	60556.494	1270	-0.018	-0.021	0.004	-0.020
	(0.049)			(0.061)	(0.063)	(0.085)	(0.045)
Political Experience	0.880	61340.167	1298	0.057	0.076	0.055	0.031
	(0.097)			(0.127)	(0.125)	(0.195)	(0.093)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	30000
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The "Propensity to Win" dependent variable denotes the propensity for a candidate to win an election based on his observable characteristics (see Table A.3). See Table 3 for more details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.27: Effects of Spending Limits on Winners' Contributions (Levels, No Open Seats)

	Linear Optimal Bandwidth				w/ Controls	Quadratic	Means
	Mean	BW	Obs	(1)	(2)	(3)	(4)
Overall Contributions	75555.52	43018.660	881	5644.46	8411.95**	4306.72	14002.80***
	(2903.40)			(3991.32)	(3972.75)	(5695.63)	(2542.76)
Own Funds	29590.36	62867.298	1341	10415.82***	9938.74**	4475.62	11504.93***
	(2650.73)			(4000.36)	(4246.91)	(6181.95)	(3007.25)
Individual Donations	38921.00	50240.885	1050	-4240.09	-3028.71	-2578.59	1514.25
	(2813.72)			(3828.58)	(3780.64)	(5059.51)	(2598.15)
Party Donations	6410.23	34140.572	697	1613.34	4185.65*	2461.15	1074.86
	(1824.65)			(2410.26)	(2374.86)	(2749.05)	(1562.29)
All Other Donations	213.57	42277.090	864	-169.55	-120.10	70.98	-91.24
	(109.33)			(253.22)	(253.34)	(310.83)	(147.30)
Bandwidth	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	30000
Polynomial Order	One	One	One	One	One	Two	Zero
Municipal Controls	No	No	No	No	Yes	No	Yes

Notes: The dependent variable "Overall Contributions" is equal to the sum of the four contribution categories: own funds, individual donations, party donations, and all other donations. See Table 3 for additional details. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.