What Happens When a Woman Wins an Election? Evidence from Close Races in Brazil

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Abstract

This paper analyzes the effect of the gender of local policymakers on policy outcomes. Analyzing a rich dataset from Brazilian municipalities and using a regression discontinuity design, we find that municipalities ruled by female mayors have better health outcomes, receive more federal discretionary transfers, and have lower corruption. Additionally, male mayors hire more temporary public employees than their female counterparts when they are allowed to run for re-election, and when municipal elections are approaching. These findings suggest that male mayors may promote more political patronage than female mayors and that men and women may respond differently to local election incentives.

JEL codes: J16, P16, D72 , I00, I18.

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1 Introduction

In recent years, a great deal of attention has been focused on the role of women as policymakers.[1] Several empirical studies find evidence consistent with the hypothesis that the gender of the policymaker affects policy decisions and outcomes (among others, Chattopadhyay and Duflo (2004), Rehavi (2007), Ferreira and Gyourko (2011), Bhalotra and Clots-Figueras (2012), Gagliarducci and Paserman (2012)).[2] In this paper, we provide new evidence on the link between the gender of the policymaker and several policy outcomes at the municipal level and highlight how local election incentives might affect gender differences, by analyzing close elections between male and female candidates for mayor in Brazilian municipalities.

The empirical literature has analyzed the effect of the gender of the policymaker using two alternative institutional settings. One set of papers focuses on female politicians elected as a result of policies that establish minimum quotas of political positions reserved for women. The other one focuses on open contested elections between candidates of different genders. The seminal contribution of Chattopadhyay and Duflo (2004) finds that the reservation of political positions for women in India affects the types of public goods provided. Beaman et al. (2009) argue that prior exposure to a female chief councilor elected because of a quota affects female attitudes and the gender composition of the future political leaders.[3] Several papers that analyze settings without quotas also find that the gender of the politician matters (among others, Rehavi (2007); Ferreira and Gyourko (2011); Bhalotra and Clots-Figueras (2012)). A key difference between elections with quotas and without is that in the latter there is competition across genders. This distinction may be relevant, as the experimental literature suggests that women may perform differently when competing against men than when competing against other women (Gneezy, Niederle and Rustichini (2003), Gneezy and Rustichini (2004)).

[1] A broader related literature analyzes women's empowerment and economic development, see Doepke, Tertilt and Voena (2011) and Duflo (2011) for recent reviews.

[2] A family of theoretical models that would be consistent with gender differences in policies would be one in which male and female politicians have different policy preferences (Alesina, 1988). For instance, the experimental literature finds evidence that, under some circumstances, the choices women make are more socially oriented than men's (see, for instance, Nowell and Tinkler (1994), Andreoni and Vesterlund (2001), Eckel and Grossman (2008)).

[3] See also Fréchette, Maniquet and Morelli (2008), De Paola, Scoppa and Lombardo (2010), Pande and Ford (2011) and Besley et al. (2012) for analyses of the effects of introducing gender quotas in different settings.

In this paper, we contribute to this literature by highlighting how local election incentives may affect gender differences in policy decisions and outcomes in a competitive environment. Local elections can increase accountability, helping to align politicians' actions to voters' preferences, but may also generate incentives for politicians to behave strategically.[4] The effect of local elections on the behavior of politicians may differ across genders if men and women respond differently to electoral incentives. A number of studies find evidence consistent with this possibility. For instance, several papers have shown that men are more willing to self-select into competitive environments than women and that their performance is more sensitive to the level of incentives provided (Gneezy, Niederle and Rustichini (2003), Niederle and Vesterlund (2007), Nierdele and Yestrumskas (2008), Dohmen and Falk (2011), Attali, Neeman and Schlosser (2010)). However, most of this evidence is from experimental settings and it is not clear whether gender differences found in the lab persist in the political arena.

We use a rich micro dataset of municipalities in Brazil to analyze whether the gender of the policymaker affects policy outcomes and whether local election incentives play a role in explaining gender differences. In order to control for municipality-specific confounding factors we adopt a Regression Discontinuity (RD) design in close electoral races.[5] In this set-up, identification comes from comparing municipalities where a female candidate barely won an election against a male candidate with municipalities where the opposite occurred.

We focus on outcomes that depend on the effort of the local government and for which administrative data at the municipal level are available. First, we look at discretionary infrastructure transfers from the federal government because the effort of the mayor is an important determinant of the amount of transfers that municipalities receive in Brazil.[6] Second, we analyze health outcomes, focusing in particular on health care services related

[4]Consistent with this idea, a growing empirical literature shows that electoral incentives may affect the performance of local politicians. Besley and Case (1995) and List and Sturm (2006) provide evidence that electoral incentives influence fiscal and environmental policies of U.S. governors. Foster and Rosenzweig (2004) show that electoral competition affects the provision of public goods in Indian villages. In the case of Brazil, the empirical evidence shows that term limits in mayoral elections affect corruption (Ferraz and Finan (2011)) and the local implementation of federal cash transfer programs (de Janvry, Finan and Sadoulet (2012)).

[5]See also Lee, Moretti, and Butler (2004), Lee (2008), Pettersson-Lidbom (2008), Vogl (2012) or Brollo and Nannicini (2012) for other examples of RDD in close elections. This strategy has been adapted to study gender differences in politics by Rehavi (2007), Ferreira and Gyourko (2011), Gagliarducci and Paserman (2012) and Bhalotra and Clots-Figueras (2012).

[6]Anzia and Berry (2011) analyze gender differences across members of Congress in the U.S. in attracting funds from federal discretionary programs.

to prenatal care delivery. The public health system in Brazil is decentralized, spending is mostly financed by the federal government, but municipalities are responsible for all decisions regarding resource allocation. Thus, municipal policies are a relevant determinant of health outcomes. Third, we analyze gender differences in corruption, using data from random audits of municipal governments that allow us to construct an administrative measure of corruption, instead of relying on survey measures.[7] Fourth, we analyze changes in temporary public sector employees, as temporary hires are a widely used political patronage instrument in Brazil (Engerman and Sokoloff (2002); Weyland (1996); Mainwaring (2002); Ames (1995)). Finally, we analyze whether the decision to run for re-election and the probability of re-election differ between male and female mayors elected after contested mixed gender races.

Our results show that there are significant gender differences in terms of policy outcomes. First, we find that female mayors attract twice as much discretionary transfers from the federal government than their male counterparts. Second, our results show that having a female mayor leads to better health outcomes related to prenatal care delivery. In particular, municipalities with a female mayor have 61 percent less women without prenatal medical visits and 1.3 percent more regular (i.e. non-premature) births. These positive health effects are concentrated on less educated mothers, who are more dependent on public health provision. Third, we find that female mayors are less likely to engage in administrative irregularities. The probability of observing a corruption episode is 33 to 28 percent lower in municipalities with female mayors than in those with male mayors. Fourth, we analyze gender differences in public employment. We find that male mayors hire about 50 percent more temporary employees to work directly in the municipal administration than female mayors. However, we do not find any significant differences across genders when analyzing permanent public employees. Finally, when analyzing re-elections, we find no differences across genders in the probability of running for re-election. Our results show, though, that female candidates elected after a contested mixed election have a 50 percent lower probability of being re-elected compared to their male counterparts. Ferreira and Gyourko (2011) study the relationship

[7]The relationship between the gender of the policymaker and corruption has received considerable attention in the literature. For example, Swamy et al. (2001) use micro data to show that women are less involved in bribery. Dollar et al. (2001) show that corruption is less severe in the countries where women constitute a majority of parliamentary seats, senior positions in the government bureaucracy, and the labor force. Beaman et al. (2009), by using random assignment of gender quotas in India, find that female leaders accept less bribes than their male counterparts do.

between the gender of the policymaker and re-election outcomes, among other things, in close races for mayor in the United States. The authors find that male mayors adopt similar policies compared to female ones, but female mayors are more likely to be re-elected. The difference between our findings and theirs might be explained by the type of policies we study, which are different from theirs, by the fact that in developing countries female politicians are a lower proportion of politicians than in developed countries, and usually face different attitudes and incentives and possibly by differences in attitudes toward women in Brazil and United States.

To analyze whether local election incentives motivate differently male and female politicians, we focus on two heterogeneous treatment effects that can plausibly capture the incentives provided to politicians by municipal elections. First, we study term limits, as the ability to run for re-election might affect the policies implemented by local politicians. Mayors in Brazil are only allowed to run for a consecutive term one time, so we compare gender differences between mayors in their first and second terms. Second, we analyze whether mayors behave differently when elections are approaching. Municipal elections in Brazil are held every four years, at the same time, so we compare gender differences between pre-electoral years (the last two years of the mandate) and non-electoral years (the first two years of the mandate).

Our results suggests that male and female politicians may respond differently to local election incentives. First, we find that male mayors tend to hire more temporary employees to work directly in the municipal administration than their female counterparts only in their first term, when they are allowed to run for re-election. This finding suggests that male mayors might be promoting more political patronage to get re-elected than female mayors. We also find that differences in terms of prenatal visits between municipalities with male and female mayors arise only for politicians in their second-term, which is consistent with the idea that lame-duck male mayors may perform worse than their female counterparts.[8] Finally, we find that male mayors tend to hire more temporary public employees (relative to female mayors) in the two years before the election, rather than in the first two years of their

[8]For transfers we find no significant differences across municipalities with mayors in their first and second mandate. It should be noted that in Brazil, the effort of the mayor in attracting these transfers is not the only determinant of the amount of transfers these municipalities receive. The interest of the president in providing resources to municipalities is another important determinant.

term.[9]

The paper proceeds as follows. Section 2 describes the Brazilian institutional framework. Section 3 lays out our identification and estimation strategy. Section 4 discusses the empirical results and validity tests. Section 5 concludes.

2 Institutions and Data

2.1 The Brazilian federal system, the allocation of infrastructure transfers and electoral data

The Brazilian presidential federal system takes place in a context of a multi-party system.[10] The layers of political and administrative organization in Brazil are the federal government, the states, the federal district and the municipalities. Municipalities are minor federative units with an autonomous local government, ruled by a mayor, directly elected by citizens to a four-year mandate, and a legislative body, also directly elected by voters. Mayors of municipalities above 200,000 voters are directly elected by a majority runoff rule, while mayors of municipalities below 200,000 voters are directly elected with plurality rule.[11] The elections of the President, governors, and members of Congress all take place at the same time every four years, while municipal elections are staggered by two years and also take place every four years. Before 1998 Brazilian mayors could not run for re-election, but after 1998, mayors were allowed to run for a second term. In our study we are considering two municipal administration mandates in municipalities below 200,000 voters: 2001-2004 and 2005-2008. Electoral data come from *Tribunal Superior Eleitoral*.

Municipal administrators are responsible for delivering a relevant share of public services and goods related to education, health, and infrastructure projects. The fact that mayors have veto power over the budget makes them the most important actors in deciding the allocation of public goods and services. However, municipal administrations are highly financially constrained. Apart from some big cities, such as Brazilian state capitals, municipalities

[9] We find that the outcomes measuring discretionary transfers and percentage of women without a prenatal visit do not vary across years within the term. One possibility is that intrinsic motivations are more important for prenatal care outcomes or discretionary transfers than electoral incentives. Alternatively, the ability to provide those public goods may differ across genders.

[10] This subsection relies heavily upon Brollo and Nannicini (2012).

[11] See Fujiwara (2011a) for an analysis of the effects of this electoral rule in Brazilian municipalities.

strongly rely on state and federal transfers as their sources of revenue (tax revenue represents only 5.5 percent of the municipal total revenues, on average). The most important source of municipal revenues are federal transfers (on average amount to 65 percent of the municipal budget). There are two different types of federal transfers: constitutional automatic transfers (i.e. Fundo de Participação do Municipio - FPM and *"Transferências Fundo a Fundo"*); and (2) discretionary transfers – *CONVENIO* agreements.[12] Most of these transfers (82 percent) are earmarked for infrastructure projects.[13]

This study focuses on discretionary transfers devoted to infrastructure projects, which amount to about 15 percent of total municipal expenditure in infrastructures. These transfers are related to budget items that involve the construction of buildings and bridges, the paving of roads, the improvement of water and sewer systems, the purchase of ambulances, and so on. We focus on this type of federal transfers because the bulk of the other revenues are largely non-discretionary and hard to manipulate.[14]

Both mayors and the president have important roles in determining the allocation of discretionary transfers. The amount of discretionary infrastructure transfers a municipal government receives depends on three factors: (i) the effort of their municipal administration in applying for transfers; (ii) the interest of a federal deputy in supporting the approval of the budget law that refers to these transfers; and (iii) the interest of the President in executing the budget amendment (i.e., send the money to that municipality).

Data on infrastructure transfers self-reported by municipal administration and are obtained on the Brazilian National Treasure Website (*Tesouro Nacional*) –*FINBRA* dataset.[15]

[12]The allocation mechanism of FPM transfers (which corresponds to 75 percent of federal transfers) depends on the population size and the state in which the municipality is located. From this total amount of federal transfers received by each municipality, there are also fixed coefficients that establish the amount of funds. 70 percent of FPM transfers are unrestricted and 30 percent to be converted into education and health expenditures: 15 percent in education and 15 percent in health. Another type of constitutional transfers are *"Transferências Fundo a Fundo"*. These transfers can be targeted to different areas (education, health, social assistance, etc) and their allocation is based on income per-capita or number of children enrolled in school.

[13]We calculate these percentages with data from FINBRA. See the subsection below where we give detailed information on our data.

[14]As a falsification test, we also performed RDD estimations on constitutional automatic transfers (FPM), detecting no effect of gender on their allocation (results are available upon request).

[15]Only since 2002 has it been possible to distinguish discretionary from constitutional transfers that finance infrastructure projects. For consistency, the period of analysis (2001-2008) considers the overall amount of federal infrastructure transfers (*Transferências de Capital*). On average, 78 percent of the total amount of infrastructure transfers is discretionary (*CONVÊNIO*). Note that after year 2002 FINBRA brings information on discretionary (*CONVÊNIO*) and constitutional infrastructure transfers. The percentage of discretionary

These data provide information from municipal and state annual balance sheets.[16]

2.2 The Health Care System in Brazil

One of the most important characteristics of the public health system in Brazil is decentralization. Spending is mostly financed by the federal government, but the municipalities are responsible for all decisions regarding resource allocation (Collins et al., 2000). Transfers are directly sent from the central government to the municipalities. The amounts are defined by constitution, transferred automatically and on a monthly basis (Transferências de Fundo a Fundo) and are mostly intend to finance primary care.

Another source of primary health care is the Family Health Program (*Programa Saúde na Família*), introduced by the municipal health secretariats in collaboration with the states and the Ministry of Public Health. This program finances health education, immunization, nutritional care, consultation with the doctor in basic specialities, dentist basic care, home visits by nurse or community health worker, basic emergencies, minor operations in addition to prenatal care, family planning activities and birth at home by a family doctor. The federal government supplies technical support and finances the program. Federal funding includes a fixed component based on population and income per capita, and the central government can also make discretionary transfers based on requests from the municipalities. As municipal administrations are responsible for the allocation of these resources, municipal policies are a relevant determinant of health outcomes.

To analyze health outcomes, we use data from the Information System on Live Births (SINASC). This system is managed by the Secretariat of Health Surveillance, in conjunction with state and municipal health departments. Each state health department collects data on live birth certificates in healthcare facilities and on the registries (for home births) and inputs all the information into the SINASC. The Ministry of Health then assembles the data. This

transfers in the total amount of infrastructure transfers is calculated by using the average for these years (2003-2008).

[16]The variable used in the first part of the analysis is the log of total amount of the per-capita infrastructure transfers. We choose the log specification given the skewness of the transfers received by the municipalities. Municipalities that do not receive infrastructure transfers are not dropped when we run the log specification. For the log transformation we considered a reported amount of R$ 1,00, then, the log amount is zero. All budget variables are in real values, base year 2006 (IPCA - FGV deflator). Alternatively, we estimate a Poisson regression considering as an outcome the transfers per capita, and our results are unchanged. Results are available upon request.

dataset contains monthly information on number of prenatal medical visits and on period of pregnancy (weeks). The variables we are employing for this analysis is the share of pregnant women without prenatal medical visits and births that are not considered as pre-mature (at least 37 weeks).

2.3 Measuring corruption

Data on corruption come from random audits of municipal governments. These data are coded from audit reports by Brollo et al. (2013).[17] The main categories of irregularities described in the audit reports are: 1) *illegal procurement practices*, which occur when one of the following is reported: a) competition has been limited, for example, when associates of the mayor's family or friends receive non-public information related to the value of the project, b) bid value has been manipulated, c) irregular firm wins the bid process, d) the minimum number of bids is not attained, or e) the required procurement procedure is not executed; 2) *fraud*; 3) *over-invoicing*, occurring when there is evidence that public goods or services are purchased for a value above the market price; and 4) *diversion of funds*. Our definition of corruption is a dummy variable that indicates whether at least one episode of any of the types of irregularities described above is detected by auditors (similar to Brollo et al. (2013)).

3 Empirical Strategy

3.1 Identification: Regression Discontinuity

Identifying the effects of gender on policy outcomes is a daunting task. A comparison between municipalities with a female mayor and those with a male mayor will probably generate biased estimates due to endogeneity issues. For instance, local policies might be correlated with municipality-specific characteristics such as attitudes towards women or demographic characteristics, all of which could also influence the gender of the local mayor. Define $\tau_{i,t}(1)$ as the potential outcome of municipality i if the mayor is a woman, and $\tau_{i,t}(0)$ as the potential outcome of the same municipality if the mayor is a man, in a specific time period t.[18] We

[17] Similar measures of corruption are used by Ferraz and Finan (2008; 2011) and Brollo (2011).

[18] In our equations, t is year or term depending on whether we have data for our outcome at the year or at the term level.

are interested in estimating the difference in *potential* outcome in mixed-gender race, i.e. $E(\tau_{i,t}(1) - \tau_{i,t}(0)|j \in \Omega)$. The problem of causal inference is that, at a given point in time, we cannot observe both potential outcomes. That is, it is impossible to know the outcomes a city that has a female mayor would have had with a male mayor. The intuition of our identification strategy is that cities in which a woman won against a man by a narrow margin can be a good counterfactual for those places in which the opposite occurred (a man won again a woman by a narrow margin). In this setting the identification comes from the assumption that in close races random factors are crucial to decide elections. Therefore the probability of winning is the same for both female and male candidates.

The variable F_{it} defines the treatment status: $F_{it} = 1$ if the mayor is a woman, and $F_{it} = 0$ otherwise. The observed outcome is thus: $\tau_{it} = F_{it} \cdot \tau_{it}(1) + (1 - F_{it}) \cdot \tau_{it}(0)$. The estimand of interest is the ATE, $E[\tau_{it}(1) - \tau_{it}(0)]$, defined over some sub-population of interest.

Specifically, we define the *treatment group* as the municipalities that have a mayor who is woman elected in a mixed-gender race. Assignment to treatment can be formalized as:

$$Female_{it} = 1[MV_{it} \geq 0] \tag{1}$$

where MV_{it} is the female candidate margin of victory in municipality i during term t and $1[.]$ the indicator function. It is specified as the difference between the vote for the female candidate *minus* the vote share of the male candidate, meaning it will have positive values if the mixed-gender electoral race resulted in a female mayor. This measure is thus greater than zero in municipalities where the mayor is woman, and lower than zero otherwise. At the zero threshold, $MV_{it} = 0$, the gender of the mayor F_{it} sharply changes from zero to one. MV_{it} can be seen as a random variable depending on observable and unobservable variables, as well as on random events on election day. The standard RDD assumption is that potential outcomes must be a continuous function of the running variable at the threshold (Hahn, Todd, and Van der Klaauw, 2001). We test this assumption in section 4.4.[19]

The ATE in close elections is thus:

$$\gamma \equiv E[\tau_{it}(1) - \tau_{jt}(0)|MV_{it} = 0] = \lim_{MV_{it} \downarrow 0} Y_{it} - \lim_{MV_{it} \uparrow 0} Y_{it} \tag{2}$$

[19]It should be noted that the assumptions refer to the *potential* outcomes. The actual outcome will be only one, of course, and if gender plays a role in affecting outcomes it will also be discontinuous at $MV = 0$.

γ is defined as a local effect, because it captures the impact of the gender of the mayor on the outcome only for towns around the threshold $MV = 0$ (i.e. for the elections that were decided for a margin that is tiny enough).

3.2 Estimation

We first analyze whether gender is correlated with our outcomes by estimating the following OLS equations:

$$\tau_{it} = \rho_0 + \rho_1 F_{it} + \mu_t + \eta_{it} \tag{3}$$

where τ_{it} is the outcome of interest in municipality i in time period t, F_{it} is a dummy that is one when the mayor of the municipality is female, μ_t are year fixed effects and standard errors are clustered at the municipality level because the same city may be observed in different mayoral terms or years.[20] We report coefficient $\hat{\rho_1}$, which does not have a causal interpretation because the gender of the politician might be correlated with the error term.[21]

We use two different methods to estimate the ATE expressed in equation (2). First, we fit a p-order polynomial in MV_{it} on either side of the threshold $MV_{it} = 0$:

$$\tau_{it} = \sum_{k=0}^{p} (\rho_k MV_{it}^k) + F_{it} \sum_{k=0}^{p} (\pi_k MV_{it}^k) + \mu_t + \eta_{it}, \tag{4}$$

where MV_{it} is the margin of victory in municipality i in time period t and standard errors are clustered at the city level. The estimated coefficient $\hat{\pi}_0$ identifies the ATE at the threshold $MV_{it} = 0$.[22]

We then follow Imbens and Lemieux (2008) and use a local linear regression approach, which restricts the sample to municipalities in the interval $MV_{it} \in [-h, +h]$ and estimates the model:

$$\tau_{it} = \rho_0 + \rho_1 MV_{it} + \delta_0 F_{it} + \delta_1 F_{it} \cdot MV_{it} + \mu_t + \eta_{it} \tag{5}$$

[20] It should be noted that we can include year fixed-effects only when we have yearly data for the outcome of interest.

[21] For example, this would happen if places that are more tolerant toward women are more likely to elect female mayors, and these places also adopt different policies.

[22] While the benefit of this estimation strategy is the possibility of keeping the whole sample, the cost is that results might potentially be sensitive to outcome values for observations far away from the threshold (see Imbens and Lemieux, 2008). We follow the standard procedure of fitting a third order polynomial. We computed our results with lower or higher order polynomials (i.e. identifying the effect on observations respectively farther and closer to the threshold) and our results are robust to different specifications. Results are available upon request).

where standard errors are clustered at the town level, and $\hat{\delta}_0$ identifies the ATE at the threshold $MV_{it} = 0$.

Finally we check for treatment effect heterogeneity in separate sub-samples. The intuition for this test is simple. Assume that D_{it} captures a given heterogeneity dimension. We are considering two dimensions that aim to capture whether electoral competition per se may exacerbate gender differences in policies: 1) whether the mayor is eligible for re-election, and 2) last two years of the mayoral mandate (when municipal elections are approaching). We estimate:

$$\begin{aligned} \tau_{it} = \sum_{k=0}^{p}(\rho_k MV_{it}^k) + F_{it}\sum_{k=0}^{p}(\pi_k MV_{it}^k) + \\ +D_{it}\cdot\big[\sum_{k=0}^{p}(\alpha_k MV_{it}^k) + F_{it}\sum_{k=0}^{p}(\beta_k MV_{it}^k)\big] + \xi_{it}. \end{aligned} \tag{6}$$

As a result, $\hat{\pi_0}$ identifies the treatment effect in $D_{it} = 0$, $\hat{\pi_0} + \hat{\beta_0}$ in $D_{it} = 1$, and $\hat{\beta_0}$ the difference between the two. The interpretation of the difference between the two sub-samples should not be causal.

4 Results

4.1 Sample selection and descriptive statistics

Brazil has 5,567 municipalities. Our study encompasses all municipalities for which we have non-missing outcome data and with mixed gender races in two elections: October 2000 and October 2004.[23] Mayors are in office for four years, i.e. from 2001 to 2004 and from 2005 to 2008, respectively.

To implement our identification strategy in the Brazilian multi-party system we restrict our sample to races with two candidates where one candidate is a woman and the other is a man. We only consider two candidates elections because in races with more than two candidates there is a discontinuity of the density of the running variable, probably because most candidates are men.[24] Races with only two candidates amount to 51 percent of the

[23]For each outcome of interest we have checked that missing values are balanced around the threshold (available upon request).

[24]For instance, the discontinuity of the log-density of our running variable for the elections with three candidates is estimated in -0.094 with a standard error of 0.054. Appendix Figure A1 shows the density of the samples of elections with three candidates and election with more than three candidates.

total. If we further restrict the sample to elections where we have two candidates of different gender, we end up with a sample of 723 races, representing 7 percent of the races in each term. To evaluate the external validity of our sample, we compare municipal and mayoral characteristics between our sample and the rest of the Brazilian elections. Table 1 and Table 2 display the results. Races in our sample, among other things, are more likely to happen in smaller and poorer cities. Table 3 presents the results of a similar exercise for our outcomes. Municipalities in our sample receive more discretionary infrastructure transfers.

Our estimation strategy controls for municipality-specific characteristics. Therefore we should not expect any difference in municipal characteristics between treatment and control groups around the cut-off $MV_{it} = 0$. Our dataset allows us to test a vast array of observable municipal characteristics, including geographic location of the city, income and population. These balance tests for municipal characteristics are reported in Table 4.[25] It's particularly interesting that even the gender wage gap at the municipality level is balanced across the cut-off $MV_{it} = 0$.[26] Table 4 also reports the results of balance tests for several mayoral characteristics (party affiliation, education, experience, etc) showing that there is no discontinuity around the cut-off for any of these observable characteristics. This is important as differences in mayoral characteristics could affect the interpretation of the results. For example, if men are more likely to face a binding term limit our estimates could potentially reflect the effect of this difference, and not gender differences per-se.

The results of these balance tests are corroborated by visual inspection. Figures 1, 2, 3, and 4 show scatterplots of the mean of municipal and mayoral characteristics. The variable on the x-axis is the margin of victory, and the observations are averaged within bins of 2 percent of margin of victory. We plot the average of each of these variables for municipalities in which women won (at the right of cut-off $MV_{it} = 0$) and for municipalities where men won (at the left of cut-off $MV_{it} = 0$). Given that the density of the margin of victory is concentrated around zero, points closer to zero (close races) are both more relevant for

[25]Note that we perform these balance tests by applying a polynomial approximation. We also did the same check by applying a local linear regression with optimal bandwidth and we find nearly identical results. Results are available upon request.

[26]This variable is computed using micro data from the 2000 Brazilian demographic census. We estimate, for each Brazilian municipality, whether the log of the hourly wage is affected by observable characteristics (gender, age, residence region, education, occupation and race). The gender coefficient obtained in these regressions is our measure of gender gap.

our strategy and contain more information compared to those far from the zero margin of victory.[27] We find no discontinuities around the threshold for all variables.[28]

4.2 The Consequences of a Female Candidate Winning a Mixed Gender Close Election

Our main results are reported in panels A and B of Table 5. For all outcomes we report OLS results and two different specifications for the RDD estimates. In particular, we show our baseline results from a split third order polynomial specification which considers the entire mixed gender sample and the results for local linear regressions with optimal bandwidth.[29,30]

In panel A of the Table 5 we report the results for total, discretionary and non-discretionary infrastructure transfers, health outcomes, and corruption. The results in column 1 show that women attract significantly higher infrastructure transfers for their municipalities.These results are driven by discretionary infrastructure transfers (column 2), as we find no significant differences for non-discretionary infrastructure transfers (column 3). This result is reassuring, as non-discretionary transfers are rule-based and thus should not be affected by the gender of the mayor. In terms of economic magnitude our results show that female mayors attract twice as much discretionary transfers from the federal government than their male counterparts.

Columns 4 and 5 in panel A of the Table 5 report the results for our health care outcomes: percentage of women who did not attend any prenatal visits and percentage of births in

[27] See Figure 7.

[28] It is particularly interesting to note that we find convergence in close elections also for the observables that do not seem to be balanced for elections that are not close. For example, as can be seen from the graphs of both age and the educational variables, female mayors are on average substantially more educated and younger than their male counterparts. The finding that female leaders are more educated than male ones is consistent with what Gagliarducci and Paserman (2012) find for Italian politicians, and the result is also consistent with what Goldin, Katz and Kuziemko (2009) find recently for American college women. However, in close elections even those educational and age variables do converge together and the jump is not statistically significant.

[29] Our baseline results are obtained using a third order polynomial. But we also find similar results using a second-order or fourth-order polynomial and a local linear specification using optimal bandwidths (Results are available upon request). In addition, we repeated the analysis implementing a simple t-test of the means of all of our outcomes in closed intervals around the threshold $MV = 0$ (with intervals getting smaller and smaller) and in most cases found statistically significant differences between municipalities headed by women and men, as shown in the Appendix Table A1.

[30] We compute optimal bandwidth with the algorithm by Calonico, Cattaneo and Titiunik (2012).

which the baby was not born premature.[31] Our RDD estimates in column 4 show us that the percentage of women without any prenatal visits is lower in municipalities headed by female mayors. Moreover, in these municipalities, the probability of a pre-mature birth is relatively lower (column 5). According to our third order split polynomial specification, we find that the share of pregnant women without any prenatal visits decreases by 1.6 percent (or 61 percent of the baseline mean) and regular births (i.e. the not pre-mature ones) increase by 1.2 percent (or 1.3 percent of the baseline mean) in municipalities headed by female mayors.[32] One potential interpretation for these findings is that women mayors are monitoring closer the (given) health resources allocated to a municipality. An alternative interpretation is that women attract more transfers and this makes easier to provide health care. To distinguish between these two alternative channels, we would need to obtain data on the quality of the public health spending, and on the proportion of discretionary transfers that are allocated to health. Unfortunately this information is not available at the municipality level for our sample period.

Column 6 in panel A of Table 5 shows results for our corruption measure, which is a dummy variable that equals one if the mayor is found to be involved in at least one irregularity classified as corruption. For these regressions we can use only the sample of municipalities that were audited by the program. The results show that women are less likely to be involved in corruption episodes, on average. The size of the estimated coefficient is relatively similar across specifications and implies that the probability of observing a corruption episode is 33 to 28 percent lower in municipalities with female mayors than in ones with male mayors. Despite the small sample size, it is reassuring that corruption data are obtained from a random sampling procedure, given that the Brazilian Anti-Corruption Program randomizes the auditing process.

Visual inspection of the outcomes in Figure 5 confirms the results described above, as there are visible discontinuities around the cut-off. In this figure, outcomes are averaged into bins of intervals of the margin of victory. Note that the bins closer to the cut-off contain more observations, given that the density of our running variable (margin of victory of the

[31] Bhalotra and Clots-Figueras (2012) is a paper contemporaneous and independently started from ours that looks at the relationship between child mortality and gender of the politician. See also Clots-Figueras (2012) on the relationship between education and the gender of the politician.

[32] A third outcome that can be analyzed from our dataset is babies' birthweight. We find that this outcome is not affected by the gender of the policymaker. Results are available upon request.

female candidate) is concentrated around zero.

The first two columns of Panel B of Table 5, display the results for public employees hired to work directly for the municipal administration. We look at two variables: the number of temporary public employees (column 2, in logs), and the number permanent public employees (column 3, in logs).[33] We find that female mayors hire around 50 percent fewer temporary public employees than male mayors. We do not find a statistically significant difference for permanent public employees. Increases in temporary public sector employees are a widely used political patronage instrument in Brazil. If this is the case, we would expect this outcome to be sensitive to changes in the political environment of the municipality. We provide more evidence regarding the link between temporary public employment in Brazilian municipalities and politics in the next section.

In the last two columns of Panel B we look at the effect of gender on the probability of running for re-election and on the probability of being re-elected. The results in column 4 show that female mayors in our sample are around 20 percentage points less likely to be re-elected than male mayors, out of a baseline mean of 38 percent. This effect is particularly surprising, especially in light of the findings discussed above, which show that women provide better outcomes and attract more resources. The results in column 5 show that the decision to run for re-election is not affected by gender.[34] These findings are confirmed by visual inspection of Figure 6.

Public health services target mostly lower income and less educated segments of the population. So if female mayors are improving the provision of public health services, we would expect to find a larger effect on this segment of the population. To test this we repeat our analysis of health outcomes for separate educational categories. These results are reported in Table 6 and show that the effect of having a female mayor on health outcomes is

[33]Data on the number of public employees hired to work directly for the municipal administration come from the survey *Perfil dos Municipios Brasileiros* 2005 and 2008. Unfortunately we were not able to obtain these data for more years. This implies that we are considering for one term both the first and last year of the mandate.

[34]It is important to note that, even if female mayors after a mixed gender close election are less likely to be re-elected, this does not imply that female mayors that were elected during a close election are less likely to be in a second term. Our outcome "Probability of re-election" refers to the election subsequent to the mixed gender close election. This means that the margin of victory of the incumbent mayor in the subsequent elections or the gender of the opponent are most likely different. On the other hand, the variable on which we implement the balance test refers to a second term during the current election. The latter is balanced, as shown in the graph in the bottom right of Figure 3.

concentrated on less educated mothers who are more dependent on public health provision.[35]

For most of our empirical results, the size of the effect of gender in the RDD estimates is larger, and more likely to be statistically different than zero, than the effect estimated by the OLS specifications. This could be explained by at least two reasons. First, the RD design controls for city-specific confounding factors, which might attenuate the effect estimated using OLS.[36] Second, the RD coefficient is identified by close elections, whereas the OLS coefficient averages over all races (competitive and non-competitive races). If politicians of different genders behave differently in competitive and non-competitive races, this could explain the differences between OLS and RDD coefficients. For instance, as discussed above, competition might exacerbate gender differences.

4.3 Gender Differences and Local Election Incentives

In this section we analyze whether term limits and electoral cycles may play a role in explaining the gender differences that we find. As discussed above, electoral competition could generate gender differences in campaign strategies and policies if men and women respond differently to incentives.

Table 7 reports the results of these estimations, which follow the specification in equation (6). Panel A reports results exploiting term limits. Mayors in Brazil can not be in office for more than two consecutive terms. Panel B focuses on the timing of elections. In particular, we compare pre-electoral years (two last years of the municipal administration mandate) versus first years of the mandate. Columns 1, 2 and 3 report the results using discretionary infrastructure transfers, no prenatal visits and temporary public employee as dependent variables, respectively.[37]

The results in Panel A show that female mayors hire less temporary public employees than

[35]Fujiwara (2011a) studies the effect of voting technology on health outcomes, and finds that the effects of this policy are concentrated on uneducated mothers as well.

[36]Our empirical strategy controls for unobservable city-specific confounding factors, but it is still possible that some individual level characteristics are correlated with the gender of the mayor. While we acknowledge this limitation, which is probably the main empirical challenge for this literature, we believe that it is reassuring that all of our individual level observable variables converge in close elections, as confirmed by visual inspection of Figures 3, and 4.

[37]Re-election outcomes are by construction available only for mayors in their first term, because of the Brazilian two-term-limit legislation. Hence we cannot perform this exercise on those outcomes. Additionally, we did not include the heterogeneity for the non premature births outcome, given that coefficients are too imprecisely estimated and are not significant in both sub-samples. Results are available upon request.

their male counterparts only in their first term. Additionally, the difference we find between municipalities governed by women and men in terms of prenatal visits are present only when mayors are in their second term. On the other hand, we find that the differences between men and women in terms of transfers exist in both periods. The results for temporary public employment and prenatal visits suggest that policy responses to the possibility of running for re-election might be gender differentiated.

These findings, and in particular the hiring of public employees, might potentially rationalize the finding that men who win a close race against a woman are more likely to be re-elected. First, there is the direct channel of rewarding a politician who provides public jobs. Second, these new public employees might be directly involved in tasks related to electoral campaign of the incumbent. The results for prenatal visits seem to be driven by lame duck mayors, suggesting that men deliver worst outcomes compared to women particularly when mayors are not allowed to run again for election.

The results in Panel B show that gender differences in transfers and the health results seem to be independent from electoral cycles. However, we also find that male mayors hire relatively more temporary public employees than women when elections are approaching. This last finding is potentially consistent with political patronage and re-election incentives having a role in explaining gender differences in politicians' behavior, while it is inconsistent with an explanation purely based on differential preferences over public good provision. The causal interpretation of these results rests on an additional assumption. We need to assume the dimension along which the heterogeneity is measured is independent from other factors that affect gender differences in politics. Thus, in the spirit of Grembi, Nannicini and Troiano (2012) and Brollo et al. (2013), we perform an additional robustness check by checking whether the gender differences we find in Table 7 are robust to a specification including a full set of interactions with covariates at the municipality level and individual level, and the results are virtually unchanged.[38]

4.4 Validity tests

RDD estimates in close races rely on the assumption that political candidates cannot manipulate the electoral outcomes. To test this assumption we conduct several robustness checks.

[38]Results are available upon request.

First, we check for nonrandom sorting by visually inspecting the histogram of the margin of victory (see Figure 7). We can see that there are no clear spikes at the right or the left-hand side of the discontinuity. Second, we address the concern of non-random sorting by formally testing the continuity of the density of the margin of victory, following McCrary (2008), in Figure 8. This procedure tests the null hypothesis of continuity of the density of the margin of victory at the zero threshold, and it is implemented by running kernel local linear regressions of the log of the density separately on both sides of zero. We find no evidence of discontinuities in the margin of victory of the female candidate.

Another concern when performing a regression discontinuity design is that results might driven by the specific functional forms considered. Our baseline results are obtained using a third order polynomial . We also find similar results using a second-order or fourth-order polynomial and a local linear specification using optimal bandwidths[39]. To further alleviate concerns arising from the specific RDD functional forms considered, we repeated the analysis implementing a simple t-test of the means of all of our outcomes in closed intervals around the threshold $MV = 0$ (with intervals getting smaller and smaller) and in most cases found statistically significant differences between municipalities headed by women and men, as shown in the Appendix Table A1.

Finally, we perform a set of placebo tests to rule out the possibility that our results arise from random chance rather than a true underlining causal relationship. To do this, in the spirit of DellaVigna and La Ferrara (2012), for all our outcome variables we conduct a set of RDD estimations at false thresholds of the margin of victory. In particular, for each outcome we estimate 580 RDD regressions considering fake margins of victory between 30 percent and 1 percent below and above the threshold (using increments of 0.1 percent). In Appendix Figure A2, we plot the cumulative density function of the t-statistics of the fake treatment effects from these regressions. At these false thresholds, we expect to find no systematic evidence of treatment effects.[40] The figures show that most of the coefficients from these placebo tests are not statistically significant, providing strong support to the robustness of our main results.

[39]Results are available upon request

[40]The figure reports the t-test from a specification with 3^{rd}-order polynomial; results are virtually unchanged with a local linear specification in an optimal bandwidth.

5 Conclusion

In this paper, we analyze the effect of the gender of the policymaker on policies and outcomes, and present new evidence suggesting that men and women may respond differently to local elections incentives (term limits and municipal electoral cycles). By analyzing a rich micro dataset from municipalities in Brazil and using a Regression Discontinuity (RD) design in close electoral races we find that municipalities ruled by female mayors receive more discretionary transfers and have better health outcomes. Male mayors tend to hire more temporary public employees before municipal elections and are more likely to be involved in corruption than their female counterparts. We additionally find that male mayors tend to hire more temporary public employees (relative to female mayors) when elections are approaching and when they are eligible for re-election.

Our results raise a number of questions for further research. First, our findings suggest that politicians of different gender might respond differentially to local election incentives. This finding is consistent with the experimental literature, which tends to find that men are more willing to self-select into competitive environments than women and that their performance is more sensitive to the level of incentives provided (Gneezy et al. (2003), Niederle and Vesterlund (2007), Niederle et al. (2008), Dohmen and Falk (2011), Attali et al. (2011)). Building a bridge between experimental literature and research on gender in political situations is an exciting direction for future research.

Second, we are able to identify our effect in close elections, characterized by an high degree of competition. Our identification strategy does not allow us to identify the link between gender and policies in situations characterized by absence of electoral competition. Competition might *per se* enhance gender differences. A rapidly growing literature is making political competition an endogenous variable that can be chosen to maximize voters' welfare (Caselli et al., 2012).

Third, and related to the previous point, our results are obtained in a setting where there is competition among politicians of different genders and where these politicians decide to run for office against each other. It is thus not clear whether these findings would also apply to a setting with quotas reserved for female politicians. In fact, an interesting direction for future research would be to understand whether policies aimed at increasing female participation

in politics through quotas that restrict cross-gender competition have different implications than policies aimed at increasing the number of women competing in open elections.

Finally, it is unclear whether our results would persist in countries with different attitudes toward women compared to Brazil. Recent research suggest different channels through which attitudes toward women may affect policies and outcomes (Goldin and Rouse (2000), Beaman et al. (2009), Pino (2011) and Givati and Troiano, (2012)). Policymakers may benefit from explicitly accounting for those slow-moving constraints when designing policies aimed at increasing the participation of women in politics.

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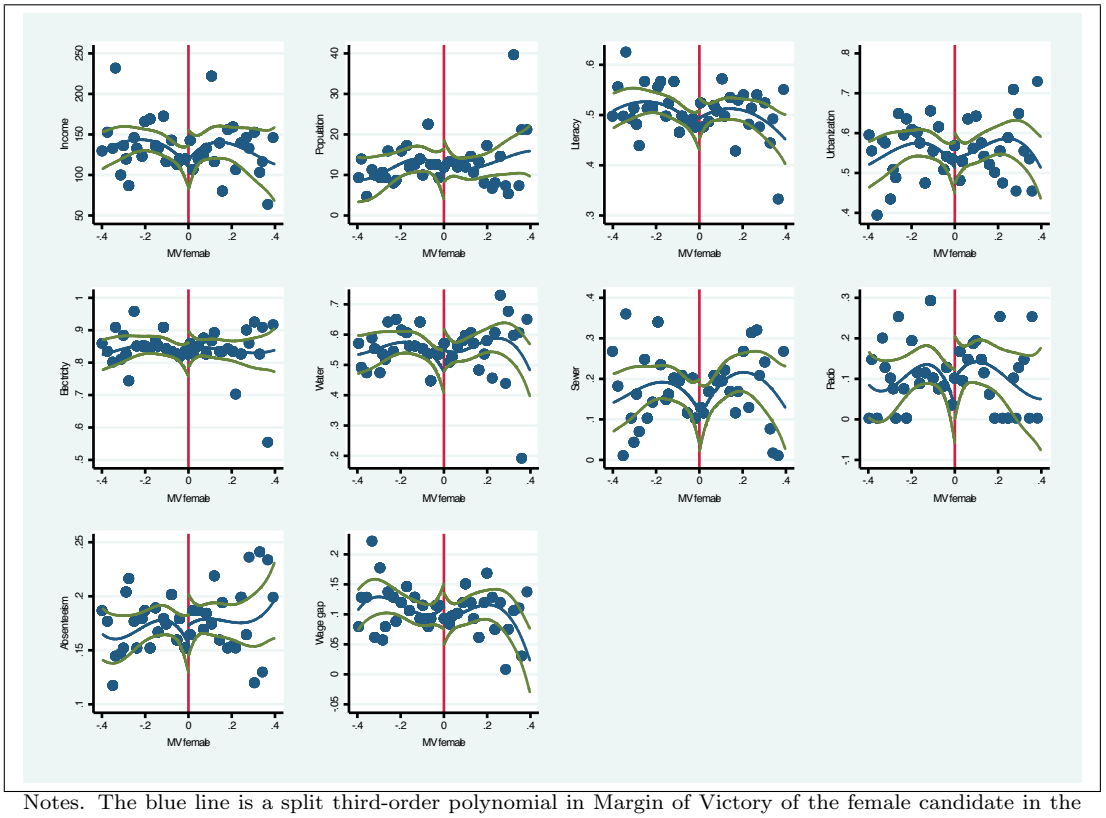
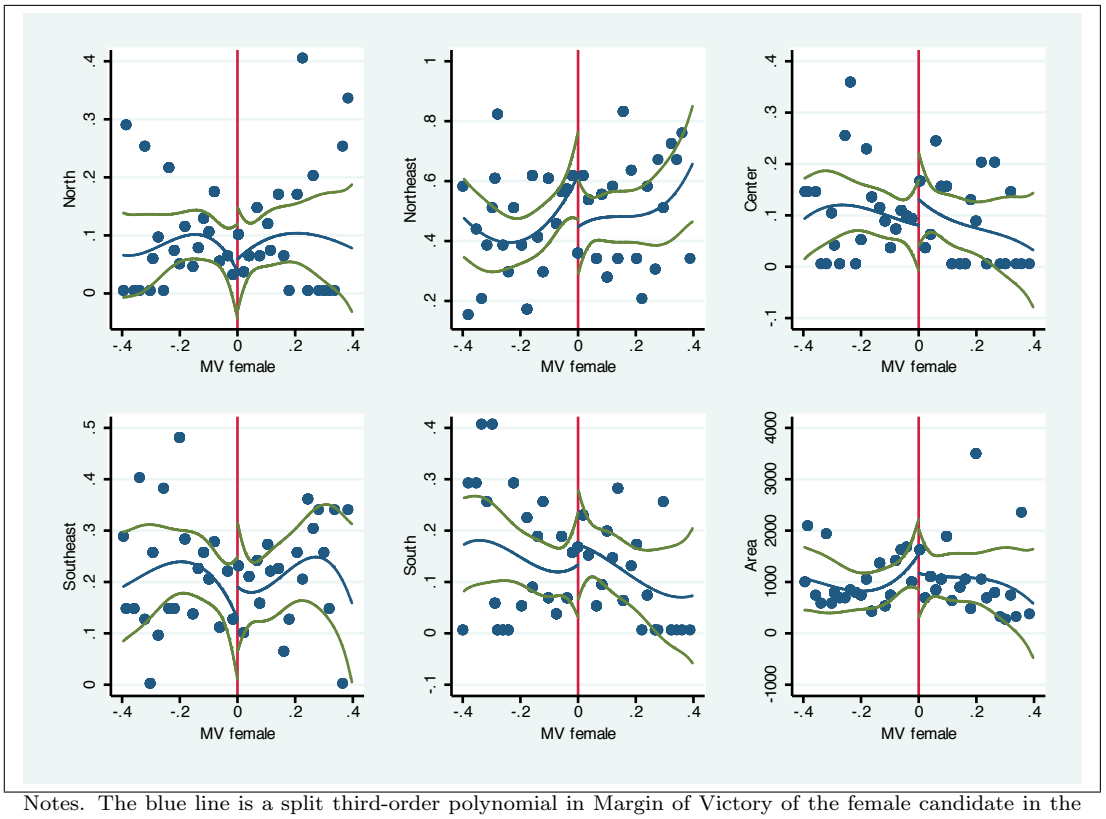
Figures

Figure 1: Balance Tests – Pre-Treatment Municipal Characteristics



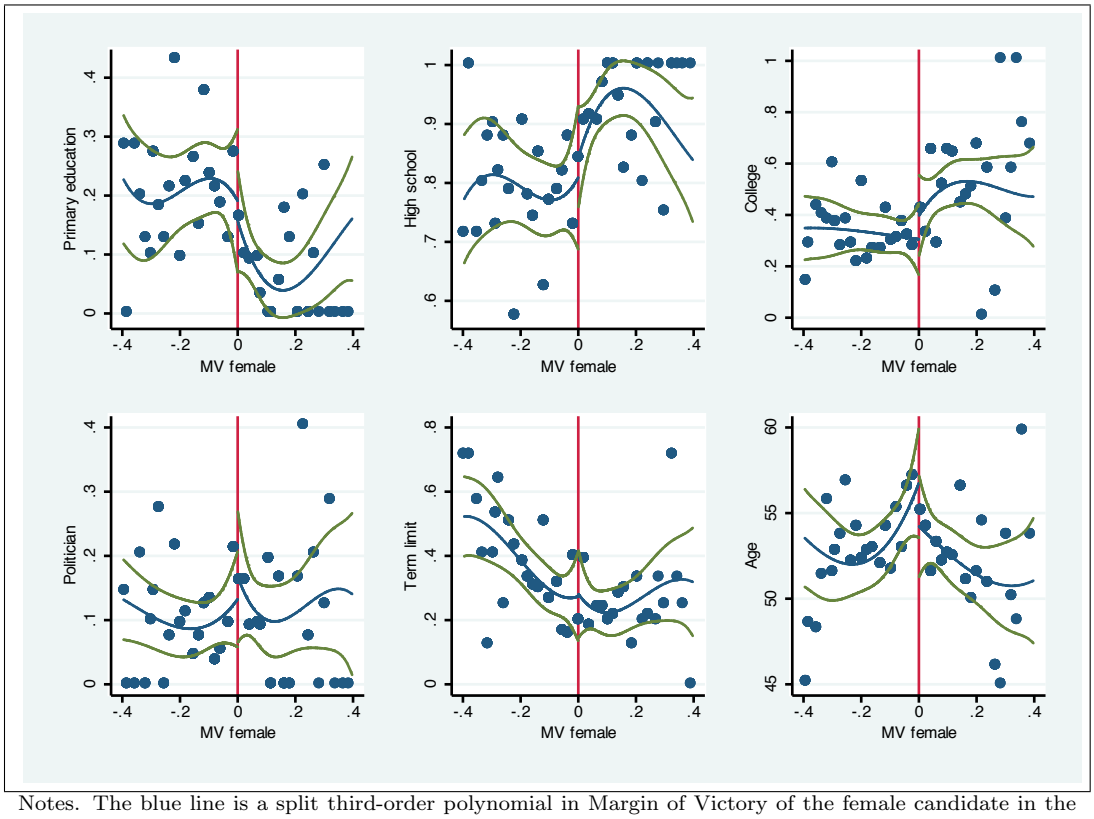
Notes. The blue line is a split third-order polynomial in Margin of Victory of the female candidate in the municipality i and mandate t, fitted separately on each side of the margin of victory (MV female) thresholds at zero. $MV_{it} > 0$ when the winner candidate in the municipality i and mandate t is female, $MV_{it} < 0$ when the winner candidate in the municipality i and mandate t is male. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. This sample considers races in 2000 and 2004 municipal elections. *Income* refers to monthly per-capita income in 2000 and is measured in Brazilian *reais*. *Population* refers to the number of inhabitants. *Literacy rate* is the fraction of people above age 20 who are literate. *Urbanization* is the fraction of people living in urban areas. *Electricity* is the fraction of houses with access to electricity. *Water* is the fraction of houses linked to the water system. *Sewer* is the fraction of houses linked to the sewerage system. *Radio* equals one if there is at least one local radio station in the municipality. *Absenteeism* is the fraction of voters that failure to appear in the election day. *Gender wage gap* is the estimated gender salary gap, see paper for details about the estimation of this variable.

Figure 2: Balance Tests – Invariant Municipal Characteristics



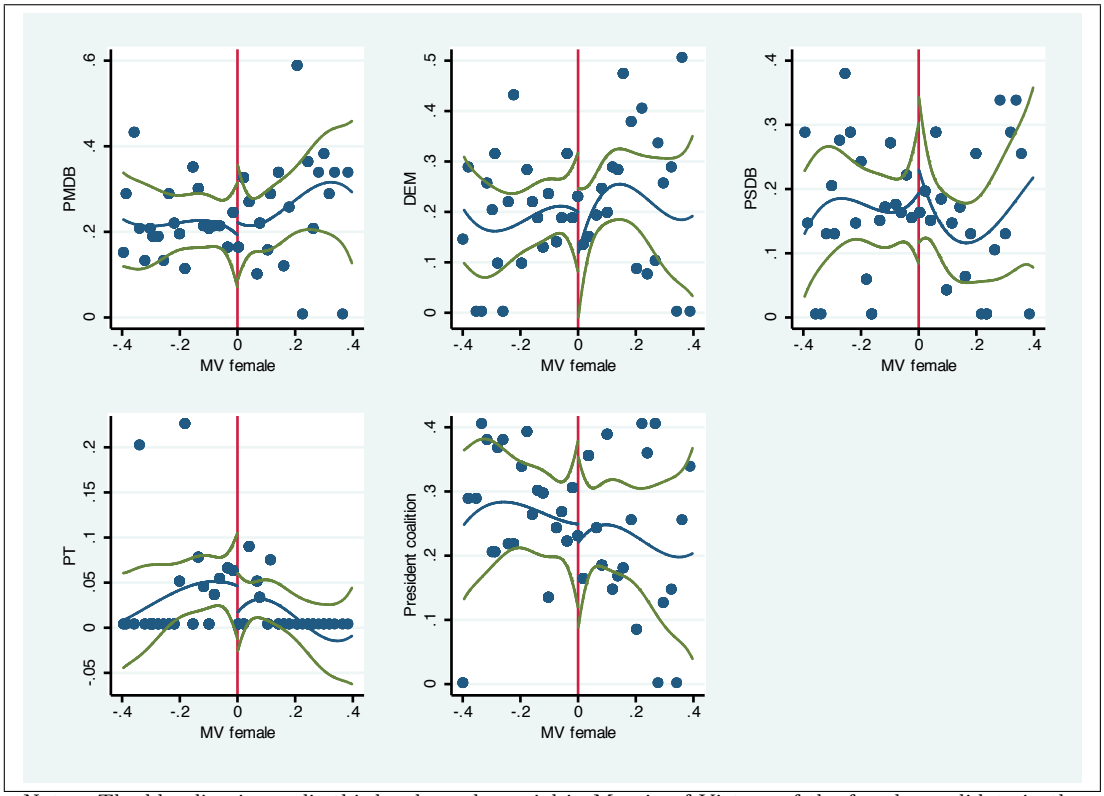
Notes. The blue line is a split third-order polynomial in Margin of Victory of the female candidate in the municipality i and mandate t, fitted separately on each side of the margin of victory (MV female) thresholds at zero. $MV_{it} > 0$ when the winner candidate in the municipality i and mandate t is female, $MV_{it} < 0$ when the winner candidate in the municipality i and mandate t is male. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. This sample considers races in 2000 and 2004 municipal elections. *North*, *Northeast*, *Center*, *South*, and *Southeast* are the Brazilian macro-regions. *Area* refers to the area size of the municipality.

Figure 3: Balance Tests – Mayoral Education and Political Experience



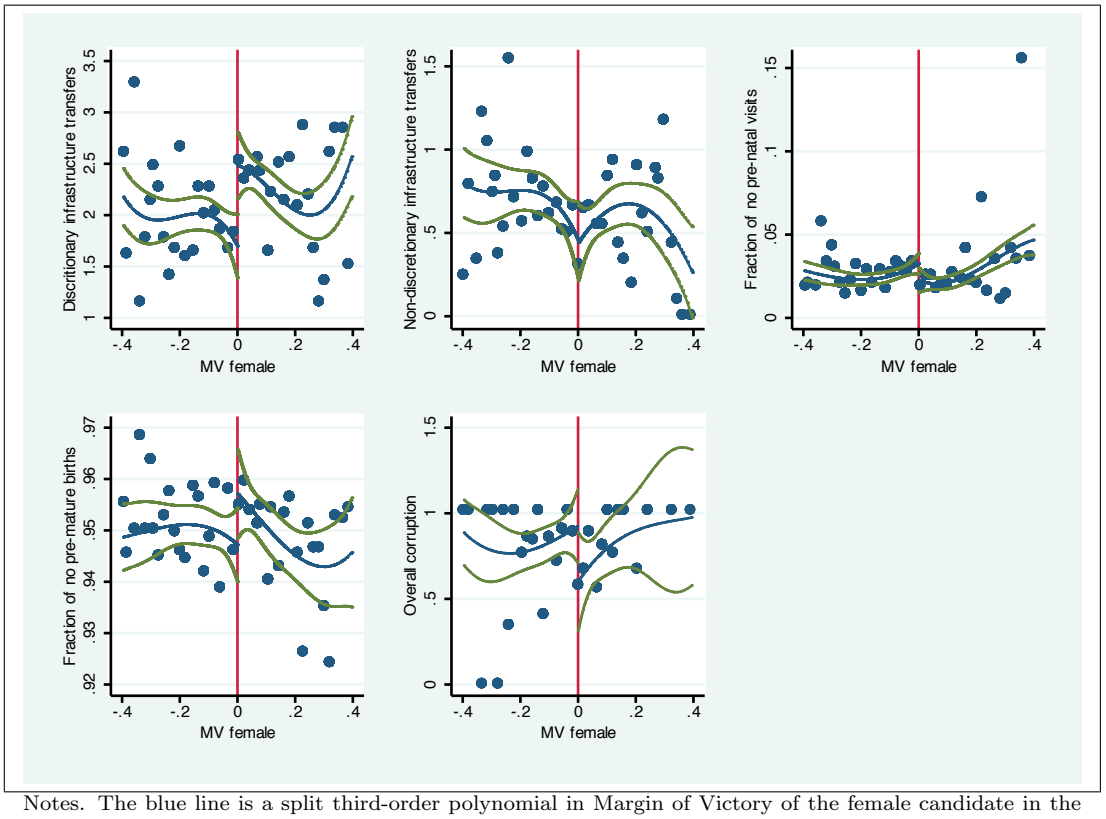
Notes. The blue line is a split third-order polynomial in Margin of Victory of the female candidate in the municipality i and mandate t, fitted separately on each side of the margin of victory (MV female) thresholds at zero. $MV_{it} > 0$ when the winner candidate in the municipality i and mandate t is female, $MV_{it} < 0$ when the winner candidate in the municipality i and mandate t is male. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. This sample considers races in 2000 and 2004 municipal elections. *Primary Education* is equal to 1 if the mayor has at most an elementary school degree. *Higher Education* is equal to 1 if the mayor has at least high school degree. *College* is equal to 1 if the mayor has at least college degree. *Politician* is equal to 1 if the mayor has previous experience in politics. *Term limit* is equal to 1 if the mayor is not eligible for re-election because is in a second consecutive term. *Age* is the age of the candidate calculated in years during the 2008 elections.

Figure 4: Balance Test – Mayoral Political Party Affiliation



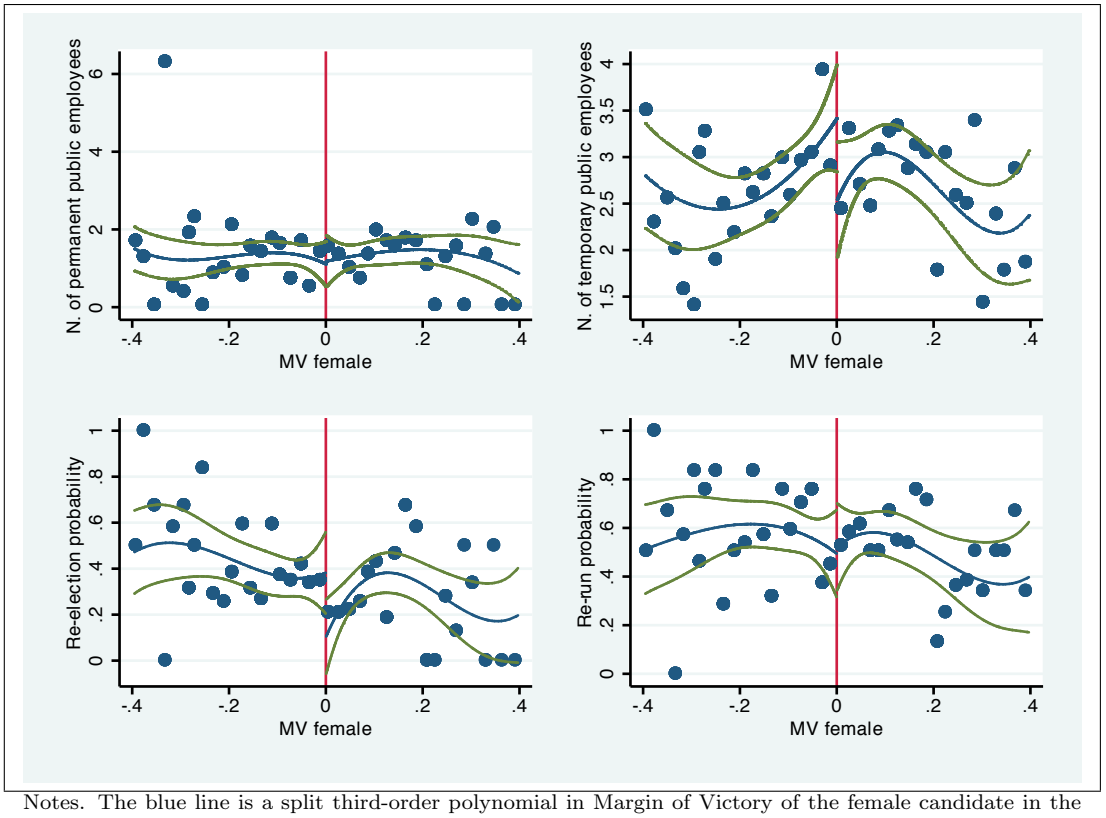
Notes. The blue line is a split third-order polynomial in Margin of Victory of the female candidate in the municipality i and mandate t, fitted separately on each side of the margin of victory (MV female) thresholds at zero. $MV_{it} > 0$ when the winner candidate in the municipality i and mandate t is female, $MV_{it} < 0$ when the winner candidate in the municipality i and mandate t is male. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. This sample considers races in 2000 and 2004 municipal elections. *PSDB*, *DEM*, *PMDB*, *PT* is the fraction of municipalities where the mayor is affiliated with PSDB, DEM, PMDB, and PT, respectively. *President's coalition* is the fraction of municipalities the mayor is affiliated to one of the president's coalition party.

Figure 5: The Effects of Gender on Infrastructure Transfers, Health Outcomes and on Corruption



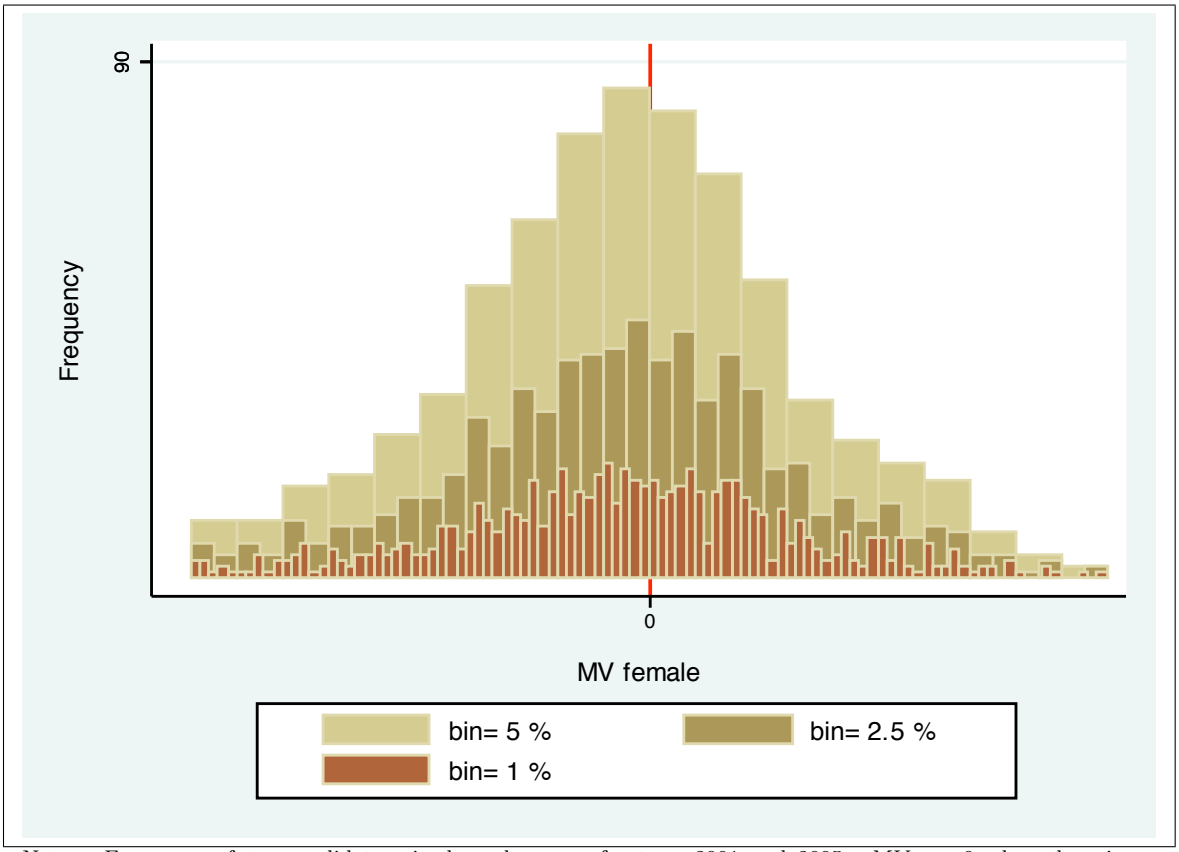
Notes. The blue line is a split third-order polynomial in Margin of Victory of the female candidate in the municipality i and mandate t, fitted separately on each side of the margin of victory (MV female) thresholds at zero. $MV_{it} > 0$ when the winner candidate in the municipality i and mandate t is female, $MV_{it} < 0$ when the winner candidate in the municipality i and mandate t is male. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. This sample considers races in 2000 and 2004 municipal elections. *Discretionary infrastructure transfers* and *Non-discretionary infrastructure transfers* are yearly transfers from the federal government to municipalities (log of per-capita real values in 2000 Brazilian *reais*). *No prenatal visits* is the yearly fraction of pregnant women without any prenatal visit before the delivery at the municipality level. *Non pre-mature births* is the yearly fraction of births that are not pre-mature at the municipality level. *Charges of corruption* equals one if at least one episode of corruption is reported.

Figure 6: The Effects of Gender on the Municipal Public Employment and on Electoral Outcomes



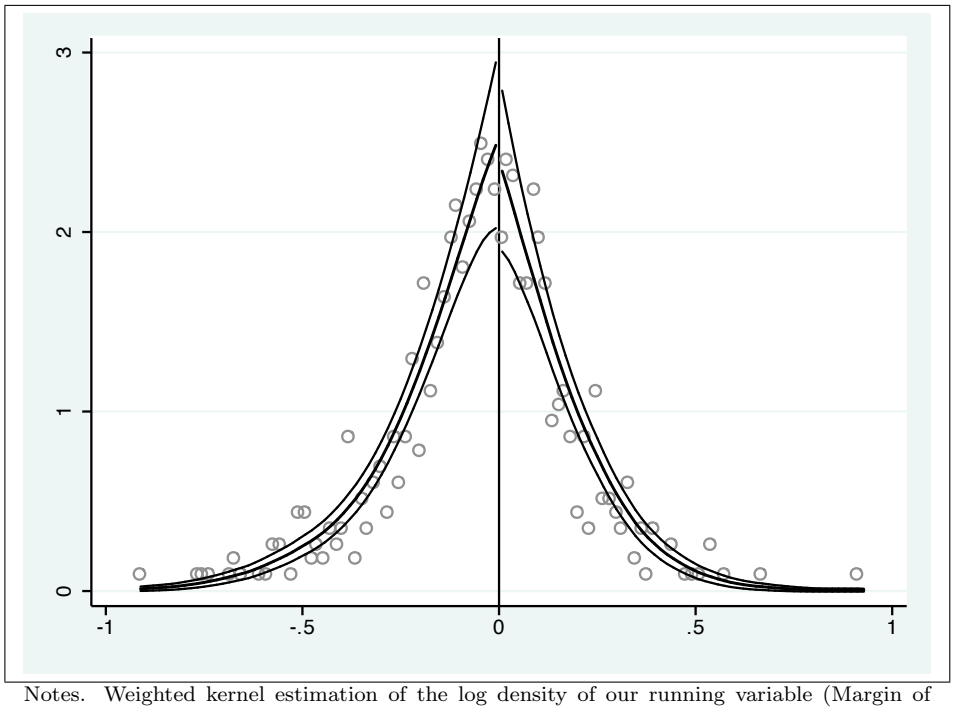
Notes. The blue line is a split third-order polynomial in Margin of Victory of the female candidate in the municipality i and mandate t, fitted separately on each side of the margin of victory (MV female) thresholds at zero. $MV_{it} > 0$ when the winner candidate in the municipality i and mandate t is female, $MV_{it} < 0$ when the winner candidate in the municipality i and mandate t is male. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. The green lines are the 95 percent confidence interval of the polynomial. Scatter points are averaged over 2 percent intervals. The sample for re-elections probabilities considers races in 2000 and 2004 municipal elections. The sample for public employment considers races in 2004 municipal elections. *Permanent public employee* denote the log of number of permanent public employees hired to work directly in the municipal administration. *Temporary public employee* denote the log of number of temporary public employees hired to work directly in the municipal administration. *Re-election* is equal to 1 if the incumbent mayor is re-elected. *Re-run* is equal to 1 if the incumbent mayor re-run the subsequent election. The last two variables are defined for mayors who are eligible to run for re-election.

Figure 7: Frequency of Margin of Victory, Two Candidates Mixed-Gender Races



Notes. Frequency of two-candidate mixed gender races for term 2001 and 2005. $MV_{it} > 0$ when the winner candidate in the municipality i and mandate t is female, $MV_{it} < 0$ when the winner candidate in the municipality i and mandate t is male.

Figure 8: McCrary Test, Two Candidates Mixed-Gender Races



Notes. Weighted kernel estimation of the log density of our running variable (Margin of Victory of the female candidate) performed separately on either side of the zero Margin of Victory threshold. $MV_{it} > 0$ when the winner candidate in the municipality i and mandate t is female, $MV_{it} < 0$ when the winner candidate in the municipality i and mandate t is male. (discontinuity estimate: point estimate -0.049 and standard error (0.071)). Optimal bin-width and bin-size as in McCrary (2008). This sample considers races in 2000 and 2004 municipal elections.

Tables

Table 1: Municipal Characteristics by Gender – Mixed Races vs Other Races

	(1) other races	(2) obs	(3) mixed races	(4) obs	(5) p-value
Municipal characteristics					
Population	24,753	10,054	12,317	723	0.000
Income per-capita (R$)	163	10,054	131	723	0.000
Literacy rate	0.558	10,054	0.502	723	0.000
Urban	0.589	10,054	0.553	723	0.000
Water supply	0.581	10,054	0.549	723	0.000
Electricity	0.870	10,054	0.839	723	0.000
Sewer	0.229	10,054	0.170	723	0.000
Absenteeism	0.185	10,054	0.176	723	0.016
Radio	0.210	10,054	0.109	723	0.000
Gender wage gap	0.134	10,054	0.101	723	0.000
North	0.082	10,054	0.084	723	0.832
Northeast	0.313	10,054	0.487	723	0.000
Center	0.082	10,054	0.093	723	0.316
South	0.216	10,054	0.130	723	0.000
Southeast	0.306	10,054	0.206	723	0.000

Notes. *Other races* is the sample of all other elections that is not considered in the sample *Two-candidate* mixed races. *Two-candidate* mixed races sample where one candidate is female and the other is male. Columns (1) and (3) report the average values in the respective samples; *obs* is the number of observations; *p-value* refers to the statistical significance of the difference between means. *Population* is the number of resident inhabitants in 2000. *Income* refers to monthly per-capita income in 2000 and is measured in Brazilian *reais*. *Urban population* is the fraction of people living in urban areas. *Water* is the fraction of houses with access to the water system. *Sewer* is the fraction of houses with access to the sewerage system. *Electricity* is the fraction of houses with access to electricity. *Absenteeism* is the fraction of voters that failure to appear in the election day. *Literacy rate* is the fraction of people above age 20 who are literate; *Presence of local radio station* is equal to 1 if there is at least one local radio station in the municipality; *Gender wage gap* is the estimated gender salary gap, see paper for details about the estimation of this variable. *North*, *Northeast*, *Center*, *South*, and *Southeast* are the Brazilian macro-regions.

Table 2: Mayoral Characteristics by Gender – Mixed Races vs Other Races

	(1) other races	(2) obs	(3) mixed races	(4) obs	(5) p-value
Mayoral characteristics					
Term limit	0.288	10,042	0.319	723	0.083
Politician	0.098	10,052	0.112	723	0.233
College	0.398	10,054	0.398	723	0.841
High School	0.402	10,054	0.841	723	0.650
Primary education	0.847	10,054	0.159	723	0.650
President's coalition	0.152	10,054	0.248	723	0.172
Married	0.779	10,054	0.818	723	0.008
Age	53.015	10,050	53.904	723	0.665
PSDB	0.270	10,054	0.160	723	0.567
DEM (PFL)	0.168	10,054	0.212	723	0.000
PMDB	0.208	10,054	0.225	723	0.262
PT	0.054	10,054	0.030	723	0.006

Notes. *Other races* is the sample of all other elections that is not considered in the sample *Two-candidate* mixed races. *Two-candidate* mixed races sample where one candidate is female and the other is male. Columns (1) and (3) report the average values in the respective samples; *obs* is the number of observations; *p-value* refers to the statistical significance of the difference between means. *Politician* is equal to 1 if the mayor has previous experience in politics. *College* is equal to 1 if the mayor has at least college degree. *High School* is equal to 1 if the mayor has at least high school degree. *Primary Education* is equal to 1 if the mayor has at most an elementary school degree. *President's coalition* is the fraction of municipalities the mayor is affiliated to one of the president's coalition party. *PSDB*, *DEM*, *PMDB*, *PT* is the fraction of municipalities where the mayor is affiliated with PSDB, DEM, PMDB, and PT, respectively. *Married* is equal to 1 if the mayor is married. *Age* is the age of the candidate calculated in years during the 2008 elections.

Table 3: Summary Statistics of Outcomes: Mixed Races vs Other Races

	(1) other races	(2) obs	(3) mixed races	(4) obs	(5) p-value
Re-election rate	0.352	7,155	0.347	493	0.806
Re-run rate	0.573	7,155	0.549	493	0.290
Permanent public employees	1.641	5,012	1.374	382	0.028
Temporary public employees	2.979	5,008	2.833	382	0.217
No pre-mature births	0.946	40,237	0.950	2,894	0.000
No pre-natal visits	0.025	40,237	0.026	2,894	0.279
Total infrastructure transfer	2.631	33,557	2.773	2,425	0.652
Non discretionary infrastructure transfer	0.659	33,559	0.646	2,425	0.000
Discretionary infrastructure transfer	1.973	33,557	2.126	2,425	0.000
Charges of corruption	0.766	2,057	0.828	163	0.070

Notes. *Other races* is the sample of all other elections that is not considered in the sample *Two-candidate mixed gender races*. *Two-candidate mixed gender races* sample considers only two-candidates races where one candidate is female and the other is male. Columns (1) and (3) report the average values in the respective samples; *obs* is the number of observations; *p-value* refers to the statistical significance of the difference between means in column (1) and column (3). *Re-election rate* denotes the fraction of incumbent mayor eligible to run for re-election that is re-elected. *Re-run rate* denotes the fraction of incumbent mayor eligible that re-run the subsequent election. *Permanent public employee* denote the log of number of permanent public employees hired to work directly in the municipal administration. *Temporary public employee* denote the log of number of temporary public employees hired to work directly in the municipal administration. *Non pre-mature births* is the fraction of births that are not pre-mature. *Non pre-natal visits* is the fraction of pregnant women without any pre-natal visit before the delivery. *Non discretionary infrastructure transfers* and *Discretionary infrastructure transfers* are yearly transfers from the federal government to municipalities (log of per-capita real values in 2000 Brazilian *reais*). *Charges of corruption* is the fraction of audited municipalities with at least one episode of corruption reported.

Table 4: Discontinuities of Town and Mayoral Characteristics in Mixed Close Races, RDD Estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A	*Brazilian macro-regions*											
	Southeast	South	Center	Northeast	North							
Female	-0.002	0.078	0.053	-0.140	0.011							
	(0.069)	(0.063)	(0.053)	(0.091)	(0.047)							
Panel B	*Pre-determinant town's characteristics*											
	Literacy rate	Electricity	Water supply	Urban	Income	Population	Sewer	Radio	Absenteeism	Wage gap		
Female	0.022	0.026	0.016	-0.009	8.878	-202	-0.033	0.043	0.008	-0.011		
	(0.024)	(0.032)	(0.040)	(0.035)	(14.343)	(2,644)	(0.041)	(0.050)	(0.015)	(0.026)		
Panel C	*Mayoral characteristics*											
	Term Limit	PT	PMDB	DEM	PSDB	President's coalition	Married	Age	Primary education	High school	College	Politician
Female	-0.014	-0.018	0.007	-0.075	0.042	-0.019	-2.853	-0.028	-0.109	0.109	0.069	0.019
	(0.079)	(0.030)	(0.076)	(0.074)	(0.070)	(0.076)	(0.075)	(1.861)	(0.067)	(0.067)	(0.086)	(0.061)
Obs.	723	723	723	723	723	723	723	723	723	723	723	723

Notes. Estimated discontinuities of town characteristics at the threshold of zero margin of victory. RDD specifications with split polynomial of Margin of Victory of the female candidate. *Two-candidate mixed gender races* sample considers only two-candidates races where one candidate is female and the other is male. In *Panel A the left-hand side variables are five Brazilian macro-regions: North, Northeast, Center, South, and Southeast. Panel B the left-hand side variables are pre-determined municipal characteristics: Literacy rate is the fraction of people above age 20 who are literate. Electricity is the fraction of houses with access to electricity. Water is the fraction of houses linked to the water system. Urbanization is the fraction of people living in urban areas. Income refers to monthly per-capita income in 2000 and is measured in Brazilian reais. Population refers to the number of inhabitants. Sewer is the fraction of houses linked to the sewerage system. Radio equals one if there is at least one local radio station in the municipality. Absenteeism is the fraction of voters that failure to appear in the election day. Gender wage gap is the estimated gender salary gap, see paper for details about the estimation of this variable. Panel C the left-hand side variables are mayoral characteristics: PSDB, DEM, PMDB, PT is the fraction of municipalities where the mayor is affiliated with PSDB, DEM, PMDB, and PT, respectively.President's coalition is the fraction of municipalities the mayor is affiliated to one of the president's coalition party. Primary Education is equal to 1 if the mayor has at most an elementary school degree. High School is equal to 1 if the mayor has at least high school degree. Married is equal to 1 if the mayor is married. Age is the age of the candidate calculated in years during the 2008 elections. College is equal to 1 if the mayor has at least college degree. Politician is equal to 1 if the mayor has previous experience in politics. Robust standard errors clustered at the municipality level are in parentheses. Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.*

Table 5: The Impact of Gender on Outcomes, RDD Estimates

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
	Total transfers	Discretionary transfers	Non discretionary transfers	Non pre-natal visits	No pre-mature births	Corruption
OLS	0.155	0.286***	-0.131*	-0.000	0.000	-0.057
	(0.102)	(0.107)	(0.076)	(0.003)	(0.003)	(0.064)
Observations	2,425	2,425	2,425	2,894	2,894	161
Spline polynomial	0.733***	0.835***	-0.102	-0.016**	0.012**	-0.338**
	(0.227)	(0.239)	(0.147)	(0.007)	(0.006)	(0.159)
Observations	2,425	2,425	2,425	2,894	2,894	161
Local linear regression	0.840***	1.080***	0.019	-0.013*	0.012**	-0.282**
	(0.240)	(0.267)	(0.131)	(0.008)	(0.006)	(0.141)
Optimal h	14	12	19	11	16	17
Observations	1,349	1,204	1,661	1,366	1,778	110
Panel B						
		Temporary public employment	Permanent public employment	Re-election	Re-run	
OLS		-0.008	-0.071	-0.091**	-0.035	
		(0.173)	(0.201)	(0.043)	(0.045)	
Observations		764	764	493	493	
Spline polynomial		-0.790*	-0.269	-0.214**	0.045	
		(0.444)	(0.558)	(0.104)	(0.116)	
Observations		764	764	493	493	
Local linear regression		-0.777*	-0.048	-0.185*	0.153	
		(0.439)	(0.548)	(0.101)	(0.127)	
Optimal h		13	13	14	11	
Observations		420	420	297	252	

Notes. Results are displayed for OLS, RDD 3^{rd} order spline polynomial and local linear regressions with optimal bandwidth calculated as in Calonico, Cattaneo and Titiunik (2012). RDD specifications with split polynomial and local linear regression as in equation (4) and (5), respectively. Dependent variables in Panel A: *Total infrastructure transfers*, *Discretionary infrastructure transfers* and *Non discretionary infrastructure transfers* are yearly transfers from the federal government to municipalities (per-capita real values in 2000 Brazilian reais). No pre-natal visits is the yearly fraction of pregnant women without any pre-natal visit before the delivery. No pre-mature births is the yearly fraction of births that are not pre-mature. Charges of corruption equals one if at least one episode of corruption. Dependent variables in Panel B: *Permanent public employee* is the log of number of permanent public employees hired to work directly in the municipal administration. *Temporary public employee* is the log of number of temporary public employees hired to work directly in the municipal administration. *Re-election* is equal to 1 if the incumbent mayor is reelected. *Re-run* is equal to 1 if the incumbent mayor re-run the subsequent election. The last two variables are defined for mayors who are eligible to run for re-election. *Two-candidate mixed gender races* sample considers only two-candidates races where one candidate is female and the other is male. h denotes the interval of our running variable. For instance h=10 represents mixed gender races where margin of victory is between -10% and 10%. Robust standard errors clustered at the municipality level are in parentheses. Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table 6: The Impact of Gender on Health Outcomes by Education Category, RDD Estimates

	(1)	(2)	(3)	(4)
	Illiterate	Semi-illiterate	Primary education	Secondary education
	Panel A: No pre-natal visits			
OLS	-0.012*	-0.002	-0.025**	-0.002
	(0.007)	(0.004)	(0.002)	(0.001)
Observations	2,894	2,894	2,894	2,894
Spline Polinomial	-0.032*	-0.025**	0.002	0.001
	(0.016)	(0.010)	(0.004)	(0.003)
Observations	2,894	2,894	2,894	2,894
Local linear regression	-0.026	0.015	-0.004	0.002
	(0.019)	(0.011)	(0.004)	(0.004)
Optimal h	12	12	14	14
Observations	1,450	1,450	1,614	1,614
	Panel B: No pre-mature births			
OLS	0.004	-0.003	0.002	0.002
	(0.005)	(0.004)	(0.003)	(0.004)
Observations	2,894	2,894	2,894	2,894
Spline Polinomial	-0.001	-0.001	0.009	0.008
	(0.011)	(0.010)	(0.009)	(0.011)
Observations	2,894	2,894	2,894	2,894
Local linear regression	0.018*	-0.004	0.004	0.011
	(0.010)	(0.011)	(0.008)	(0.012)
Optimal h	22	15	21	14
Observations	2,138	1,706	2,070	1,614

Notes. Results are displayed for OLS, RDD 3^{rd} order spline polynomial and local linear regressions with optimal bandwidth calculated as in Calonico, Cattaneo and Titiunik (2012). RDD specifications with split polynomial and local linear regression as in equation (4) and (5), respectively. Panel A report the results when *no pre-natal visits* is the dependent variable. Panel B report the results when *no pre-mature birth* is the dependent variable. *No pre-natal visits* is the yearly fraction of pregnant women without any pre-natal visit before the delivery. *No pre-mature births* is the yearly fraction of births that are not pre-mature. In column 1, *Illiterate* is the fraction of illiterate women with *no pre-mature births* or *non pre-natal visits*; in column2, *semi-Illiterate* is the fraction of semi-illiterate women with *no pre-mature births* or *no pre-natal visits*; In column 3, *Primary education* is the fraction of women with at most primary education and with *no pre-mature births* or with *no pre-natal visits*; in column 4, *Secondary education* is the fraction of women with at most secondary education and with *no pre-mature births* or *no pre-natal visits*, respectively. Robust standard errors clustered at the municipality level are in parentheses. Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table 7: The Impact of Gender on Discretionary Infrastructure Transfers, Pre-natal Visits and Temporary Public Employment, Heterogeneity Results

	Discretionary infrastructure transfers	No pre-natal visits	Temporary public employment
		Panel A	
First-term	0.704***	-0.006	-1.158***
	(0.236)	(0.005)	(0.423)
Second-term	0.767***	-0.019***	0.519
	(0.062)	(0.000)	(0.360)
Difference	0.063	-0.013*	1.677**
	(0.424)	(0.008)	(0.949)
Observations	2,425	2,894	764
		Panel B	
First 2-years	0.775***	-0.017***	-0.287
	(0.278)	(0.006)	(0.532)
Last 2-years	0.810***	-0.012***	-1.292***
	(0.030)	(0.001)	(0.136)
Difference	0.036	0.004	-1.005
	(0.371)	(0.007)	(0.746)
Observations	2,425	2,894	764

Notes. Results are displayed for RRD 3rd-order spline polynomial specification in different subsamples, as especfied in equation (6). In Panel A the heterogeneity dimension D_{it} is a dummy variable that denotes whether the mayor is on her second-term, where the mayor face a binding term limit. In panel B the heterogeneity dimension D_{it} is a dummy variable that denotes the last two years of the municipal mandate and zero in the first two years. *Discretionary infrastructure transfers* yearly amount of discretionary transfers from the federal government to municipalities (per-capita real values in 2000 Brazilian reais). No pre-natal visits is the yearly fraction of pregnant women without any pre-natal visit before the delivery *Temporary public employee* is the log of number of public employees hired to work directly in the municipal administration. *Two-candidate mixed gender races* sample considers only two-candidates races where one candidate is female and the other is male. Robust standard errors clustered at the municipality level are in parentheses. Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Appendix (For Online Publication)

This Appendix provides additional robustness checks, which are also discussed in the paper. In particular, we present the following robustness checks:

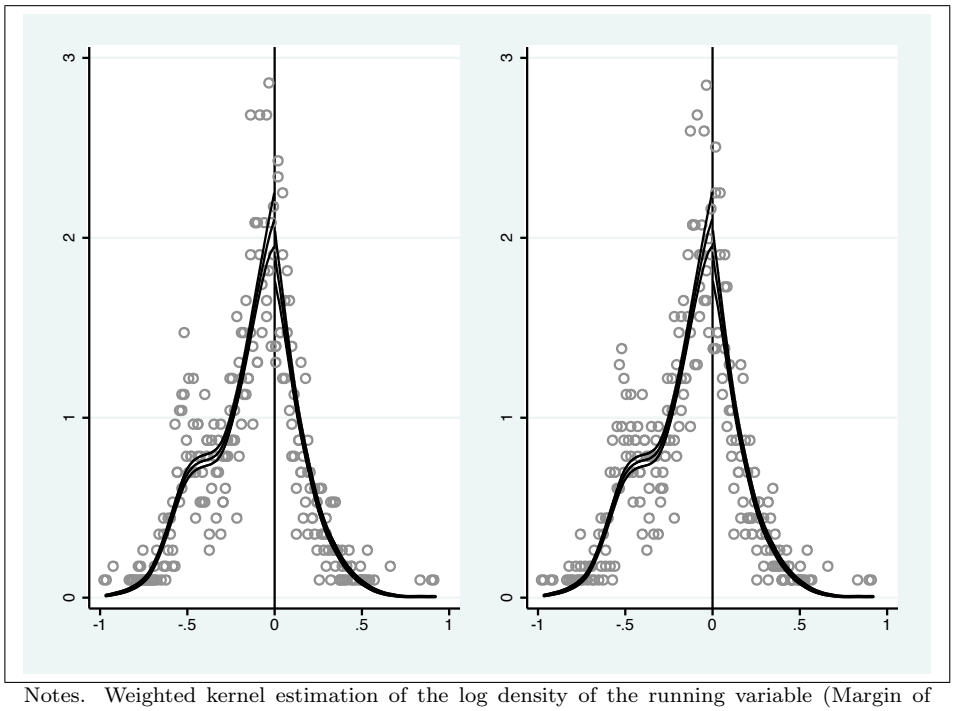
- T-test of the outcomes in close elections with different intervals of margin of victory of the female candidate (Table A1);
- Test of the continuity of the density for different sub-samples (Figure A1);
- Placebo tests based on permutation methods (Figure A2).

Table A1: T-test of the Outcomes in Close Elections with Different Intervals of the Margin of Victory of the Female Candidate: Female vs Male

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
MV Interval	Female	obs	Male	obs	p-value	Female	obs	Male	obs	p-value	Female	obs	Male	obs	p-value
	Total transfers					**Discretionary transfers**					**Non discretionary transfers**				
$[-5;+5]$	2.956	271	2.355	284	0.000	2.508	271	1.840	284	0.000	0.449	271	0.515	284	0.512
$[-7.5;+7.5]$	2.978	372	2.395	408	0.000	2.454	372	1.840	408	0.000	0.523	372	0.556	408	0.721
$[-10;+10]$	2.481	508	2.985	528	0.000	2.445	508	1.900	528	0.000	0.540	508	0.581	528	0.611
	No pre-natal visits					**No pre-mature births**									
$[-5;+5]$	0.023	324	0.031	340	0.028	0.953	324	0.947	340	0.128					
$[-7.5;+7.5]$	0.021	448	0.031	496	0.001	0.954	448	0.949	496	0.091					
$[-10;+10]$	0.021	602	0.029	648	0.000	0.954	602	0.949	648	0.051					
	Corruption														
$[-5;+5]$	0.688	16	0.904	21	0.099										
$[-7.5;+7.5]$	0.667	27	0.897	29	0.037										
$[-10;+10]$	0.697	33	0.872	39	0.070										
	Temporary public employees					**Permanent public employees**									
$[-5;+5]$	2.772	84	3.396	94	0.037	1,221	84	1,281	94	0.844					
$[-7.5;+7.5]$	2.791	114	3.238	130	0.080	1.156	114	1.176	130	0.932					
$[-10;+10]$	2.846	156	3.081	170	0.302	1.182	156	1.953	170	0.778					
	Re-election probabilities					**Re-run probabilities**									
$[-5;+5]$	0.200	60	0.348	66	0.064	0.566	60	0.500	66	0.458					
$[-7.5;+7.5]$	0.224	85	0.351	91	0.062	0.576	85	0.554	91	0.768					
$[-10;+10]$	0.254	114	0.367	120	0.064	0.544	114	0.578	120	0.595					

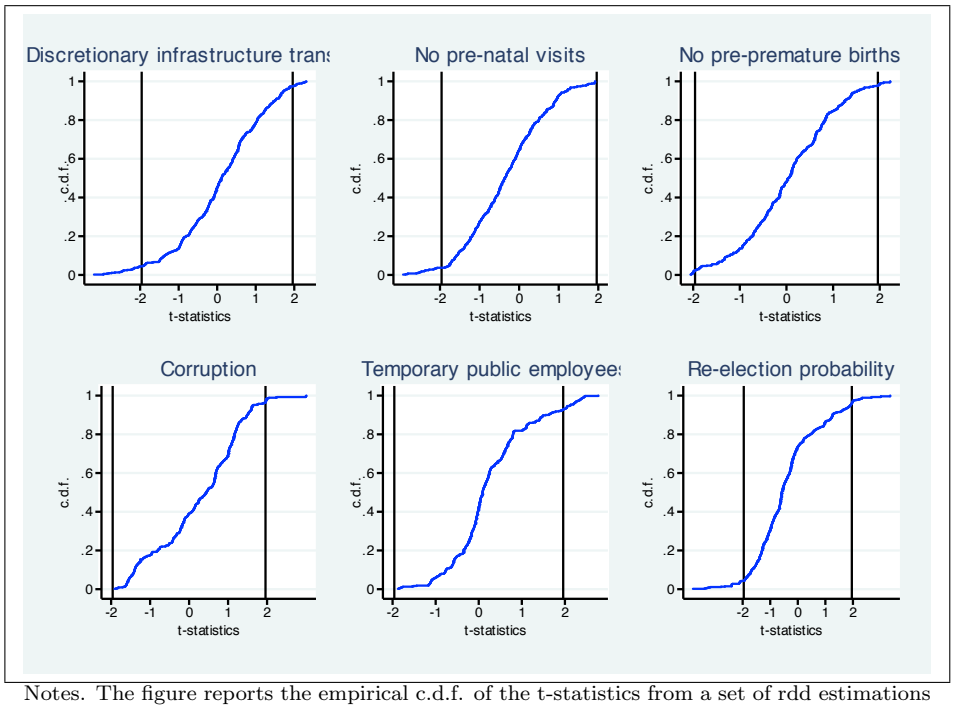
Notes. Mean-comparison tests for samples of municipalities with female mayors ($MV > 0$) vs male mayors ($MV < 0$). Three different intervals of Margin of Victory of the female candidate are considered in the two-candidates gender mixed races sample: $[-5;+5]$; $[-7.5;+7.5]$, and $[-10;+10]$. Outcome variables: *Total infrastructure transfers*, *Discretionary infrastructure transfers* and *Non discretionary infrastructure transfers* are yearly transfers from the federal government to municipalities (per-capita real values in 2000 Brazilian reais). No pre-natal visits is the yearly fraction of pregnant women without any pre-natal visit before the delivery. No pre-mature births is the yearly fraction of births that are not pre-mature. Charges of corruption equals one if at least one episode of corruption. *Permanent public employee* is the log of number of permanent public employees hired to work directly in the municipal administration. *Temporary public employee* is the log of number of temporary public employees hired to work directly in the municipal administration. *Re-election* is equal to 1 if the incumbent mayor is reelected. *Re-run* is equal to 1 if the incumbent mayor re-run the subsequent election. The last two variables are defined for mayors who are eligible to run for re-election.

Figure A1: McCrary Test for Other Mixed Gender Races Samples



Notes. Weighted kernel estimation of the log density of the running variable (Margin of Victory of the female candidate) performed separately on either side of the zero Margin of Victory threshold. $MV_{it} > 0$ when the winner candidate in the municipality i and mandate t is female, $MV_{it} < 0$ when the winner candidate in the municipality i and mandate t is male. Optimal bin-width and bin-size as in McCrary (2008). We are presenting the tests for the following mixed races samples: left panel considers all races where the two first candidates are a man and a woman (discontinuity estimate: point estimate -0.095 and standard error (0.054)), right panel considers all races where in the first three candidates there are at least one man and one woman (discontinuity estimate: point estimate -0.094 and standard error (0.054)). All samples consider 2000 and 2004 municipal elections.

Figure A2: Placebo Tests for Outcomes



Notes. The figure reports the empirical c.d.f. of the t-statistics from a set of rdd estimations at 580 false thresholds below and above the true threshold at Margin of Victor of the female candidate equal zero (namely, t-statistics from regressions that consider margin of victory from -30% to -1% as fake cutoffs and t-statistics from regressions that consider margin of victory from 1% to 30% as fake cutoffs).