Are Women Electing Women? An Analysis of the Brazilian Elections

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Abstract

Civil society actors have made continuous efforts to promote greater female representation in Brazilian politics. However, if women are not electing women, such initiatives may inadvertently conflict with the preferences of the female electorate itself. Motivated by this issue, the present study tested the null hypothesis that the electoral performance of female candidates is not associated with a higher proportion of female voters. In doing so, it sought to answer a central question: are women electing women in Brazil? Using a regression discontinuity design applied to municipal-level data from Brazilian elections between 2008 and 2020, the analysis found that the null hypothesis could not be rejected. This result indicates that a higher proportion of female voters is not a sufficient condition for improving the electoral success of female candidates. Consequently, there is no empirical evidence to suggest that women are systematically electing women in Brazilian elections.

Keywords: Gender, politics, women in politics, female electoral preferences, discontinuous regression, Brazil.
JEL codes: D70, D71, D72, J16.

Highlights

- Female voters are indifferent to the gender of candidates.
- A higher proportion of female voters does not imply better electoral performance for female candidates.
- There is no evidence to show that women are electing women in Brazil.

1 Introduction

For an extended period, women faced legally sanctioned restrictions that could only be alleviated through increased representation of their interests in political discourse. Meaningful change began to emerge in the second half of the 20th century, as women gradually challenged and transcended the social norms that had long constrained their participation. Despite the progress resulting from these efforts, the political underrepresentation of women persisted for many years—even within developed nations (Labonne et al , 2021).

As women endeavored to overcome restrictions imposed across various social and economic spheres, there emerged a growing demand for public figures capable of representing their interests in the political domain. In response to this context, women increasingly began to seek elected office as a means of advocating for greater representation of their demands. Nevertheless, research such as Franceschet (2001) demonstrates that women continue to face unequal political representation compared to men.

The literature frequently attributes the underrepresentation of women in political office to their historically lower engagement in political life (Elder , 2008) and the disproportionately higher number of male candidates in electoral contests (Trimble , 2005). Furthermore, even when women do run for office, many fail to secure electoral success. For instance, data from the Brazilian Superior Electoral Court (*Tribunal Superior Eleitoral* - TSE) reveal that in the 2020 municipal elections, only 12% of elected mayors in Brazil were women. Among those who contested the mayoral position, merely 26% succeeded in being elected. In other words, despite the low level of female engagement in politics, many women are running for elected office, yet remain unsuccessful in securing victory.

In addition to the disparity between the number of female candidates and those elected in Brazil, data from TSE (2020) show that, in 2020, women accounted for the majority of voters—representing 52.5% of the electorate. Furthermore, during the 2020 municipal elections, women constituted the majority of voters in over 60% of Brazilian municipalities. Given that women are increasingly participating as candidates yet remain underrepresented among elected officials, and considering that women comprise the majority of the electorate, this raises a compelling question: Are women electing women in Brazil?

This paper seeks to address this question by presenting statistical evidence drawn from several recent Brazilian elections in which female candidates directly contested male opponents. Additionally, the study contributes to the ongoing scholarly debate regarding women's preferences for the sex of their political representatives, as discussed in works such as Plutzer and Zipp (1996), Fulton (2014), and Campbell and Heath (2017).

This study is grounded in a hypothesis test examining women's preferences for female candidates in political office. Specifically, the central objective is to assess the null hypothesis that the electoral performance of female candidates in Brazilian elections is independent of the proportion of female voters. Confirmation of this hypothesis would suggest that an increased presence of female voters has no impact on the electoral success of women. In other words, failure to reject the null hypothesis may indicate that women are indifferent to the sex of the candidates, implying that female votes are not a decisive factor in women's political success. Conversely, rejection of the null hypothesis could yield two possible outcomes: either a positive or negative influence of female voter concentration on the performance of female candidates. A positive result would imply that women are more inclined to elect other women, thereby supporting the assertion that "women are electing women". A negative result, on the other hand, would suggest that women prefer male candidates, offering evidence that "women are not electing women".

The results of this hypothesis test may offer empirical evidence to inform the design and refinement of electoral rules that promote increased female representation in Brazilian politics. Furthermore, addressing the research question posed in this study could stimulate broader discussions on the validity

and effectiveness of existing interventions intended to elevate the participation of women in local political offices. For instance, if the null hypothesis is rejected, this would indicate that women are actively electing female candidates, suggesting that initiatives aimed at expanding women's political inclusion align with the preferences of female voters. Conversely, failure to reject the null hypothesis would imply that affirmative measures directed at enhancing female representation may not reflect a priority from the perspective of the female electorate.

In addition to offering valuable insights for enhancing the effectiveness and representativeness of the Brazilian political system, this study contributes to the ongoing debate regarding women's electoral preferences by sex in Brazil, as previously explored in works such as Aguilar et al (2015) and Lucciola (2022). Accordingly, the rationale behind this research lies in the need to generate empirical evidence that can support reforms in electoral regulations and advance scholarly understanding of a subject of enduring relevance within the literature.

This paper is organized into five sections, beginning with the present introduction. The second section presents a concise literature review, aiming to summarize key debates and contributions surrounding the topic. The third section outlines the materials and methods employed to address the research question. In the fourth section, the findings are analyzed in dialogue with the existing literature. Finally, the fifth section presents the concluding remarks.

2 Literature review

Women's electoral preferences have been a subject of academic inquiry since the second half of the 20th century, notably with the publication of the seminal work "*The Political Role of Women*" by Duverger (1955). In this study, Duverger analyzed electoral data and public opinion polls from four European countries—France, West Germany, Norway, and Yugoslavia—to examine in detail the political behavior and preferences of female voters. Her pioneering research uncovered essential aspects of women's electoral choices and helped initiate a broad scholarly debate on the topic. This contribution laid the foundation for a growing field of study that has since garnered attention from researchers across multiple academic disciplines.

Dols (1957) made a significant contribution to the theory of political choice, which later served as a foundation for numerous studies on women's electoral preferences. The theory posits that voters behave rationally, consistently aiming to maximize their objectives through a cost-benefit analysis of their voting decisions. When this theoretical framework was contrasted with the findings of Duverger (1955), researchers concluded that women's tendency to favor conservative candidates stemmed from a rational evaluation. That is, such candidates were perceived as those who maximized the benefits or minimized the risks women would face, compared to choosing candidates with opposing political orientations.

Although these studies have identified notable distinctions in the political preferences of men and women, a prevailing consensus during the second half of the 20th century was that gender-related factors were not decisive in shaping electoral choices. At that time, voters were believed to prioritize traditional determinants of political behavior, such as social class, geographic location, and religious affiliation (Lipset , 1981).

Among the many pioneering findings presented by Duverger (1955), one notable observation was that, at the time of the study, women exhibited a preference for candidates with a more conservative profile when compared to the electoral preferences of men. Additionally, women tended to maintain their political affiliations for longer periods and were less likely to change their political preferences than their male counterparts. These findings initiated a scientific debate that endures to this day, with results varying according to context and social conditions. As a counterpoint to the notion that women are, on

average, more conservative, Inglehart and Norris (2000) demonstrated that in developed countries, female voters increasingly favor candidates aligned with progressive social agendas. This shift challenges the previously dominant view in the literature. To support their analysis, the authors proposed the "developmental theory of the gender gap" suggesting that gender-based political behavior evolves in response to a society's economic and social development.

The "Developmental Theory of the Gender Gap" proposed by Inglehart and Norris (2000) demonstrated that socioeconomic development fosters increased political engagement among women. However, when juxtaposed with persistent statistics on women's underrepresentation in elected office, this finding prompted the emergence of a scholarly agenda aimed at investigating the paradox of high female participation and low representation. This marked the beginning of academic debates centered on female political representation and the pursuit of mechanisms to enhance women's presence in decision-making positions, particularly within developed democracies. Drawing from these investigations, several countries adopted institutional measures to increase the number of women in legislative roles. Among the most widely discussed and recommended in the literature is the implementation of gender quotas, as exemplified by studies such as Baltrunaite et al. (2014), Murray (2014), and Paola et al (2014).

In line with the theoretical evolution of gender and electoral studies, Abendschön and Steinmetz (2014) systematized the debate on gender disparities in political preferences into three distinct analytical stages. In the first stage, the theory of the "gender gap" was primarily framed around women's underrepresentation in politics and the pursuit of legislative reforms—under the premise that meaningful change required greater female participation in the political sphere. The second stage emerged from empirical findings showing that women hold distinct political and ideological values compared to men, often attributing different levels of importance to traditionally male-dominated political priorities. In the third and more recent phase, topics such as women's right to vote and formal gender equality among voters began to recede as central concerns in democratic contexts. Instead, theoretical attention shifted toward analyzing voter behavior itself, emphasizing the nuanced differences between men's and women's electoral preferences.

The latest developments in the aforementioned gender gap theory have been fundamental to the construction of theoretically grounded empirical evidence on differences in political preferences between male and female voters, including the study by Abendschön and Steinmetz (2014). Nowadays, it is increasingly common to find research that builds hypotheses and analytical assumptions upon this framework. Examples include Gottlieb et al (2016), Golder et al (2017), Harteveld et al (2017), and Dingler et al (2018), whose studies delve into diverse political contexts while reflecting the gender-based disparities in voter behavior and preferences.

The empirical evidence has supported the development and validation of reforms in electoral processes aimed at attracting more women into politics and promoting greater gender equality in elected office. A prominent strand of the literature, grounded in the "gender gap" theory, has examined interventions such as gender quotas for political participation, with empirical contributions from studies like O'brien and Rickne (2016),Besley et al (2017), and Geys and Sørensen (2019). Additionally, other works have focused on measures designed to equalize campaign financing between female and male candidates, addressing disparities in political spending power. Notable examples include Gamboa and Morales (2021), Herrnson et al (2022), and Maddens et al (2023), which analyze the impact of financial interventions on women's electoral competitiveness.

However, even with the theoretical advances and considerable efforts made to promote greater gender equality in politics, it remains possible that female voters do not feel politically represented by the ideals of the women running for office. One consequence of the idea that preferences guide voters' choices is the possibility that female candidates may not hold political stances that are significantly different from those of male candidates. In some cases, male candidates might even better reflect the pref-

erences of female voters than female candidates themselves. These scenarios have prompted researchers to investigate whether women are, in fact, voting for women. Studies such as Campbell and Heath (2017), Wauters and Devroe (2018), and Setzler and Yanus (2018) explore these dynamics.

3 Methodology

3.1 Empirical strategy

To test the null hypothesis that a larger female electorate does not influence the election of female candidates, a regression discontinuity design (RDD) was employed. This approach is well-established in the literature and frequently used in electoral studies, as in Trounstine (2011) and Hyytinen et al (2018). In this framework, the treatment condition is determined based on a cut-off variable, whereby individuals situated near the point of discontinuity are considered statistically comparable. Individuals positioned to the right of this threshold constitute the treatment group, while those on the left comprise the untreated group.

The cut-off variable used in the analysis is the female voter margin, which captures the proportion by which the female electorate exceeds the male electorate. This variable was constructed by subtracting 0.5 from the proportion of female voters in each municipality, such that the point of discontinuity is centered at zero. Municipalities to the right of this threshold have a greater number of female voters than male voters, whereas municipalities to the left of the cut-off point exhibit a male majority. To avoid spurious results, the dataset was restricted to municipalities in which the two most voted candidates in the first round of elections[1] were of different sexes—that is, only municipalities where a male and a female candidate directly competed for the majority vote were included in the sample.

There is a straightforward rationale for adopting this cut-off variable. In municipalities located to the right of the threshold, the percentage of female voters exceeds that of male voters, implying that women's votes alone would suffice to elect the female candidate—even in the hypothetical scenario where all male voters supported male candidates. Thus, if a positive discontinuity is observed in the proportion of votes for female candidates when moving from the left to the right of the cut-off point, this provides empirical evidence that a larger female electorate contributes positively to the electoral success of women.

As outlined in the introductory section, this study aims to test the null hypothesis that the electoral performance of female candidates in Brazilian elections is not associated with the proportion of female voters. Given that the empirical strategy relies on a RDD, the null hypothesis cannot be rejected if no discontinuity is observed around the cutoff variable—specifically, when transitioning from the left to the right of the cutoff point. In this case, the result would suggest that the performance of female candidates in municipalities where the number of female voters exceeds that of male voters does not differ from the performance observed in municipalities with a male voter majority. Conversely, if a discontinuity is identified across the cutoff point, the null hypothesis must be rejected, indicating that differences exist in the electoral performance of female candidates depending on the composition of the electorate.

In the RDD estimation, covariates were included to account for voter characteristics, female candidate profiles, electoral process attributes, and municipal features. Additionally, binary indicators were incorporated to control for geographic region. In addition, in each estimate, errors were clustered by

[1] In Brazil, elections for municipal executive office may consist of two rounds in municipalities with more than 250,000 inhabitants if no candidate secures more than 50% of the valid votes in the first round. Similarly, elections for state and federal executive offices may also proceed to a runoff if no candidate obtains an absolute majority in the initial vote. In both cases, only the two candidates with the highest number of valid votes advance to the second round.

municipality, and two different bandwidths were selected, one to the right and one to the left of the cutoff variable.

3.2 Data

The estimates presented in this study are based on data from elections for municipal and federal executive offices in Brazil. For the municipal elections, four electoral cycles were examined: 2008, 2012, 2016, and 2020. This timeframe was selected due to the broader availability of data and improved organization of electoral databases during these years. Regarding federal elections, the analysis includes only the instances in which the two candidates advancing to the second round were of different sexes—specifically the elections held in 2010 and 2014. In both cases, the elected candidate, Dilma Rousseff, competed against José Serra in 2010 and Aécio Neves in 2014.

Each estimate incorporates distinct sets of covariates, depending on the availability of information and the statistical properties of the data. Covariates describing female candidate profiles appear only in estimates based on municipal election data, as federal elections involve a single female candidate whose attributes are invariant across municipalities. By contrast, covariates characterizing voter profiles and electoral process features were consistently included in all specifications. Regarding municipal-level variables, most covariates were present across all estimates—except for development indicators, which were selectively incorporated depending on the temporal availability of data. Table 6 provides a detailed description of each covariate, including its source and the corresponding estimates in which it was applied.

It is important to underscore the theoretical rationale behind the inclusion of certain control covariates. For instance, the political orientation of female candidates is incorporated to account for potential voter responses to their ideological positioning, particularly in light of findings from studies such as Duverger (1955) and Helimäki et al (2024), which suggest evolving ideological preferences among female voters. To capture these dynamics, a discrete scale was constructed based on the party ideology classification proposed by Bolognesi et al (2023). On this scale, a value of zero is assigned to parties not included in the classification, and the scores increase progressively as parties shift from the extreme left to the extreme right of the ideological spectrum.

Building on the findings of Adnan (2018), which suggest that voter preferences and electoral behavior may be influenced by the gender wage gap, it becomes essential to control for gender-related labor market disparities to enhance the validity of the estimated effects. Accordingly, this study employs data from the Annual Social Information Report (*Relação Anual de Informações Sociais* - RAIS), published by the Ministry of Labor and Employment (*Ministério do Trabalho e Emprego* - MTE), to construct two indicators at the municipal level: the wage ratio, defined as the average male wage divided by the average female wage, and the employment ratio, calculated by comparing the number of male to female formal sector workers. These covariates help characterize the socioeconomic profile of each municipality and are intended to capture how varying degrees of gender inequality in the labor market may condition voter preferences for female candidates.

As detailed in Sections (1) and (2), the "Developmental Theory of the Gender Gap" proposed by Inglehart and Norris (2000) posits that women's political preferences are shaped by local patterns of socioeconomic development. If such patterns are not accounted for in the RDD estimates, a non-zero correlation may arise between the cutoff variable and the error term, potentially leading to endogeneity and omitted variable bias. To mitigate this issue, covariates capturing municipal development conditions were incorporated into the model, depending on data availability for each election year. For the 2010 presidential elections, the Municipal Human Development Index, derived from Brazilian census data and published by the United Nations Development Programme (UNDP , 2025), was used. Beginning in 2013,

the FIRJAN Municipal Development Index—produced by the Federation of Industries of the State of Rio de Janeiro—was adopted as a covariate for the estimates pertaining to the 2014, 2016, and 2020 elections.

Table 1 presents the distribution of data in the database across Brazil's major geographic regions. The findings indicate that direct contests between candidates of different sexes occur proportionally less in the South, whereas such contests are more prevalent in the North and Northeast regions. It is important to emphasize that certain information is unavailable for some municipalities included in the identification strategy, which means the database does not encompass 100% of the cases in which a female candidate competed directly against a male candidate. This limitation is particularly noticeable in federal election years, during which it was not possible to include all 5,570 Brazilian municipalities due to incomplete data for some locations.

Table 1: Distribution of the sample by broad regions of Brazil.

Region	Number of municipalities					
	2008*	2010†	2012*	2014†	2016*	2020*
North	99 (22%)	427 (94.9%)	127 (28.2%)	432 (96%)	138 (30.7%)	133 (29.6%)
Northeast	470 (26.2%)	1765 (98.3%)	570 (31.8%)	1774 (98.9%)	505 (28.1%)	583 (32.5%)
Southeast	260 (15.6%)	1623 (97.3%)	330 (19.8%)	1612 (96.6%)	164 (9.8%)	324 (19.4%)
South	162 (13.6%)	1154 (12.9%)	205 (17.2%)	1146 (96.2%)	186 (15.6%)	215 (18.1%)
Midwest	93 (19.9%)	453 (97.2%)	104 (22.3%)	448 (96.1%)	91 (19.5%)	112 (24%)
Total	1084	5422	1336	5412	1084	1367

Source: Own elaboration according to reseach data.

Note: The symbol $\star$ indicates municipal elections for mayor, and the symbol † indicates national elections for president.

Note: Percentage of total municipalities in the region in parentheses.

Table 2 presents the descriptive statistics of the dataset used in the analysis. The table reports the mean and standard deviation for both the cutoff variable and the covariates included in the RDD estimation, offering a preliminary overview of the typical profile of Brazilian elections. Notably, the mean value of the cutoff variable is negative in municipal elections and positive in federal elections. This pattern suggests that, on average, male candidates outperform female candidates in municipal contests, whereas female candidates tend to perform better than their male counterparts in federal elections.

Descriptive statistics on the profile of female candidates reveal that, on average, women who directly compete against male opponents in Brazilian municipal elections are between 46 and 50 years old, predominantly married, hold a college degree, and typically run for mayor in their state of birth. These candidates are generally non-incumbents and affiliated with right-wing or center-right political parties. As for the electorate in such contests, voters who face a choice between a male and a female candidate are, on average, adults or elderly individuals, literate but without higher education, and tend to be unmarried.

Regarding the characteristics of the electoral process, descriptive statistics indicate that when women run directly against male candidates, voter abstention tends to be higher in federal elections than in municipal ones. Additionally, in mayoral races, female candidates consistently spend proportionally less than their male counterparts during the campaign period.

Finally, the average profile of municipalities where a woman competes directly against a man in Brazilian elections is characterized by a labor market in which formal male employment exceeds formal female employment, and the average male salary surpasses that of women. A notable feature is the high GDP per capita and elevated number of social assistance benefits observed in the 2014 elections, followed by a decline in these indicators in the 2016 municipal elections. Although the samples refer to different municipalities, these trends align with broader macroeconomic patterns—reflecting the economic expansion experienced in Brazil during the early 2010s and the subsequent downturn triggered by the political and economic crisis that began in 2016.

Table 2: Descriptive statistics of variables.

Pseudonym	**Statistic**	**2008⋆**	**2010†**	**2012⋆**	**2014†**	**2016⋆**	**2020⋆**	**All⋆**	**All†**
Cut-off	Mean	-0.018	0.095	-0.018	0.079	-0.017	-0.021	-0.019	0.087
	Std. Deviation	0.139	0.153	0.122	0.179	0.124	0.141	0.132	0.167
		Profile of female candidates							
Age	Mean	47.50	-	46.80	-	47.70	49.40	47.90	-
	Std. Deviation	9.28	-	9.78	-	10.30	10.40	10.0	-
Married	Mean	0.686	-	0.670	-	0.663	0.639	0.663	-
	Std. Deviation	0.464	-	0.470	-	0.473	0.481	0.473	-
College_Degree	Mean	0.584	-	0.640	-	0.709	0.735	0.670	-
	Std. Deviation	0.493	-	0.480	-	0.455	0.442	0.470	-
Migrant	Mean	0.156	-	0.162	-	0.167	0.157	0.160	-
	Std. Deviation	0.363	-	0.368	-	0.373	0.364	0.367	-
Incumbent	Mean	0.228	-	0.05	-	0.217	0.003	0.116	-
	Std. Deviation	0.419	-	0.208	-	0.412	0.05	0.320	-
Political_Alignment	Mean	2.82	-	2.90	-	2.71	2.71	2.79	-
	Std. Deviation	1.59	-	1.62	-	1.53	1.41	1.54	-
		Voter profile							
Young_voters	Mean	0.353	0.321	0.325	0.288	0.303	0.262	0.308	0.305
	Std. Deviation	0.048	0.046	0.05	0.043	0.04	0.04	0.06	0.047
Illiterate_voters	Mean	0.112	0.092	0.10	0.08	0.10	0.09	0.10	0.087
	Std. Deviation	0.07	0.062	0.06	0.06	0.06	0.05	0.06	0.060
Educated_voters	Mean	0.01	0.017	0.02	0.026	0.03	0.07	0.03	0.022
	Std. Deviation	0.05	0.014	0.01	0.021	0.03	0.04	0.03	0.018
Married_voters	Mean	0.317	0.333	0.306	0.328	0.296	0.345	0.317	0.330
	Std. Deviation	0.09	0.087	0.08	0.089	0.10	0.09	0.09	0.088
		Electoral process profile							
Abstencions	Mean	0.132	0.271	0.176	0.265	0.155	0.211	0.172	0.268
	Std. Deviation	0.216	0.067	0.154	0.064	0.184	0.120	0.171	0.066
Campaign_Expenses	Mean	0.460	-	0.438	-	0.447	0.441	0.446	-
	Std. Deviation	0.237	-	0.234	-	0.182	0.196	0.213	-
		Municipality profile							
Labor_gap	Mean	0.175	0.160	0.104	0.118	0.045	3.56	1.00	0.139
	Std. Deviation	0.265	0.232	0.206	0.231	0.223	17.2	8.88	0.232
Wage_gap	Mean	0.915	0.624	0.490	0.499	0.356	0.05	0.441	0.562
	Std. Deviation	4.92	1.420	1.04	0.175	0.813	0.316	2.45	1.590
GDP	Mean	20.60	25.30	25.40	29.50	23.0	29.9	25.10	27.40
	Std. Deviation	25.50	30.10	46.0	34.40	22.1	36.6	34.90	32.40
Income_inequality	Mean	0.441	0.477	0.479	0.465	0.390	0.469	0.448	0.471
	Std. Deviation	1.01	1.170	1.890	1.220	0.627	1.11	1.28	1.190
Social_assistance	Mean	0.10	0.091	0.118	0.188	0.187	0.115	0.128	0.140
	Std. Deviation	0.05	0.046	0.056	0.674	0.375	0.07	0.190	0.480
demographic_density	Mean	125.0	103.0	76.50	99.4	68.3	90.3	89.1	101.0
	Std. Deviation	569.0	564.0	341.0	0.674	225.0	373.0	392.0	558.0
Distance	Mean	254.0	269.0	260.0	269.0	251.0	254.0	255.0	269.0
	Std. Deviation	186.0	173.0	177.0	173.0	182.0	165.0	177.0	173.0
Development_index	Mean	-	-	-	0.480	0.431	0.509	0.474	-
	Std. Deviation	-	-	-	0.146	0.133	0.134	0.139	-
Municipal_Development	Mean	-	0.658	-	-	-	-	-	-
	Std. Deviation	-	0.071	-	-	-	-	-	-

Source: Own elaboration according to reseach data.
Note: The symbol ⋆ indicates municipal elections for mayor, and the symbol † indicates national elections for president.
Note: The term "All" indicates that all elections were aggregated into a single sample.

4 Results

Before presenting the results of the hypothesis test, it is important to highlight that at least two key assumptions must be met for the estimated RDD parameters to be interpreted with minimal bias. The first is the continuity assumption, which ensures that the counterfactual trajectory of elected and non-elected female candidates around the cutoff point is not influenced by any discontinuity in the assignment variable. In practical terms, this means that factors other than treatment assignment that may affect the outcome must vary smoothly around the cutoff. A common procedure for testing the validity of this assumption involves examining whether covariates unrelated to treatment exhibit discontinuities at the cutoff point. Table 3 presents the results of this diagnostic test for the covariates used in the study. The values shown correspond to the estimated coefficients from separate RDD models, in which each covariate is treated as a dependent variable and the female voter margin serves as the assignment variable.

The covariate discontinuity test was conducted in two stages. In the first stage, an RDD was estimated using the performance of female candidates as the dependent variable and the cutoff variable as the assignment variable, applying a first-degree polynomial specification. During this step, the optimal bandwidth was calculated separately for observations to the left and right of the cutoff point, based on the criterion of minimizing the mean squared error. In the second stage, each covariate was individually treated as a dependent variable in an RDD, using the same cutoff variable and the optimal bandwidths determined in the first step.

It is worth noting that, with the exception of the 2010 and 2016 elections, all other estimates exhibit at least one covariate with a discontinuity at the cutoff point. This finding may compromise the reliability of the estimates, as it could indicate potential manipulation of the assignment variable or a lack of comparability between the treatment and control groups. To address this issue, for election years in which discontinuities were detected, the bandwidth was progressively reduced until all covariates displayed a smooth trajectory around the cutoff. This bandwidth, which ensures that none of the covariates have discontinuities at the cutoff point, will later be used as the optimal bandwidth in estimates containing covariates. This procedure reinforces the validity of the continuity assumption and ensures that the conditions necessary for unbiased RDD estimation are met in the context of this research.

Table 3: Results of covariate discontinuity tests at the cutoff point.

Pseudonym	2008⋆	2010†	2012⋆	2014†	2016⋆	2020⋆
	Profile of female candidates					
Age	1.736	-	1.513	-	0.970	-1.635
Married	-0.055	-	0.027	-	0.006	0.090
College_Degree	-0.096	-	0.090	-	-0.070	-0.004
Migrant	-0.074	-	-0.032	-	0.111	0.119*
Incumbent	-0.144	-	-0.078*	-	0.007	0.001
Political_Alignment	0.290	-	0.081	-	0.186	0.166
	Voter profile					
Young_voters	0.005	0.004	0.016*	0.006	0.009	0.001
Illiterate_voters	0.005	0.007	0.005	0.007	0.005	0.004
Educated_voters	-0.003	0.000	-0.008*	-0.001	-0.004	-0.009
Married_voters	0.003	-0.009	-0.005	-0.005	-0.010	-0.0032*
	Electoral process profile					
Abstencions	-0.018	0.008	0.014	0.010	0.067	0.026
Campaign_Expenses	-0.014	-	-0.005	-	-0.020	-0.030
	Municipality profile					
Labor_gap	0.062	0.012	-0.05	-0.001	-0.033	-1.992
Wage_gap	5.743*	0.099	-0.07	0.022	0.045	0.024
GDP	0.041	-0.087	-0.363*	-0.113	0.059	-0.090
Income_inequality	0.018	-0.123	-0.426	0.121	-0.062	0.175
Social_assistance	0.011	0.002	0.008	-0.017	-0.036	0.012
demographic_density	0.037	-0.008	0.017	-0.075	0.015	-0.128
Distance	2.908	-11.793	-37.2	-3.779	-10.969	-5.869
Development_index	-	-	-	-0.043*	-0.017	-0.010
Municipal_Development	-	-0.006	-	-	-	-

Source: Own elaboration according to reseach data.
Note: The symbol ⋆ indicates municipal elections for mayor, and the symbol † indicates national elections for president.
Note: Values following the symbol "*" are statistically significant at the 95% confidence level.

The second key assumption in the design of a regression discontinuity design (RDD) concerns the potential manipulation of the assignment variable. For the estimates to be considered reliable and unbiased, it must be assumed that individuals—or, in this case, municipalities—do not have the ability to manipulate the cutoff variable. Specifically, the present study assumes that municipalities cannot influence the proportion of female voters in a way that systematically exceeds the proportion of male voters. A formal method for testing the validity of this assumption is the density test proposed by McCrary (2008). This test examines whether there is a discontinuity in the density of the assignment variable around the cutoff point. If manipulation is absent, the distribution of the cutoff variable should be smooth across the threshold. Conversely, a significant jump in density at the cutoff suggests that the assignment variable may have been manipulated, thereby violating the assumption and potentially biasing the estimates. The results of this procedure are shown in Figure 1.

For each election considered in this study, the confidence intervals around the cutoff point are virtually identical, indicating that the null hypothesis of no discontinuity in the density of the assignment variable cannot be rejected. This result suggests that the individuals observed in the analysis do not possess the ability to manipulate the proportion by which the number of female voters exceeds the number of male voters. This finding aligns with expectations, as it would be practically infeasible for a female candidate to influence the demographic composition of the electorate in her municipality. Consequently, the McCrary (2008) test confirms that the estimated coefficients derived from the RDD, under the identification strategy employed in this study, are not subject to bias stemming from manipulation of the cutoff variable.

Having confirmed that the identification strategy adopted in this study satisfies the assumptions necessary to minimize estimation bias, the next step involves estimating the RDD and analyzing the results of the hypothesis test. To enhance the robustness of the findings, four distinct specifications were estimated for each election. These models incorporate binary variables to control for heterogeneity across

Brazil's geographic regions[2], as well as the covariates listed in Table 3. Additionally, each specification was estimated under two different assumptions regarding the trajectory of female candidate performance in Brazilian elections. The first assumes a linear relationship, while the second adopts a parabolic form. In other words, the RDD was estimated using both first-degree and second-degree polynomial specifications[3]. The results of these estimations are presented in Table 4.

At a 95% statistical confidence level, none of the estimates yielded coefficients that were statistically different from zero, as the null value was consistently contained within the confidence intervals of all estimates. Consequently, we cannot reject the null hypothesis that the electoral performance of female candidates in Brazilian municipalities is unrelated to the proportion of female voters, whether in municipal or federal elections. This failure to reject the null hypothesis suggests that female voters exhibit indifference toward the gender of political candidates. In other words, when selecting their representatives, female voters tend either to disregard the candidate's gender or to evaluate gender-related attributes uniformly across all candidates.

The failure to reject the null hypothesis is visually illustrated in Figures (2), (3), (4), and (5) in the appendix of the manuscript. These figures depict the estimated trajectory of female candidates' electoral performance in municipal elections around the cutoff point. Although the graphs suggest the possibility of discontinuities in this trajectory, the confidence intervals on either side of the cutoff point overlap at key moments, indicating that these discontinuities are not statistically distinguishable from zero. Consequently, there is insufficient statistical evidence to affirm that the electoral performance of female candidates changes significantly in municipalities where the proportion of female voters exceeds that of male voters, compared to municipalities with a predominantly male electorate.

In practical terms, the failure to reject the null hypothesis indicates that there are no statistically significant differences in the electoral performance of female candidates between municipalities where the majority of voters are male versus female. This finding yields important insights for the development of campaign strategies targeting female candidates. First, women may adopt similar campaign approaches regardless of the gender composition of the electorate. Second, a predominance of female voters should not be regarded as a decisive factor for electoral success. Third, strategies that emphasize gender-based polarization or conflicting narratives between the sexes are unlikely to produce substantial gains in voter support. Finally, concentrating campaign efforts primarily on female voters may not be more effective than distributing those efforts evenly across both genders.

Given the absence of robust evidence that a higher proportion of female voters leads to improved electoral performance for female candidates, the findings of this study yield two important recommendations for the design and implementation of interventions aimed at increasing women's participation in Brazilian politics. First, policies that seek to expand the number of women elected by focusing exclusively on the female electorate may not significantly reduce the underrepresentation of women in political office. Second, such policies are likely to be more effective if they are not structured solely around the gender of voters or candidates, but instead incorporate broader institutional, ideological, and contextual factors that influence electoral dynamics and political engagement.

This result contributes to addressing the central question of this study: are women electing women in Brazil? The failure to reject the null hypothesis suggests that the answer may be ambiguous, as

[2]For more details on the territorial division of Brazilian geographic regions, visit https://geoftp.ibge.gov.br/produtos_educacionais/mapas_tematicos/mapas_do_brasil/mapas_nacionais/politico/brasil_grandes_regioes.pdf.

[3]Although it would be technically feasible to increase the polynomial order of the estimated trajectory of female electoral performance beyond the second degree, this study follows the recommendations of Gelman and Imbens (2019), which advise against the use of high-order polynomials in RDD estimations due to potential overfitting and instability in the estimates. Accordingly, the maximum polynomial order adopted in this analysis is limited to two.

female voters appear to be indifferent to the gender of candidates and may support either male or female contenders. Consequently, the election of a female candidate may reflect the preferences of male voters, female voters, or a combination of both.

When comparing these findings with the broader literature, the non-rejection of the null hypothesis appears counterintuitive when contrasted with studies such as Campbell and Cowley (2014) and Cutler (2003), which demonstrate that individuals tend to vote for candidates who share their own social characteristics. These works suggest that sociodemographic similarity can influence electoral behavior. However, when narrowing the comparison to empirical studies that specifically examine gender as the social characteristic in question, the non rejection of H0 aligns more closely with expectations. For instance, McElroy and Marsh (2010) found no robust evidence of a strong relationship between candidate gender and voter choice, indicating that gender alone may not be a decisive factor in electoral preferences.

Table 4: Results of the RDD estimates.

	2008*				**2010**†			
Polynomial order = 1								
Coefficient	0.035	0.035	0.038	0.038	0.021	0.019	0.019	0.019
95% CI	[-0.017; 0.087]	[-0.017; 0.087]	[-0.017; 0.092]	[-0.017; 0.092]	[-0.001; 0.042]	[-0.003; 0.040]	[-0.004; 0.042]	[-0.004; 0.042]
P-value	0.182	0.187	0.176	0.176	0.060	0.092	0.099	0.099
Std. Error	0.026	0.027	0.028	0.028	0.011	0.011	0.012	0.012
AIC	-673.07	-679.63	-773.09	-778.52	-3623.12	-5403.50	-6229.87	-6336.35
	2012*				**2014**†			
Coefficient	-0.002	-0.002	0.001	0.001	0.016	0.015	0.021	0.021
95% CI	[-0.031; 0.026]	[-0.031; 0.026]	[-0.029; 0.031]	[-0.029; 0.031]	[-0.013; 0.045]	[-0.014; 0.043]	[-0.010; 0.052]	[-0.010; 0.052]
P-value	0.871	0.869	0.964	0.964	0.283	0.307	0.183	0.183
Std. Error	0.015	0.015	0.015	0.015	0.015	0.014	0.016	0.016
AIC	-1400.30	-1490.02	-1294.59	-1307.61	-1543.18	-4214.20	-4181.22	-4491.17
	2016*				**2020***			
Coefficient	0.023	0.024	0.029	0.029	-0.014	-0.014	0.005	0.005
95% CI	[-0.010; 0.055]	[-0.009; 0.057]	[-0.004; 0.062]	[-0.004; 0.062]	[-0.049; 0.021]	[-0.048; 0.020]	[-0.039; 0.049]	[-0.039; 0.049]
P-value	0.172	0.160	0.081	0.081	0.437	0.423	0.825	0.825
Std. Error	0.017	0.017	0.017	0.017	0.018	0.018	0.022	0.022
AIC	-1009.88	-1002.78	-1162.34	-1161.81	-1026.42	-1044.04	-713.92	-712.35
Polynomial order = 2								
	2008*				**2010**†			
Coefficient	0.044	0.045	0.056	0.056	0.026	0.022	0.025	0.025
95% CI	[-0.017 , 0.106]	[-0.016 , 0.106]	[-0.014 , 0.126]	[-0.014 , 0.126]	[-0.002 , 0.054]	[-0.005 , 0.048]	[-0.003 , 0.054]	[-0.003 , 0.054]
P-value	0.156	0.147	0.114	0.114	0.066	0.112	0.084	0.084
Std. Error	0.031	0.031	0.036	0.036	0.014	0.014	0.015	0.015
AIC	-1143.27	-1161.13	-1170.39	-1166.05	-3864.12	-6894.13	-7165.73	-7278.42
	2012*				**2014**†			
Coefficient	-0.011	-0.010	0.001	0.001	0.027	0.028	0.031	0.031
95% CI	[-0.051, 0.030]	[-0.051, 0.030]	[-0.036, 0.037]	[-0.036, 0.037]	[-0.012, 0.066]	[-0.011, 0.066]	[-0.009, 0.071]	[-0.009, 0.071]
P-value	0.609	0.612	0.983	0.983	0.169	0.159	0.125	0.125
Std. Error	0.021	0.021	0.019	0.019	0.020	0.020	0.020	.020
AIC	-1768.57	-1807.97	-1832.46	-1836.42	-1816.02	-4712.92	-5363.84	-5766.35
	2016*				**2020**†			
Coefficient	0.022	0.023	0.035	0.035	0.004	0.005	0.018	-0.018
95% CI	[-0.018, 0.062]	[-0.018, 0.063]	[-0.004, 0.074]	[-0.004, 0.074]	[-0.052, 0.061]	[-0.051, 0.061]	[-0.045, 0.081]	[-0.045, 0.081]
P-value	0.279	0.269	0.080	0.080	0.879	0.860	0.577	0.577
Std. Error	0.020	0.021	0.020	0.020	0.029	0.029	0.032	0.032
AIC	-1260.18	-1259.06	-1460.10	-1462.93	-906.17	-908.94	-800.95	-799.44
Covariates	*Not*	*Not*	*Yes*	*Yes*	*Not*	*Not*	*Yes*	*Yes*
Region Control	*Not*	*Yes*	*Not*	*Yes*	*Not*	*Yes*	*Not*	*Yes*

Source: Own elaboration according to research results.

Given that the results of the hypothesis test remain consistent across multiple specifications—whether controlling for covariates and regional heterogeneity or not—this lends a reasonable degree of robustness and reliability to the decision to not reject the null hypothesis. To further reinforce the statistical validity of these findings, an additional estimation was considered using stacked data in the form of a panel. However, applying panel data techniques within the context of an RDD presents methodological challenges,

and the resulting coefficients should not be interpreted as causal effects. This limitation arises because stacking cross-sectional data introduces individual-specific effects into the estimation error, which may be correlated with covariates or the cutoff variable. Such correlations can lead to endogeneity, typically addressed through variable transformations—such as the Within transformation. Nonetheless, applying these transformations would alter the structure of the cutoff variable for each unit, potentially undermining the definition of the threshold central to the RDD framework. Therefore, in this study, panel-based estimates are used solely to reinforce the conclusions drawn from cross-sectional analyses, without serving as the primary basis for causal inference.

Table 5 presents the detailed results of this procedure. Across all cases considered, there is insufficient statistical evidence to support the claim that the trajectory of female candidates' electoral performance in Brazilian elections changes abruptly at the cutoff point. This outcome corroborates the failure to reject the null hypothesis observed in the year-by-year disaggregated estimates and reinforces the conclusion that the electoral performance of female candidates does not undergo a statistically significant shift in municipalities where the number of female voters surpasses that of male voters.

Table 5: Results of estimates using aggregated data.

Municipal elections								
Polynomial order = 1								
Coefficient	0.002	0.002	0.002	0.002	0.007	0.007	0.007	0.007
95% CI	[-0.012, 0.016]	[-0.012, 0.016]	[-0.013, 0.016]	[-0.012, 0.016]	[-0.008, 0.023]	[-0.008, 0.023]	[-0.008, 0.023]	[-0.008, 0.023]
Std. Error	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.008
P-value	0.796	0.763	0.815	0.783	0.354	0.354	0.354	0.354
AIC	-5289.90	5290.42	-5309.14	-5309.56	-5095.64	-5090.34	-5108.31	-5103.25
Polynomial order = 2								
Coefficient	0.005	0.005	0.004	0.005	0.014	0.014	0.014	0.014
95% CI	[-0.016, 0.025]	[-0.016, 0.025]	[-0.016, 0.025]	[-0.016, 0.025]	[-0.008, 0.036]	[-0.008, 0.036]	[-0.008, 0.036]	[-0.008, 0.036]
Std. Error	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
P-value	0.670	0.651	0.680	0.661	0.219	0.219	0.219	0.219
AIC	-5289.56	-5290.25	-5309.31	-5309.82	-5049.60	-5044.90	-5071.94	5068.21
Federal elections								
Polynomial order = 1								
Coefficient	0.009	0.009	0.008	0.008	0.008	0.008	0.008	
95% CI	[-0.007, 0.025]	[-0.007, 0.025]	[-0.008, 0.024]	[-0.008, 0.024]	[-0.009, 0.025]	[-0.009, 0.025]	[-0.009, 0.025]	[-0.009, 0.025]
Std. Error	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
P-value	0.280	0.289	0.320	0.310	0.345	0.345	0.345	0.345
AIC	-6751.58	-6774.80	-13049.47	-13079.31	-13428.22	-13675.09	-14497.65	-14631.38
Polynomial order = 2								
Coefficient	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
95% CI	[-0.004, 0.039]	[-0.004, 0.039]	[-0.005, 0.038]	[-0.004, 0.039]	[-0.006, 0.039]	[-0.006, 0.039]	[-0.006, 0.039]	[-0.006, 0.039]
Std. Error	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
P-value	0.116	0.115	0.130	0.119	0.140	0.140	0.140	0.140
AIC	-6751.17	-6774.26	-13048.87	-13078.54	-13452.67	-13702.26	-14530.53	-14668.66
Covariates	*Not*	*Not*	*Not*	*Not*	*Yes*	*Yes*	*Yes*	*Yes*
Region Control	*Not*	*Not*	*Yes*	*Yes*	*Not*	*Not*	*Yes*	*Yes*
Year Control	*Not*	*Yes*	*Not*	*Yes*	*Not*	*Yes*	*Not*	*Yes*

Source: Own elaboration according to research results.

These findings lead to the conclusion that the composition of the female electorate is not a determining factor in the electoral success of female candidates in Brazil, whether in federal or municipal contests. In other words, the failure to reject the null hypothesis indicates that a higher proportion of female voters does not constitute a sufficient condition for increasing the number of women elected to public office. This reinforces the broader finding that there is no consistent statistical evidence indicating that female voters tend to favor female candidates in Brazilian elections. Such results contribute meaningfully to the academic debate on gendered political preferences, highlighting that, in certain contexts, the underrepresentation of women in politics may not be directly attributable to the gender composition of the electorate.

Overall, the conclusions drawn in this study align with the findings of Fulton (2014) in the context of the United States, reinforcing, within a Brazilian framework, the notion that women do not necessarily vote for female candidates. However, as previously discussed, this interpretation is not unanimous in the literature, and the results presented here should be approached with caution before informing any policy decisions or broader generalizations.

5 Concluding remarks

The primary objective of this study was to test the null hypothesis that the electoral performance of female candidates in Brazilian elections is not associated with the proportion of female voters. To this end, data from municipal elections held between 2008 and 2020 were analyzed, focusing on contests for municipal and federal executive positions. The sample was restricted to cases in which a female candidate competed directly against a male candidate. A regression discontinuity design was employed, in which the cutoff variable was defined as the margin by which the proportion of female voters exceeded that of male voters, and the outcome variable of interest was the vote share obtained by female candidates.

The results indicate that the null hypothesis cannot be rejected, suggesting that the electoral success of female candidates in Brazilian elections is not significantly associated with a higher proportion of female voters. This finding implies that the female vote, in isolation, does not constitute a decisive factor in the election of women in Brazil. Moreover, the non-rejection of the null hypothesis contributes meaningfully to the literature on gendered political preferences, suggesting that female voters in Brazil do not systematically prioritize the gender of candidates when casting their votes.

As a result, the findings suggest that female voters in Brazil do not exhibit a systematic preference for female candidates, indicating that women do not necessarily elect women. This observation implies that campaign strategies centered primarily on gender-based discourse may have limited effectiveness in enhancing the electoral success of female candidates. Moreover, the non-rejection of the null hypothesis reinforces the notion that policies aimed at increasing women's political representation in Brazil should focus on factors beyond gender alone.

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Appendices

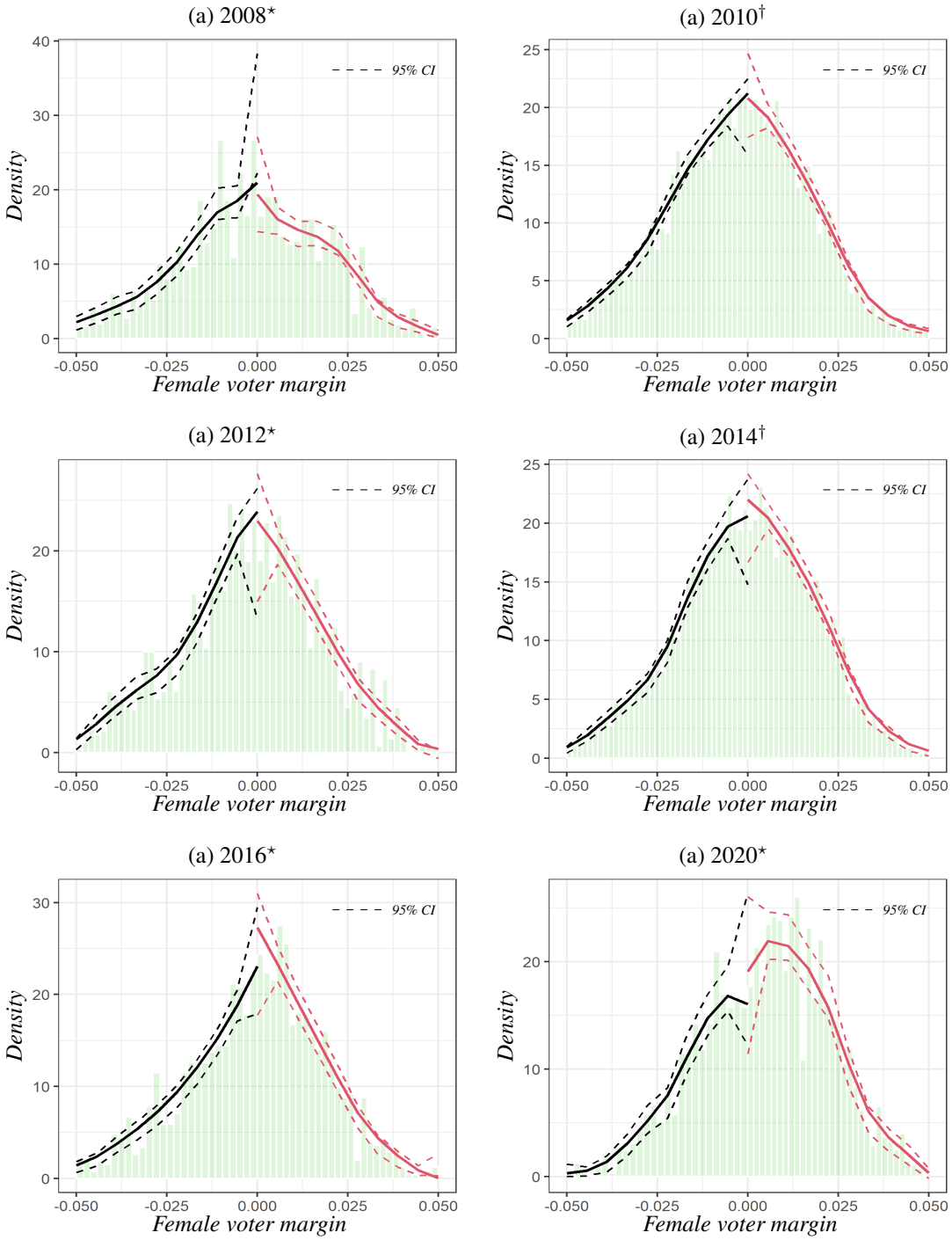
A Variables

Table 6: Description and source of variables.

Pseudonym	Description	Source	Used in					
			2008⋆	2010†	2012⋆	2014†	2016⋆	2020⋆
		Profile of female candidates						
Age	Age of female candidate in years	TSE (2025a)	yes	not	yes	not	yes	yes
Married	1 if the female candidate is married, and 0 otherwise	TSE (2025a)	yes	not	yes	not	yes	yes
college_Degree	1 if the female candidate has a college degree, and 0 otherwise	TSE (2025a)	yes	not	yes	not	yes	yes
Migrant	0 if the woman is running for political office in the same state where she was born, and 1 otherwise	TSE (2025a)	yes	not	yes	not	yes	yes
Incumbent	1 if the female candidate is the incumbent and 0 otherwise	TSE (2025a)	yes	not	yes	not	yes	yes
Political_alignment	0 if undefined, 1 if far right, 2 if right, 3 if center-right, 4 if center, 5 if center-left, 6 if left, and 7 if far left	Bolognesi et al (2023)	yes	not	yes	not	yes	yes
		Voter profile						
Young_voters	Proportion of the voter population aged between 16 and 29	TSE (2025b)	yes	yes	yes	yes	yes	yes
Illiterate_voters	Proportion of illiterate voters	TSE (2025b)	yes	yes	yes	yes	yes	yes
Educated_voters	Proportion of the electorate with higher education	TSE (2025b)	yes	yes	yes	yes	yes	yes
Married_voters	Proportion of married voters	TSE (2025b)	yes	yes	yes	yes	yes	yes
		Electoral process profile						
Abstentions	Proportion of voters who did not vote	TSE (2020)	yes	yes	yes	yes	yes	yes
Campaign_expenses	Proportion of female candidate campaign expenses relative to total candidate expenses	TSE (2020)	yes	yes	yes	yes	yes	not
		Municipality profile						
Labor_gap	Percentage by which formal jobs held by men exceed formal jobs held by women	MTE (2025)	yes	yes	yes	yes	yes	yes
Wage_gap	Percentage by which the average salary for men exceeds the average salary for women	MTE (2025)	yes	yes	yes	yes	yes	yes
GDP	GDP per capita in R$ 1,000.00	IBGE (2021)	yes	yes	yes	yes	yes	yes
Income_inequality	Approach to income inequality based on municipal GDP per capita	Souza et al (2023)	yes	yes	yes	yes	yes	yes
Social_assistance	Proportion of the population covered by the federal government's social assistance program called *Bolsa Família*	Portal da Transparência (2025)	yes	yes	yes	yes	yes	yes
Demographic_density	Population per square kilometer	IBGE (2025b)	yes	yes	yes	yes	yes	yes
Distance	Distance in kilometers to the state capital	IBGE (2025a)	yes	yes	yes	yes	yes	yes
Development_index	FIRJAN municipal development index	FIRJAN (2025)	not	not	yes	yes	yes	yes
Municipal_Development	Municipal human development index	UNDP (2025)	not	yes	not	not	not	not

Source: Own elaboration according to reseach data.
Note: The symbol ⋆ indicates municipal elections for mayor, and the symbol † indicates national elections for president.

Figure 1: Testing the manipulation of the cutoff variable according to McCrary (2008).

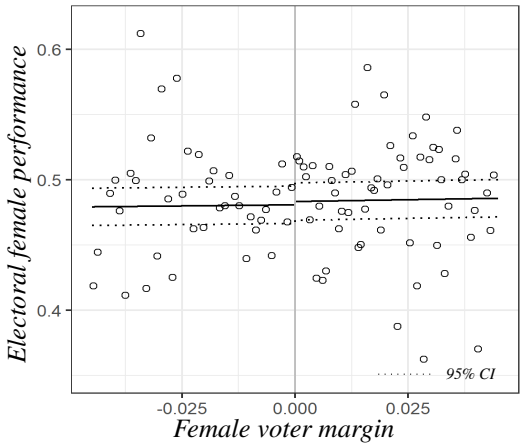


Source: Own elaboration according to reseach data.
Note: The symbol ⋆ indicates municipal elections for mayor, and the symbol † indicates national elections for president.

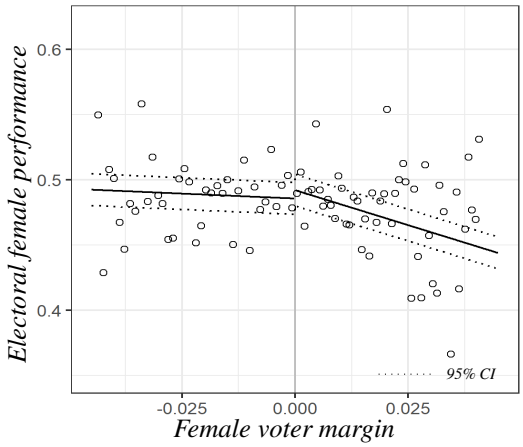
B Discontinuite plots

Figure 2: Municipal elections with polynomial order 1.

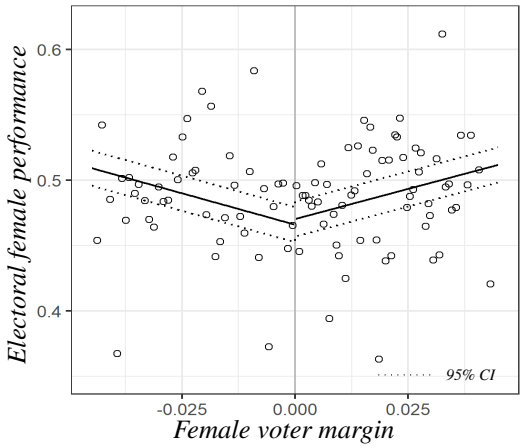
(a) 2008



(b) 2012



(c) 2016



(d) 2020

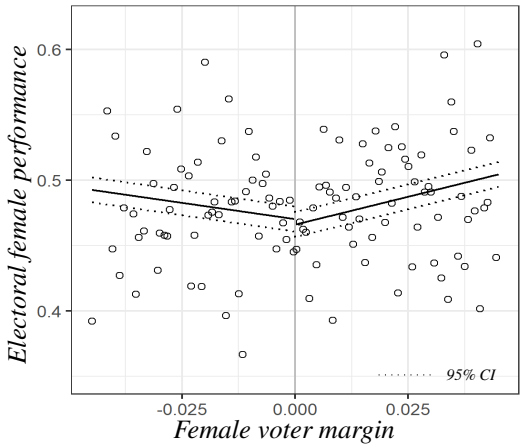


Figure 3: Municipal elections with polynomial order 2.

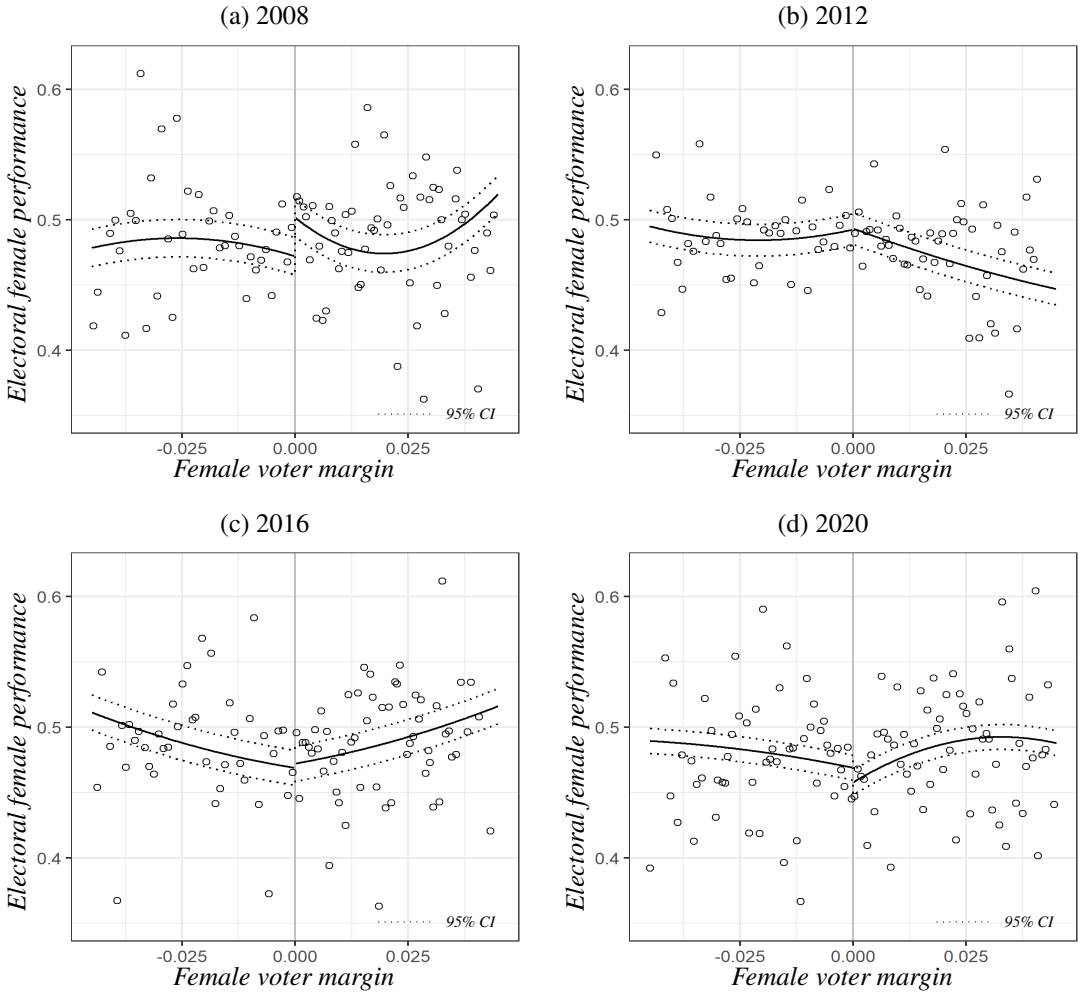


Figure 4: Federal elections with polynomial order 1.

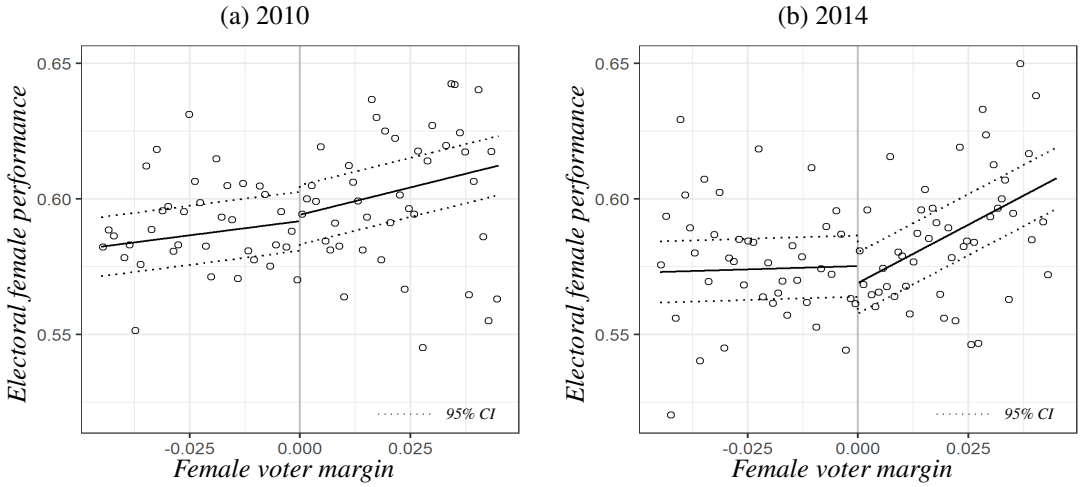


Figure 5: Federal elections with polynomial order 2.