

# Electorate Size and Female Representation: Evidence from State Legislative Assemblies in India

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## Abstract

Is smaller better for female political representation? We investigate the relationship between electorates' demographic size and women's political representation in India. We capitalize on the 2008 Delimitation (redistricting) of constituency boundaries to assess how *within* constituency changes in electorate size correlated with female candidates' participation and performance with data from over 13,000 state legislative assembly elections from 1989 to 2021. We find that electorate downsizing reduces female candidates' likelihood of participating in an election. This reduction is greatest in constituencies with stronger patriarchal norms. Electorate size, however, appears to have no bearing on female candidates' electoral performance. Size may matter more for the supply of than the demand for female candidates.

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# 1 Introduction

In 2026 the world’s largest democracy will begin redrawing its electoral boundaries (Bharati 2023). India’s Delimitation Commission will expand some electorates and downsize others in pursuit of greater voter to representative parity across electorates (Rangarajan 2024). Amidst these shifting electorate boundaries, Indian women remain severely under-represented in parliamentary office (Brechenmacher 2023). Women made up just fifteen percent of India’s national legislatures in 2023 (*Women in Parliament and State Assemblies* 2024), and the country ranks 141st out of 185 with respect to women’s political representation (Brechenmacher 2023) How will female candidates fare in India’s new electoral landscape?

Despite extensive and canonical scholarship on the importance of population size for democratic governance (Dahl and Tufte 1973; Diamond and Tsalik 1999; Fors 2014; Veenendaal 2015), economic institutions (Alesina and Spolaore 2005; Haggard 1990; Katzenstein 1985), development (Easterly and Kraay 1999; Jugl 2019; Post and Kuipers 2023), and myriads of other political outcomes (Gerring and Veenendaal 2020), whether and how electorate size shapes women’s political representation remains understudied. Most scholarship on the barriers to female representation points to electoral institutions (Gonzalez-Eiras and Sanz 2021; Profeta and Woodhouse 2022; Teele 2023a; Valdini 2012) and women’s ambitions to run (Fox and Lawless 2004). Electorate size, however, likely affects both the rules that govern an election and female candidates’ electoral ambitions. Ignoring size might skew our understanding of the institutional and behavioural determinants of women’s political representation. Meanwhile, scholarship on gender politics in small states casts smallness as an impediment to women’s political representation (Baker 2018; Baker and Corbett 2023; Baldacchino 2012; Corbett and Liki 2015; Nan Oye Hsse-Bayne and Kremer 2018). The supremacy of personal politics in smaller polities dooms female candidates’ electoral prospects. Given this literature’s focus on small states, however, it can only infer how size might impact women’s political representation in large or even medium-sized electorates.

We investigate the relationship between electorate size and female political representation in India. We examine these dynamics sub-nationally. The tremendous range in Indian constituencies’ electorate size and frequency of elections make India an excellent case to study the effect of size on female candidates’ electoral participation and performance. Crucially, we leverage India’s 2008 Delimitation (ie redistricting) of constituencies’ electoral boundaries to estimate how *within* electorate changes in demographic size correlate with female candidates’ participation and performance in state legislative assembly elections. Examining female candidates’ electoral participation in the same constituency before and after the 2008 Delimitation helps control for institutional and socio-economic confounders that undermine cross-national and even many sub-national studies of women’s political representation. We use a difference-in-differences (DiD) design to measure the impact of changing electorate size on female candidates’ electoral participation and performance.

We find that female candidates were less likely to run in constituencies that became *smaller* post-Delimitation. We estimate that the share of female candidates running for office fell eighteen percent in constituencies that shrunk after the 2008 Delimitation. This decline was greatest in smaller constituencies post-Delimitation with stronger patriarchal norms. While women were less likely to run in constituencies that became smaller, their electoral performance remained relatively the same across constituencies that grew, downsized or stayed the same. Electorate shrinkage may have a greater effect on the supply of female candidates, not voters’ demand for female candidates.

Our findings contribute to many strands of scholarship. To scholars of female representation, we demonstrate that electorate downsizing can depress women’s willingness to run, not their electoral performance. This intuition corroborates recent scholarship on the impact of decentralization on women’s representation in

India (Narasimhan and Weaver 2024). Our work tests and upholds insights from the small states literature as well. That perspectives unearthed from the study of the world’s smallest democracies can travel to the world’s largest reaffirms that politics in small states can teach us a lot about politics writ-large (Veenendaal 2015).

Lastly, our findings have policy implications. Amidst the proliferation of small states since World War II (Alesina et al. 2005; Corbett 2023; Maass 2014), and the push for greater decentralization (Mookherjee 2015; Veenendaal and Corbett 2015), many elections are fought in shrinking electoral arenas. Given that women’s political inclusion correlates with a host of developmental benefits (Brollo and Troiano 2016; Chattopadhyay and Duflo 2004; Hessami and Fonseca 2020a), our work suggests that efforts to downsize electoral boundaries in the name of decentralization or voter parity could amplify gender inequalities. A better understanding of how electorate size influences women’s electoral participation can help policymakers craft more inclusive electoral policies in smaller electorates. India’s recent gender quota law which will reserve a third of seats for women in parliament and state assemblies is a welcome accompaniment to the 2026 Delimitation (Bharti 2023; Brechenmacher 2023).

The article proceeds as follows. The next section surveys research on size and female political representation from the gender politics and small states literatures. The third section discusses our empirical strategy. We provide background on Indian state assembly elections, the 2008 Delimitation and an overview of scholarship on the challenges to female political representation in India. We then describe our data, models, and hypotheses. The fourth section presents our results. We conclude by discussing limitations and proposing future avenues of research.

## 2 Is Bigger Better for Female Political Representation?

Though women have made substantial gains in political representation over the past decade, they remain highly under-represented. Women held just short of twenty-five percent of all parliamentary seats worldwide in 2019 (Hessami and Fonseca 2020b). Two veins of scholarship explain women’s persistent political under-representation (Lawless 2015). The first focuses on electoral institutions. This scholarship finds that female candidates do better in proportional rather than majoritarian electoral systems (Profeta et al. 2022; Teele 2023a), and in closed rather than open list elections (Valdini 2012). Women are also more electorally successful in states with strong parties (Matland 1993; Thames and Williams 2010), greater party competition (Folke, Rickne, et al. 2016), and electorates with greater district magnitude (more elected representatives per constituency) (Crisp and Silva 2023; Kjaer and Elklit 2014; Matland and Taylor 1997).<sup>1</sup>

The benefits of elevating programmatic and party politics over personal politics is a lesson that permeates these institutional accounts. Strong parties, closed lists, and proportional electoral systems help depersonalize politics (Carey and Shugart 1995). Greater district magnitude allows parties to field more candidates, thus diluting the electorate’s focus and scrutiny of any particular female candidate. These electoral features insulate female candidates from voters’ gender biases, resulting in greater female representation.

The second vein of scholarship, pioneered by Jennifer Lawless and Richard Fox, argues that women’s political ambition to run is the chief barrier to women’s political representation (Fox et al. 2004; Lawless 2012; Lawless and Fox 2005, 2010). When women run, they win - or at least they fare no worse than male candidates after controlling for other determinants of electoral success like incumbency status and party. Weak evidence of a gender bias in survey respondents’ candidate preferences (Schwarz and Coppock 2022)

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1. Lucardi and Micozzi (2022), however, challenges this.

bolsters the view that female candidates' motivation, not voter biases, is the greatest hurdle to women's political representation.

Electorate size, however, likely shapes an electorate's institutions *and* female candidates' motivations to run. Smaller electorates generally have smaller district magnitudes and less party competition (Gerring et al. 2020). Amidst a dearth of candidates and parties, policymakers in smaller electorates frequently craft electoral institutions like open list systems (Gonzalez-Eiras et al. 2021) to encourage greater candidate participation. These institutions, however, are also associated with lower female representation. The confluence of smaller electorate and less gender inclusive electoral institutions obfuscates whether size or institution is responsible for women's under-representation.

Size likely influences women's motivations to run as well. On the one hand, winning an election in a smaller constituency may seem less daunting for women considering running for office. All else equal, the costs of campaigning in smaller electorates are lower - eroding the barriers to competing against predominantly male incumbents. At the same time, campaigning in smaller constituencies - where everybody knows everybody (Corbett 2015) - may expose female candidates to more personal attacks on the campaign trail and in office. A report on women's political representation in five small Caribbean states deplored the verbal abuse afflicting female representatives, especially abuse concerning "family relations and past intimate relationships (Nan Oye Hsese-Bayne et al. 2018, p.8)." The prospect of this kind of abuse, which is likely more damaging to female than male candidates' electoral prospects (p.8), probably dissuades many women from running in demographically smaller electorates. Greater anonymity and social distance between candidate and voter in larger electorates could better shield female candidates from such personal attacks. The *a priori* impact of electorate size on women's ambitions to run are unclear.

Finally, scholarship on electoral geography and female representation argues that female candidates do better in more urban electorates. Palmer and Simon (2008) propose that female candidates in the US house of representatives are more likely to be elected in geographically smaller and more urban districts. More recently, Teele (2023b) demonstrates that women's electoral turnout was higher in more urban districts in Sweden, and that urban women were more supportive of leftist causes. Urbanization is core to both these analyses. While urbanization captures greater population density, it also embodies a host of other economic and cultural factors outside of electorates' demographic size that might also explain women's electoral success.

The small states literature is much clearer about the dangers of smallness for women's political representation. Politics in smaller states tend to be hyper-personal (Sutton 2007; Veenendaal 2020). There is also greater public surveillance of candidates' private lives in smaller polities. Greater communal surveillance can uphold conservative norms (Baldacchino 2012, p.113), solidifying patriarchal hierarchies. Conservative norms discourage women from running for office in small Caribbean (Nan Oye Hsese-Bayne et al. 2018) and Pacific island states (Baker 2018). Indeed, the Pacific island states have some of the lowest levels of female representation among democracies in the world (Baker et al. 2023; Corbett et al. 2015).

This literature, however, has two limitations. First, by investigating in depth the challenges confronting female candidates in small states, it can only infer about the opportunities and the challenges confronting female candidates in demographically larger states. We build off of the rich insights uncovered in the small states' literature to assess whether these inferences can travel to larger electorates. Second, Caribbean and Pacific island states represent the bulk of cases in this scholarship. Many of these states have first-past-the-post electoral systems (Veenendaal 2020, p.66), which tend to disadvantage female candidates relative to proportional electoral systems (Teale 2023a). Perhaps electoral rules more than electoral size explain women's under-representation in small states.

Building off of insights from the gender politics and small states' literatures, we test the following hypothesis:

H1: Smaller electorates *decrease* women's electoral representation.

Existing scholarship points to supply and demand side mechanisms linking smaller electorate size and lower female electorate representation.

On the supply side, smaller electorates discourage female candidates from running because politics becomes more personal. As the social distance between voter and candidate decreases, prospective female candidates are more likely to sit out of elections out of fear of more intense and personal voter scrutiny. To assess an outcome of this supply side mechanism, we test:

H1a: Smaller electorates *decrease* female candidates' electoral participation.

On the demand side, existing scholarship warns that voters are less likely to support female candidates in smaller electorates. This is because voters' gender biases increase as the social distance between voter and candidate decreases. To assess an outcome of this demand side mechanism, we test:

H1b: Smaller electorates *decrease* female candidates' electoral performance.

### **3 Research Design: Delimitation and Female Electoral Representation in India**

We investigate the relationship between electorate size and female electoral representation by capitalizing on changing constituency boundaries in India. When lawmakers drafted the Indian Constitution in 1949, they stipulated there should be no more than one parliamentary representative for every 720,000 citizens (*Constitution of India, Second Amendment 1952*). Though this upper limit has changed amidst population growth, the constitution maintains a periodic Delimitation Commission to redress demographic imbalances between constituencies. There have been four Delimitation Commissions since independence, with the last commission formed by the central government after the 2001 census enumeration was concluded and the Delimitation Act, 2002 was passed into law (Sadan and Road 2008).

India is a parliamentary democracy comprised of twenty eight states and eight union territories. Central and state governments share power, with both national and state legislatures executing the legislative function of government. Representatives are directly elected to the lower houses of Parliament (Lok Sabha or House of the People) and state legislatures (Vidhan Sabha or State Legislative Assembly). Hence, constituencies are of two types - parliamentary constituencies and state assembly constituencies. The Fourth Delimitation Commission was tasked with rearranging the boundaries of parliamentary and assembly constituencies to accord with changes in population, which had increased by close to 87% since the Third Delimitation committee three decades prior (Sadan et al. 2008). Although boundaries changed, the total number of constituencies and electoral magnitude of each constituency remained the same. In this paper, we focus on election outcomes for state legislative assembly elections (Vidhan Sabha) in state assembly constituencies.

State governments in India are important. They have authority over their state’s health, education and law and order (Iyer 2019).

Each state’s Election Commission conducts state assembly elections every five years, barring political crisis. The timing of these elections varies across states. Each constituency within a state elects a single candidate in a first-past-the-post system. The number of constituencies in each state assembly is fixed and determined by the parliament – the size of state assemblies varies significantly based on the size of the state, from 30 members (Puducherry) to 403 members (Uttar Pradesh).

State assemblies reserve seats for historically marginalized groups - Scheduled Castes (SC) and Tribes (ST). The number of constituencies reserved for SC and ST candidates reflects these groups’ relative size in their state. SC and ST candidates can also contest in ‘general’ seats, which are open to all eligible candidates. While state assemblies did not reserve seats for female candidates, a higher percentage of female candidates participated in elections reserved for SC and ST seats (Jensenius 2016).

#### The 2008 Delimitation Commission’s

The 2008 Delimitation Commission, which convened in 2002, used the 2001 Census to determine constituencies’ electorate size. Their mandate was twofold – to equalize the size of constituencies within each state, and to adapt the reserved constituencies based on the change in relative population size of SC and ST groups. The Delimitation Commission used a benchmark of no more than 10% deviation in electorate size from a state’s average electorate size (Sadan et al. 2008). Other factors, like geography and administrative boundaries, also influenced the Delimitation Commission’s redrawing of India’s electoral map. Existing scholarship argues that the 2008 Delimitation was conducted in a politically neutral fashion (Iyer and Reddy 2013). Following extensive consultations with states and citizen groups, the Delimitation Commission announced the forthcoming change in electoral boundaries in 2007, and the new electoral boundaries came into effect in early 2008 (Sadan et al. 2008).<sup>2</sup>

We exploit the change in constituency boundaries following the 2008 Delimitation to isolate the effect of electorate size on women’s participation and performance in state legislative assembly elections. The 2008 Delimitation created a discrete and in some cases dramatic change in electorate size for many constituencies. Crucially, though 2008 Delimitation changed the demographic size of many constituencies’ electorates, it did not alter these constituencies’ electoral magnitude or first-past-the-post electoral system. Our analysis holds these electoral institutions constant to better assess the relationship between electorate size and female representation. Other scholars have used the 2008 Delimitation as a natural experiment to examine a variety of other outcomes as well (Cage, Cassan, and Jensenius 2023; Jensenius and Chhibber 2023; Old 2020). We conduct a difference-in-differences (DiD) analysis where we compare female candidates’ electoral participation and outcomes before and after Delimitation in constituencies which experienced a small change in electorate size post-Delimitation with those that experienced a large decrease and increase in electorate size post-Delimitation.

### 3.1 Background: Challenges to Female Representation in India

Despite high levels of female voter turnout, women are severely underrepresented in India’s national and state legislatures. In 2023 women held fewer than twenty percent of legislative assembly seats in every state (*Women in Parliament and State Assemblies* 2024). Few women contest elections as well. Female candidates

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2. The Indian government did not implement delimitation in states with high levels of conflict. These include Assam, Arunachal Pradesh, Manipur, Nagaland, and Jammu and Kashmir. As will be discussed, we drop constituencies from these states in our analysis.

made up less than ten percent of all candidates for state legislative assembly elections between 2011 to 2015 (Jensenius 2016, p.450). Less than ten percent of candidates for the 2019 national election were women (Iyer 2019).

Existing work identifies strong patriarchal norms and party gatekeeping as main barriers to female candidates' participation in Indian electoral politics, in spite of growing demands for female representation since the 1990s (Spary 2014, 2020). Parties are risk averse in nominating female candidates, especially in tight elections (Spary 2014). Parties prefer to nominate female candidates in reserved elections from ST and SC seats than to displace male candidates in unreserved (Jensenius 2016).

Party gatekeeping persists even after women prove their winnability. Bhalotra, Clots-Figueras, and Iyer (2018) uncover a stronger incumbency effect for women than men in state assembly elections. This incumbency, however, may produce a 'backlash' effect where fewer other female candidates contest female incumbent constituencies. This 'backlash' is especially pronounced in constituencies with lower female to male ratios, which they attribute to stronger patriarchal norms. Brown, Mansour, and O'Connell (2022), however, find that winning seats in state assemblies increases the number of female candidates and vote share for female candidates in subsequent national parliamentary elections. In their study of village-council quotas in the state of West Bengal, Beaman, Chattopadhyay, Duflo, Pande, and Topalova (2009) find that women are more likely to come into power in unreserved constituencies if the constituency has a history of being reserved in previous elections. Goyal (2023) suggests that once elected, women are able to loosen the constraints of party gatekeeping through both top-down and bottom-up mechanisms. Using local-level quotas in Delhi, she shows that a greater presence of female representatives creates a pathway for further representation through female leaders' promotions within the party and by strengthening grassroots networks of women activists.

With regards to voters, Indian women are much less politically active than men in non-electoral domains of political participation<sup>3</sup> (Iyer and Mani 2019; Prillaman 2023). They often adhere to their husbands' political preferences when they lack economic opportunities (Prillaman 2023). Kapoor and Ravi (2013) show that female candidates are less likely to contest in constituencies with a favorable sex ratio. They infer that women are more likely to express their policy preferences by voting instead of contesting elections in these constituencies. Lastly, as in the Caribbean (Nan Oye Hsese-Bayne et al. 2018), and democracies broadly, harassment on the campaign trail and in office is a major impediment to women's political participation in India. One Indian journalist described "character assassination" as being the biggest challenge confronting female politicians in India (Das 2023).

Stepping back, scholarship on female representation in India agrees that although rates of female candidates' electoral participation and parliamentary inclusion are low, they are slowly improving. There is more debate over whether women's electoral success catalyzes additional gains in women's electoral representation or whether institutional and economic remedies are necessary to lessen the gender gap.

## 3.2 Data

We test our hypotheses with data from the Socioeconomic High-resolution Rural-Urban Geographic Platform for India (SHRUG) (*Socioeconomic High-resolution Rural-Urban Geographic Platform (SHRUG)* 2024). SHRUG is an open access data repository that combines dozens of datasets. It provides socio-economic, geographic, as well as electoral data for over half a million Indian towns, villages, and assembly constituencies over a fifty year period. Crucially, SHRUG provides a unique identifier for each geographical unit, including

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3. These include meeting with public officials, attending local council meetings, organizing and signing petitions.

at the constituency level. We use these identifiers to compare female candidates' electoral participation and performance in state legislative assembly elections before and after the 2008 Delimitation.

Each constituency in the SHRUG dataset has two unique identifiers - one for all elections before the 2008 Delimitation<sup>4</sup>, and another post-delimitation. Thus most constituencies in the SHRUG dataset have two set of observations per election-year - one based on their pre-2008 boundaries, and the other based on their post-2008 boundaries.

We match pre-Delimitation constituencies to their post-Delimitation counterparts based on the similarities of their pre and post-Delimitation constituency names. We match constituencies in two steps. First, we identify pairs within a state for which the constituency name pre-2008 perfectly matches the constituency name post-2008 and denote them as the same constituency. There are 4008 unique constituencies pre-2008 and 4120 unique constituencies post-2008. Of these, 2808 constituencies have the same name. These are exact matches.

Second, we attempt to match the remaining constituencies using Surf, which is an open-source software for matching Indian names (Surf 2024). Surf identifies groups with similar names using a variety of string-matching algorithms. We iteratively apply three different algorithms to the list of unmatched constituencies, and hand-match pairs identified as close matches by Surf. This allows us to match an additional 253 constituencies. We drop the remaining unmatched constituencies from our analysis. This produces a dataset of 3061 unique constituencies.<sup>5</sup>

This matching strategy restricts our analysis to constituencies that endured pre to post-Delimitation. Indeed, while the *total* number of constituencies per state remained the same pre to post-Delimitation, some shrinking constituencies were merged with growing neighbors. In other cases, the Delimitation Commission cut out new constituencies from growing ones. Our empirical design omits constituencies that no longer exist, and ones created after delimitation. Nevertheless, because we are able to match roughly three-quarters of pre-Delimitation constituencies, our data covers a large and diverse sample of constituencies.

Our unit of analysis is constituency-election. Because elections for state legislative assembly seats occur at different years for different states, we mark each election year in terms of the number of elections before or after the 2008 Delimitation. We restrict our analysis to three elections pre and two elections post delimitation. This produces 13,319 constituency-election observations. The average electorate size in our analysis is 180,000 voters. The largest constituency pre-Delimitation had 1.5 million voters. The smallest had less than 3,000.

### 3.3 Independent Variable: Change in Electorate Size

Change in electorate size is our independent variable. To define treatment and control groups, we first calculate each constituency's electorate size change following the 2008 Delimitation. This is their percent change in electorate size pre to post-Delimitation. It equals the following -

$$\frac{\text{Number of electors in first election post-2008} - \text{Number of electors in last election pre-2008}}{\text{Number of electors in last election pre-2008}} * 100$$

Electors are the voting illegible members of an electorate. A positive number indicates that the constituency grew, and a negative number indicates that it shrank post-Delimitation. Among the constituencies we are able to match pre to post-Delimitation, the median constituency grew ten percent. Roughly a quarter

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4. Beginning after 1977.

5. Please see Appendix for more information on SHRUG data and our matching strategy



of constituencies downsized, with the first quartile of change in constituency size ranging from a  $-81$  to  $-1$  percent. The distribution of percent electoral size change is relatively normal (See Figure 5 in Appendix).

Our main measure places constituencies into three categories - those that became *smaller*, stayed the *same*, and became *larger* after Delimitation. We assign constituencies to these categories based on the percent change in their electorate size pre to post-Delimitation.

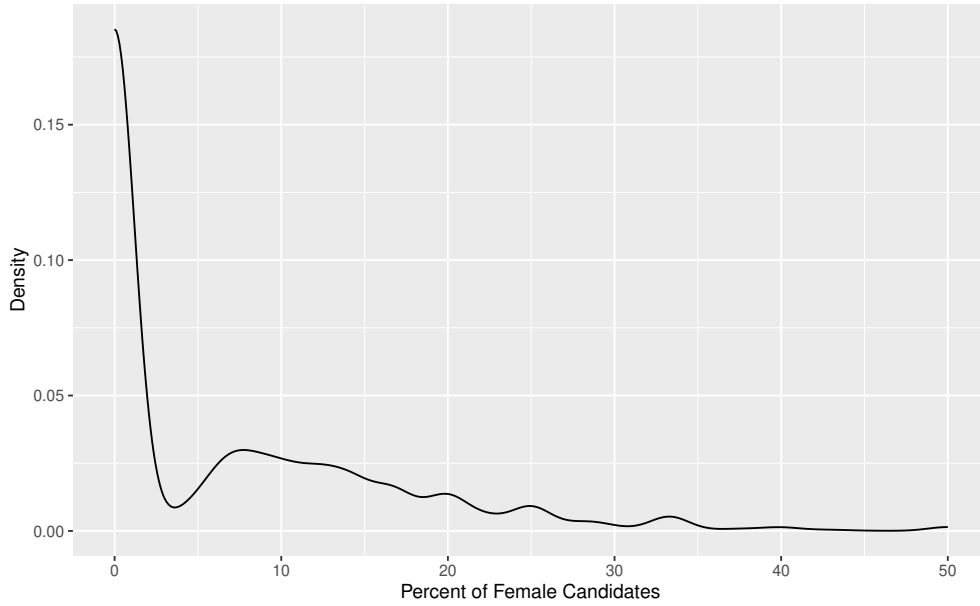
The main analysis defines *smaller* constituencies as constituencies whose size shrunk by more than ten percent in the first election after Delimitation. *Larger* constituencies grew by more than ten percent, and the remaining constituencies' change in size spanned from negative to positive ten percent (*Same*). Under this categorization, roughly thirteen percent of constituencies became *smaller* ( $n = 1,750$ ), almost half became *larger* ( $n = 6,643$ ) and thirty-seven percent remained the *same* ( $n = 4,926$ ). We expand and shrink the size cutoffs for *smaller* and *larger* constituencies in robustness checks. Using the ten percent cutoff measure, the median *smaller* constituency's electorate shrunk nineteen percent in the first election after Delimitation. The median *larger* constituency grew twenty-four percent, and *same* constituencies grew 1.6 percent.

To be clear, each constituency's assignment into the different size categories stems from demographic, economic and social factors in addition to the Delimitation Commission's efforts to impose within-state demographic constituency parity. Indeed, the Delimitation Commission efforts counter-balanced many of these changing demographic patterns. It made some constituencies *smaller* because economic and social factors rendered these constituencies demographically larger than their peers. *Larger* constituencies grew after Delimitation because they were not growing as fast as their peers before Delimitation. Before Delimitation, constituencies that would become *smaller* were more populous, had more candidates per election, had lower electoral turnout and fewer parties contesting elections than constituencies that would stay the *same* post-Delimitation. *Smaller* constituencies had higher levels of female labor force participation and literacy rates. Female candidates were also more likely to run (See Balance Tables 3 and Table 4). There are likely observable and unobservable differences between smaller, larger and same-sized constituencies that would also affect female political representation. Our Difference-in-Differences (DiD) approach helps account for these cross-constituency confounders.

### 3.4 Dependent Variable: Female Electoral Representation

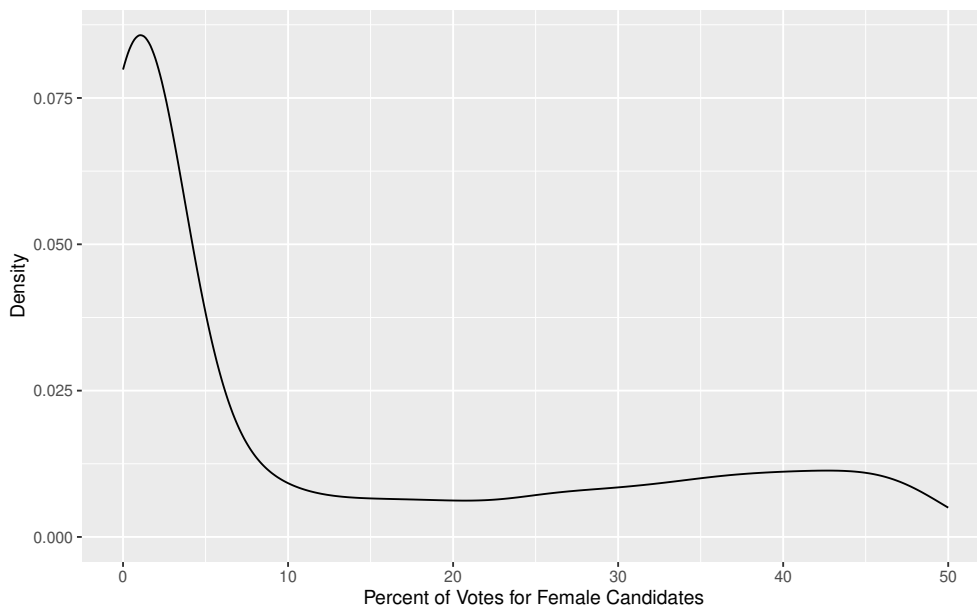
We assess female electoral representation through two outcomes: female candidates' electoral participation (H1a) and electoral success (H1b). We measure electoral participation by the share of female candidates running in a state assembly election (*Female Candidate Share*). This is the number of female candidates divided by the total number of candidates per election. The median total number of candidates per election is nine. Figure 1 plots the distribution of percent of female candidates per election. There are zero female candidates in the median election, while 6.7 percent of candidates are women in the average state legislative assembly election. We log *Female Candidate Share* in our analysis because of its rightward skew. We also use a dummy variable equal to one if an election had at least one female candidate (*Female Candidate Ran*). Forty-five percent of the constituency-election observations in our analysis had at least one female candidate.

Figure 1: Density Plot of Percent of Female Candidates per Election



We gauge female candidates' electoral success by the share of votes won by all female candidates in an election (H1b). This is the total number of votes won by female candidates divided by the total number of valid votes in an election. Because women partake in less than half of constituency elections, the median value of *Female Vote Share* is zero. When subsetted to elections with at least one female candidate, the median *Female Vote Share* is three percent. We also assess female electoral representation in terms of winning an assembly seat. Female candidates won seven percent of our population of constituency-election observations. This rate more than doubles when restricted to elections with at least one female candidate. These averages are comparable to other work on women's representation in Indian state legislative assembly elections (Iyer 2019; Jensenius 2016).

Figure 2: Density Plot of Aggregate Female Vote Share in Elections (with at least one female candidate)



### 3.5 Control Variables

Many factors can influence both the size of an electorate and female candidates' political representation. Our full models control for the number of candidates (logged) and parties contesting an election to account for a lower supply of potential candidates and parties in smaller electorates. We control for electoral turnout<sup>6</sup> as a measure of electoral competitiveness, given that Indian parties are less likely to nominate female candidates in more competitive elections (Spary 2014). We account for whether the election is for a Reserved Seat (ST or SC), a type of election which parties are more likely to nominate female candidates (Jensenius 2016). Female candidates' past electoral success might also influence their willingness to run and their current electoral success - though scholars disagree whether positively (Beaman et al. 2009; Brown et al. 2022) or negatively (Bhalotra et al. 2018). Our models include a dummy variable equal to one if a female candidate ever won a previous election in that constituency.<sup>7</sup> Constituencies' socio-economic characteristics also matter. If access to employment expands female voters' networks and lessens the political influence of their husbands or fathers (Prillaman 2023), then higher levels of female employment and human capital may correlate with greater female electoral representation. Our full models control for a constituency's rate of female literacy and female employment. These socio-economic indicators stem from censuses that were conducted at the start of each decade. We use values from the last census before each constituency-election observation. Finally, all our models employ constituency and election-year fixed effects. See Table ?? in the Appendix for Summary Statistics on the control and dependent variables.

6. This is the number of valid votes divided by a constituency's total voting age population.

7. Beginning from three elections before the 2008 Delimitation.

### 3.6 Model

We apply a DiD design to assess the relationship between electorate size and female representation. For constituency  $i$  in election  $t$ ,

$$\left\{ \begin{array}{l} \text{Female Electoral Representation}_{it} = \beta + \lambda \text{Delimitation}_t X \text{Electorate Size Change}_i + \\ \alpha \text{Delimitation}_t + \\ \text{Controls}_{it} + \text{Constituency}_i + \text{Election Year}_t + \epsilon_{it} \end{array} \right. \quad (1)$$

$\lambda$  is an interaction term consisting of *Delimitation* and *Electorate Size Change*. The *Delimitation* variable is dummy variable equal to one if an election occurred after the 2008 Delimitation. *Electorate Size Change* is a categorical variable consisting of three values. In our main analysis, constituencies are *smaller* if their electorate size downsized by more than ten percent, and *larger* if they grew by more than ten percent in their first election after Delimitation. The reference category, *same* constituencies, are constituencies whose electorate size changed between negative and positive ten percent in the first election after the 2008 Delimitation.

H1 expects a negative coefficient on the interaction term  $\lambda$  for *smaller* constituencies relative to constituencies' whose electorate size stayed the *same*. It predicts a positive coefficient on the interaction term for *larger* constituencies relative to constituencies' whose size remained the *same*. *Controls* are a vector of control variables. Each model uses *Constituency* and *Election-Year* fixed effects.  $\epsilon$  is the error term. We cluster standard errors at the constituency level. We use Ordinary Least Squares (OLS) models for our continuous and binary dependent variables.

A causal interpretation of the interaction term relies on two assumptions. The first is that a constituency's change in electorate size following delimitation was exogenous to considerations of female representation. We have found no evidence that the Delimitation Commission redrew constituencies with regards to promoting (or undermining) women's political representation. The second assumption is that there would have been "parallel trends" in female candidates' electoral representation among the different constituency types in the absence of Delimitation. This means that electoral outcomes in constituencies in which population changed significantly following Delimitation would have followed the same trend as constituencies in which population did not change significantly had Delimitation not occurred.

Figures 3 and 4 support this assumption. Note that 0 on the x-axis indicates a constituency's last election before Delimitation. Both plots depict low but slightly improving levels of female candidate participation and electoral success in the three constituency types pre-Delimitation. Post-Delimitation ( $x > 0$ ), however, constituencies that became *smaller* under-perform relative to those that stayed the *same* or became *larger*. The rate in female candidates' share of candidates (H1a) and vote share (H1b) overtime *decreases* in *smaller* constituencies while they continue to increase in constituencies that became *larger* or stayed the *same*.

Figure 3: Average Share of Female Candidates Per Election

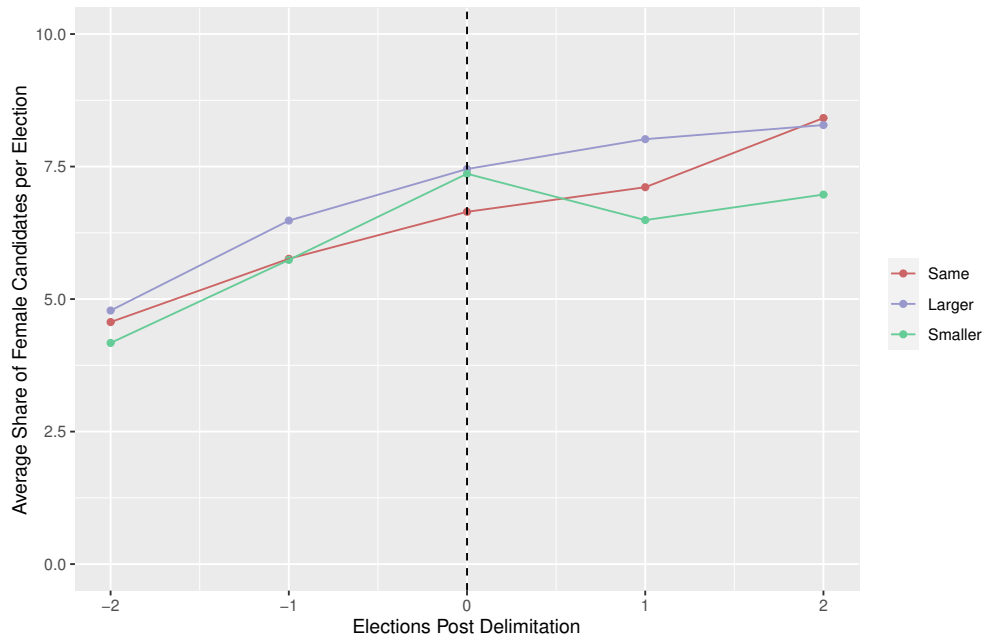
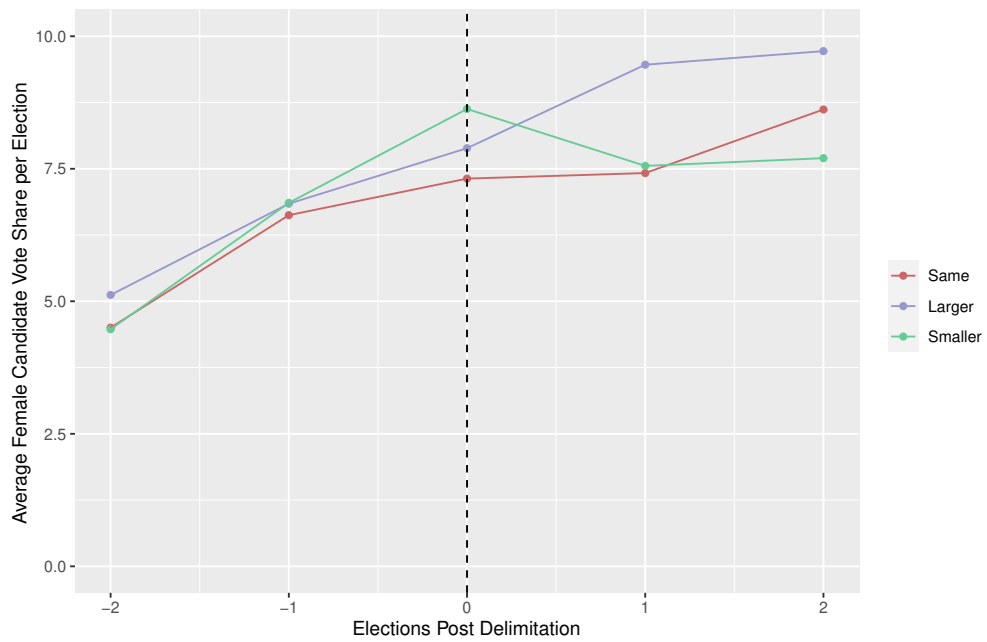


Figure 4: Average Female Candidates Vote Share Per Election



## 4 Results

### 4.1 Electorate Size Decreases the Supply of Female Candidates

We first examine the relationship between electorate size and female candidates' electoral participation. In support of H1a, *smaller* constituencies experienced lower levels of female candidate participation following Delimitation relative to constituencies whose size remained the *same* (Table 1). The negative *Smaller\*Delimitation* coefficient is statistically significant at the five percent level in all model specifications except Model 3, where it is just short of statistical significance ( $p=0.05$ ). The magnitude of the coefficient is also substantively important. Model 3 estimates that holding all else equal, electorate downsizing reduced *smaller* constituencies' aggregate share of female candidates per election by eighteen percent. The likelihood of having *any* female candidate participate in an election was seven percentage points lower in *smaller* constituencies post-Delimitation than constituencies which stayed the same post-Delimitation (Model 4). Meanwhile, there is no statistically significant relationship between constituencies that became *larger* and female candidates' electoral participation post-Delimitation. Unlike with electorate downsizing, electorate expansion does not appear to influence the number of female candidates contesting an election.

Table 1: Electorate Size and Female Candidates' Electoral Participation

	<i>Dependent variable:</i>			
	Share of Fem Cand (log)			Female Ran (1=Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.61*** (0.05)	0.60*** (0.05)	0.60*** (0.08)	0.22*** (0.03)
Num Candidates (logged)		0.36*** (0.03)	0.30*** (0.05)	0.22*** (0.02)
Electorate Turnout		-0.002 (0.002)	-0.003 (0.003)	-0.001 (0.001)
Reserved		0.36*** (0.07)	0.43*** (0.09)	0.12*** (0.03)
Female Ever Winner			-0.12 (0.08)	-0.05** (0.03)
Number of Parties			0.03 (0.02)	0.01* (0.01)
Female Emp			-0.004 (0.003)	-0.002 (0.001)
Fem Lit			0.002 (0.002)	0.001 (0.001)
Larger*Delimitation	-0.05 (0.05)	-0.06 (0.05)	-0.05 (0.06)	-0.02 (0.02)
Smaller*Delimitation	-0.20*** (0.07)	-0.17** (0.07)	-0.18* (0.09)	-0.07** (0.03)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	13,319	13,319	9,810	9,810
R <sup>2</sup>	0.04	0.05	0.05	0.07
F Statistic	67.44***	60.66***	27.00***	40.73***

Note:

\* $p<0.1$ ; \*\* $p<0.05$ ; \*\*\* $p<0.01$

These patterns persist with different measures of *smaller* and *larger* constituencies (Tables 6 and ??),

though levels of statistical significance are short of five percent in some model specifications. These results are robust to examining the relationship between change in constituency size and the number of female candidates running (Table 8), and removing constituencies that changed states<sup>8</sup> after Delimitation (Table 9).

The *Smaller\*Delimitation* interaction term loses statistical significance when we limit the analysis to the first post-Delimitation election (Table 10). It regains statistical significance at the ten percent level after subsetting the post-Delimitation observations to the second election (Table 11), suggesting a gradual decline in female candidates' electoral in *smaller* constituencies post-Delimitation.

Turning to control variables, in line with existing scholarship, *Reserved* elections are positively associated with greater female candidate participation. We find mixed evidence of a “backlash” effect of women’s electoral success. Past female candidate success (*Female Ever Winner*) has no statistically significant association with current rates of female candidate participation (Model 3). It is negatively associated, however, with the likelihood of at least one female candidate running (Model 4). Higher levels of female literacy and employment are also not associated with greater female candidate electoral participation. If these measures are proxies for constituencies that would be most open to female political representation, they do not seem to attract female candidates.

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8. The Delimitation Commission assigned 1209 constituencies in our analysis to other pre-existing states after Delimitation.

## 4.2 Electorate Size Has Little Effect on Demand for Female Candidates

While female candidates were generally less likely to participate in *smaller* constituencies post-Delimitation, change in electoral size appears to have no bearing on female candidates' electoral performance (H1b). The *smaller* and *larger* interaction coefficients are negative but not statistically significant at the five percent level across all model specifications.

Table 2: Electorate Size and Female Candidates' Electoral Success

	<i>Dependent variable:</i>			
	Female Vote (log)			Female Won (1 = Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.41*** (0.05)	0.43*** (0.05)	0.37*** (0.08)	0.05*** (0.02)
Num Candidates (logged)		0.16*** (0.03)	-0.002 (0.05)	-0.01 (0.01)
Electorate Turnout		-0.005** (0.002)	-0.01*** (0.003)	-0.001 (0.001)
Reserved		0.42*** (0.07)	0.50*** (0.09)	0.06*** (0.02)
Female Ever Winner			-0.19* (0.10)	-0.24*** (0.03)
Number of Parties			0.13*** (0.02)	0.01 (0.004)
Female Emp			-0.004 (0.003)	0.0003 (0.001)
Fem Lit			0.01*** (0.002)	0.001*** (0.0004)
Larger*Delimitation	0.06 (0.05)	0.05 (0.05)	0.01 (0.07)	-0.0002 (0.01)
Smaller*Delimitation	-0.12 (0.08)	-0.10 (0.08)	-0.11 (0.10)	-0.002 (0.02)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	13,319	13,319	9,810	9,810
R <sup>2</sup>	0.02	0.03	0.04	0.04
F Statistic	43.73***	39.35***	21.47***	22.93***

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

This null finding persists across different measures of change in constituency size (Tables 12 and 13), and removing constituencies that changed states when using full model specifications (Table 14). Nor is the interaction term statistically significant when subsetting the analysis to the first (Table 15) and second (Table 16) post-Delimitation election. Lastly, running in *smaller* and *larger* constituencies post-Delimitation has no statistically significant association with female candidates' electoral performance when restricting the analysis to elections with at least one female candidate (Table 17).

While smaller may be worse for female candidates' electoral participation, electorate size does not undermine nor improve their electoral success when they do run. Indeed, there is no statistically significant increase in the average share of total votes per female candidate in *smaller* constituencies post-Delimitation (Table 18). This may be because while the total (male and female) number of candidates *decreased* in *smaller* constituencies (Table 19), electoral turnout as measured as a percent of eligible voters *increased* in



*smaller* constituencies post-Delimitation (Table 19). Fewer candidates and higher voter participation may have preserved female candidates’ average vote share despite fewer women running in *smaller* constituencies. These trends suggest that electorate size may not impact voters’ *demand* for female candidates.

Turning to control variables, Table 2 presents additional evidence of reserved elections promoting women’s political inclusion. It also demonstrates a “backlash” effect against female candidates’ electoral success in constituencies with a history of elected female representatives. Levels of female literacy are also strongly correlated with female candidates’ electoral success.

Lastly, to unpack the relationship between voters’ demand for female candidates and female candidates’ electoral participation and performance in constituencies of different electorate sizes, we subset our analysis between constituencies’ with high and low female to male sex ratios. Like others (Bhalotra et al. 2018; Kapoor et al. 2013), we interpret constituencies with a higher share of women to men to be more “female friendly” towards female candidates and have weaker patriarchal norms. Higher ratios indicate greater human capital and health investment in women, as well as a lower incidence of privileging boys over girls at birth. We divide constituencies based on whether their female-male sex ratio is greater than the median of 0.941. We expect and find that changes in electorate size have no association with female candidates’ likelihood of running or their electoral performance in *pro-female* constituencies (Table 21). Women are less likely to run in *smaller* constituencies among *anti-female* constituencies. They also obtain a relatively lower share of the vote in these constituencies (Table 22). Similar patterns hold when we divide constituencies into pro and anti-female based on female literacy rates<sup>9</sup> (Tables 23 and 24). If sex ratios and female literacy rates are valid proxies for social attitudes towards female political representation, then female candidates are less willing to participate, and/or parties are less willing to nominate female candidates in *smaller* constituencies with stronger patriarchal norms. Women and their respective parties may think they are less likely to win in these constituencies. Additionally, women may be more reluctant to run in *smaller* constituencies with stronger patriarchal norms for fear of greater abuse on the campaign trail or in office.

## 5 Discussion and Conclusion

We find the electorate downsizing undermines female candidates’ participation in state legislative assembly elections in India. Electorate size, however, has little observable impact on female candidates’ electoral performance. We infer that size has a greater effect on the *supply* of female candidates in an election, not voters’ *demand* for female representation.

These findings point to many future avenues of research. The first is to probe the mechanisms underlying these results. Is the drop in female candidates’ participation in *smaller* constituencies a reflection of greater harassment and intimidation in smaller electorates? If so, this would lend credence to arguments about a lack of candidate motivation being a primary deterrent for women’s political representation (Lawless 2015; Lawless et al. 2005). Or did parties hesitate to nominate female candidates in smaller constituencies out of fear they would lose? Interviews and case studies of *smaller* constituencies would help clarify these dynamics. This could then help explain why electorate expansion did not correlate with greater female participation.

That electorate size had no apparent impact on female candidates’ electoral performance merits further investigation as well. We suspect that changes in electorate boundaries have no effect on voters’ preferences for female candidates. However, because change in electorate size also correlated with changes in the number

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9. Constituencies have *high female literacy* if their rate of female literacy is above the median rate of 53.60. Constituencies have *low female literacy* if their female literacy rates are equal to or below the median.

of candidates contesting an election (Table 19) and electoral turnout (Table 20), it is hard to untangle which factors underpin women's stable electoral performance. Given female candidates' low levels of electoral success, floor effects may dampen our ability to measure the relationship between electorate size and voter support for female candidate. Observational and experimental surveys on voters' attitudes towards female political representation across different types of constituencies could help probe the null relationship between electorate size and female candidates' electoral performance.

Another avenue of research can interrogate the socio-economic consequences of *smaller* electorates for women. Narasimhan et al. (2024) demonstrate that while women are less likely to run in smaller polities in Uttar Pradesh, they are more likely to participate in civic life. Civic engagement with the state may be easier in smaller electorates. If representatives of smaller constituencies are more responsive to voters' demands and are more likely to provide public goods (Narasimhan et al. 2024; Post et al. 2023), then women's welfare in those constituencies may improve irrespective of female candidates' electoral participation.

Finally, to return to India's 2026 Delimitation, the recent gender quota law will mitigate the delimitation's dissuasion on female candidates' participation in *smaller* constituencies. The quota, which may not come into effect until 2029, will reserve a third of legislative state assembly seats for women (Das 2023), more than tripling the number of female representatives in many legislative state assemblies. It remains to be seen whether and which parties can field so many female candidates. Large parties like the Bharatiya Janata Party (BJP) will likely benefit from this electoral change. Indeed, the BJP nominated more female candidates than any other party in the 2019 elections (Brechenmacher 2023). Nevertheless, the quota's success depends on women's willingness to run. Building more inclusive electoral arenas - ones that ban candidate harassment, lower costs of campaigning and are sensitive to the public's unequal standards and expectations towards female candidates - is necessary to deepen both women's symbolic and substantive representation under the gender quota law.

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## 6 Appendix

### 6.1 Plots, Summary Statistics and Balance Tables

Figure 5: Density Plot of Percent Change in Constituency Size (Post - Pre-Delimitation)

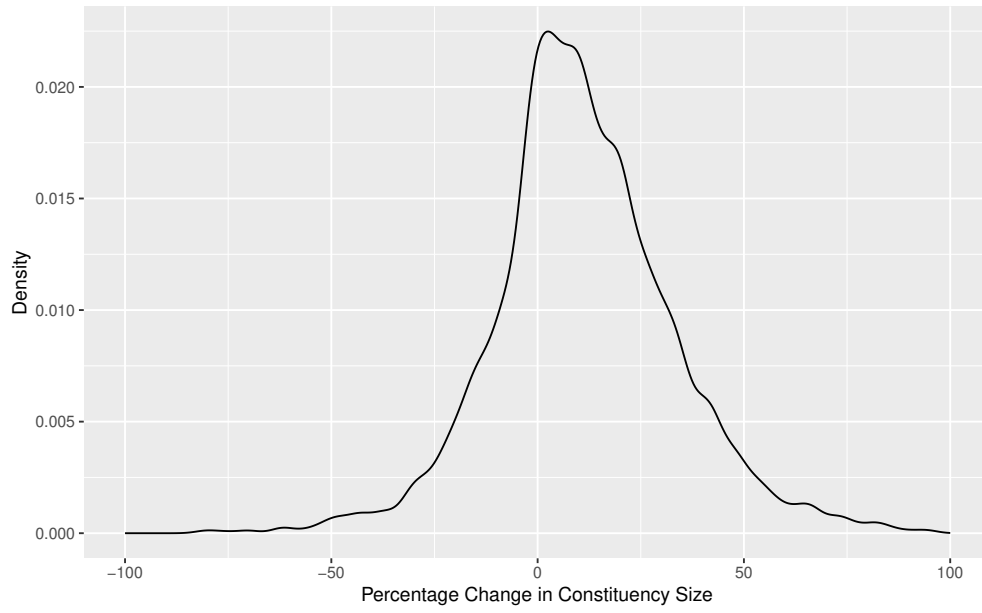




Table 3: Smaller and Same Constituencies Pre-Delimitation

<b>Variable</b>	<b>Same, N = 2,948<sup>1</sup></b>	<b>Smaller, N = 1,048<sup>1</sup></b>	<b>p-value<sup>2</sup></b>
Female Candidates (Percent)	6	6	0.7
One Female Candidate (1 = Yes)	38%	41%	0.051
Female Candidate Votes (Percent)	6	7	0.4
Female Winner (1 = Yes)	5.9%	6.5%	0.5
Electors	169,284	210,548	<0.001
Number of Candidates	10	11	<0.001
Electoral Turnout	64	62	<0.001
Area (Pre Delimitation, km2)	946	803	0.024
Reserved Election (1 = Yes)	24%	20%	0.006
Female Candidate Ever Won (1 = Yes)	16%	16%	0.7
Number of Parties	3.13	2.96	<0.001
Female Percent of Labor Force	16	17	0.013
Female Literacy Rates	44	50	<0.001
<sup>1</sup> Mean or Frequency			
<sup>2</sup> Welch Two Sample t-test; Pearson's Chi-squared test			

Table 4: Larger and Same Constituencies Pre-Delimitation

Variable	Larger, N = 3,980 <sup>1</sup>	Same, N = 2,948 <sup>1</sup>	p-value <sup>2</sup>
Female Candidates (Percent)	6	6	0.011
One Female Candidate (1 = Yes)	39%	38%	0.3
Female Candidate Votes (Percent)	7	6	0.2
Female Winner (1 = Yes)	6.2%	5.9%	0.7
Electors	150,058	169,284	<0.001
Number of Candidates	9	10	<0.001
Electoral Turnout	67	64	<0.001
Area (Pre Delimitation, km2)	782	946	0.004
Reserved Election (1 = Yes)	26%	24%	0.028
Female Candidate Ever Won (1 = Yes)	16%	16%	>0.9
Number of Parties	2.93	3.13	<0.001
Female Percent of Labor Force	17	16	0.003
Female Literacy Rates	47	44	<0.001
<sup>1</sup> Mean or Frequency			
<sup>2</sup> Welch Two Sample t-test; Pearson's Chi-squared test			

Table 5: Summary Statistics

Variable	Obs	Mean	SD	Min	Max
Female Candidates (Percent)	13319	6.71	9.57	0.00	80.00
Female Candidates (1 = Yes)	13319	0.45	0.50	0.00	1.00
Female Candidate Votes	13319	7.38	16.35	0.00	98.33
Female Winner (1 = Yes)	13319	0.07	0.26	0.00	1.00
Delimitation	13319	0.40	0.49	0.00	1.00
Number of Candidates	13319	10.22	5.54	2.00	53.00
Electoral Turnout	13319	67.64	11.99	6.48	96.68
Land Area (Pre Delimitation km2)	12420	846.40	1914.39	0.73	79745.38
Reserved Election (1 = Yes)	13319	0.25	0.44	0.00	1.00
Female Candidate Ever Won (1 = Yes)	13319	0.19	0.39	0.00	1.00
Number of Parties	13319	3.05	1.01	1.08	11.11
Female Percent of Labor Force	9852	18.75	9.75	0.00	72.32
Female Literacy Rates	10709	52.71	19.71	0.00	97.48

## 6.2 Robustness Checks

## 6.3 Female Candidates' Electoral Participation

Table 6: Electorate Size and Female Candidates' Electoral Participation (15 percent marker)

	<i>Dependent variable:</i>			
	Share of Fem Cand (log)			Female Ran (1=Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.59*** (0.04)	0.59*** (0.04)	0.59*** (0.07)	0.21*** (0.03)
Num Candidates (logged)		0.36*** (0.03)	0.30*** (0.05)	0.22*** (0.02)
Electorate Turnout		-0.002 (0.002)	-0.003 (0.003)	-0.001 (0.001)
Reserved		0.36*** (0.07)	0.43*** (0.09)	0.12*** (0.03)
Female Ever Winner			-0.12 (0.08)	-0.05** (0.03)
Number of Parties			0.03 (0.02)	0.01* (0.01)
Female Emp			-0.004 (0.003)	-0.002 (0.001)
Fem Lit			0.002 (0.002)	0.001 (0.001)
Larger*Delimitation	-0.04 (0.05)	-0.05 (0.05)	-0.05 (0.06)	-0.02 (0.02)
Smaller*Delimitation	-0.18** (0.08)	-0.15* (0.08)	-0.21* (0.11)	-0.07* (0.04)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	13,319	13,319	9,810	9,810
R <sup>2</sup>	0.04	0.05	0.05	0.07
F Statistic	66.98***	60.42***	27.02***	40.66***

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 7: Electorate Size and Female Candidates' Electoral Participation (5 percent marker)

	<i>Dependent variable:</i>			
	Share of Fem Cand (log)			Female Ran (1=Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.61*** (0.05)	0.60*** (0.05)	0.60*** (0.08)	0.22*** (0.03)
Num Candidates (logged)		0.36*** (0.03)	0.30*** (0.05)	0.22*** (0.02)
Electorate Turnout		-0.002 (0.002)	-0.003 (0.003)	-0.001 (0.001)
Reserved		0.36*** (0.07)	0.43*** (0.09)	0.12*** (0.03)
Female Ever Winner			-0.12 (0.08)	-0.05** (0.03)
Number of Parties			0.03 (0.02)	0.01* (0.01)
Female Emp			-0.004 (0.003)	-0.002 (0.001)
Fem Lit			0.002 (0.002)	0.001 (0.001)
Larger*Delimitation	-0.05 (0.05)	-0.06 (0.05)	-0.05 (0.06)	-0.02 (0.02)
Smaller*Delimitation	-0.20*** (0.07)	-0.17** (0.07)	-0.18* (0.09)	-0.07** (0.03)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	13,319	13,319	9,810	9,810
R <sup>2</sup>	0.04	0.05	0.05	0.07
F Statistic	67.44***	60.66***	27.00***	40.73***

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 8: Electorate Size and Female Candidates' Electoral Participation (Number of Female Candidates Running (logged))

	<i>Dependent variable:</i>		
	Number of Female Candidates		
	(1)	(2)	(3)
Delimitation	0.23*** (0.02)	0.22*** (0.02)	0.22*** (0.03)
Num Candidates (logged)		0.27*** (0.01)	0.25*** (0.02)
Electorate Turnout		-0.0005 (0.001)	-0.001 (0.001)
Reserved		0.13*** (0.02)	0.16*** (0.03)
Female Ever Winner			-0.01 (0.03)
Number of Parties			0.02*** (0.01)
Female Emp			-0.002* (0.001)
Fem Lit			0.001 (0.001)
Larger*Delimitation	-0.02 (0.02)	-0.03 (0.02)	-0.03 (0.02)
Smaller*Delimitation	-0.09*** (0.03)	-0.07** (0.03)	-0.07* (0.03)
Constituency Fixed Effects	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes
Observations	13,319	13,319	9,810
R <sup>2</sup>	0.05	0.10	0.10
F Statistic	101.98***	136.19***	63.75***

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 9: Electorate Size and Female Candidates' Electoral Participation (Removing New State Constituencies)

	<i>Dependent variable:</i>			
	Share of Fem Cand (log)			Female Ran (1=Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.84*** (0.07)	0.80*** (0.07)	0.82*** (0.11)	0.30*** (0.04)
Num Candidates (logged)		0.28*** (0.06)	0.25*** (0.07)	0.22*** (0.03)
Electorate Turnout		0.002 (0.003)	0.0004 (0.004)	0.0001 (0.001)
Reserved		0.54*** (0.11)	0.59*** (0.12)	0.17*** (0.04)
Female Ever Winner			-0.08 (0.10)	-0.05 (0.03)
Number of Parties			0.01 (0.03)	0.01 (0.01)
Female Emp			-0.01 (0.005)	-0.002 (0.002)
Fem Lit			0.0004 (0.003)	0.0001 (0.001)
Larger*Delimitation	-0.09 (0.08)	-0.10 (0.08)	-0.06 (0.08)	-0.04 (0.03)
Smaller*Delimitation	-0.26** (0.12)	-0.25** (0.12)	-0.27* (0.14)	-0.10** (0.05)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	5,170	5,170	4,452	4,452
R <sup>2</sup>	0.07	0.08	0.08	0.10
F Statistic	51.70***	41.10***	22.80***	27.91***

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 10: Electorate Size and Female Candidates' Electoral Participation (First Election Post-Delimitation)

	<i>Dependent variable:</i>			
	Share of Fem Cand (log)			Female Ran (1=Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.47*** (0.05)	0.45*** (0.05)	0.49*** (0.08)	0.17*** (0.03)
Num Candidates (logged)		0.38*** (0.04)	0.31*** (0.06)	0.22*** (0.02)
Electorate Turnout		-0.003 (0.002)	-0.003 (0.003)	-0.001 (0.001)
Reserved		0.36*** (0.08)	0.43*** (0.09)	0.13*** (0.03)
Female Ever Winner			-0.28*** (0.10)	-0.10*** (0.03)
Number of Parties			0.03 (0.02)	0.02** (0.01)
Female Emp			-0.01 (0.005)	-0.003 (0.002)
Fem Lit			0.002 (0.003)	0.001 (0.001)
Larger*Delimitation	0.01 (0.06)	-0.002 (0.06)	0.04 (0.07)	0.001 (0.03)
Smaller*Delimitation	-0.13 (0.09)	-0.10 (0.09)	-0.15 (0.11)	-0.06 (0.04)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	10,648	10,648	7,225	7,225
R <sup>2</sup>	0.03	0.04	0.05	0.07
F Statistic	45.13***	43.00***	19.92***	29.82***

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 11: Electorate Size and Female Candidates' Electoral Participation (Second Election Post-Delimitation)

	<i>Dependent variable:</i>			
	Share of Fem Cand (log)			Female Ran (1=Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.65*** (0.05)	0.63*** (0.05)	0.54*** (0.09)	0.20*** (0.03)
Num Candidates (logged)		0.31*** (0.04)	0.23*** (0.06)	0.20*** (0.02)
Electorate Turnout		0.001 (0.002)	-0.001 (0.003)	-0.0003 (0.001)
Reserved		0.36*** (0.08)	0.42*** (0.10)	0.12*** (0.04)
Female Ever Winner			0.03 (0.09)	-0.01 (0.03)
Number of Parties			0.02 (0.02)	0.01 (0.01)
Female Emp			-0.004 (0.004)	-0.002 (0.001)
Fem Lit			0.005** (0.002)	0.001* (0.001)
Larger*Delimitation	-0.10 (0.06)	-0.12* (0.06)	-0.11 (0.08)	-0.04 (0.03)
Smaller*Delimitation	-0.27*** (0.09)	-0.25*** (0.09)	-0.21* (0.11)	-0.08* (0.04)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	10,647	10,647	7,479	7,479
R <sup>2</sup>	0.04	0.05	0.05	0.07
F Statistic	66.88***	52.29***	19.81***	28.89***

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01



## 6.4 Female Candidates' Electoral Success

Table 12: Electorate Size and Female Candidates' Electoral Success (15 percent marker)

	<i>Dependent variable:</i>			
	Female Vote (log)			Female Won (1 = Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.42*** (0.04)	0.44*** (0.04)	0.38*** (0.07)	0.05*** (0.01)
Num Candidates (logged)		0.16*** (0.03)	-0.003 (0.05)	-0.01 (0.01)
Electorate Turnout		-0.005** (0.002)	-0.01*** (0.003)	-0.001 (0.001)
Reserved		0.42*** (0.07)	0.50*** (0.09)	0.06*** (0.02)
Female Ever Winner			-0.19* (0.10)	-0.24*** (0.03)
Number of Parties			0.13*** (0.02)	0.01 (0.004)
Female Emp			-0.004 (0.003)	0.0003 (0.001)
Fem Lit			0.01*** (0.002)	0.001*** (0.0004)
Larger*Delimitation	0.05 (0.05)	0.04 (0.05)	0.003 (0.07)	0.001 (0.01)
Smaller*Delimitation	-0.14 (0.09)	-0.12 (0.09)	-0.15 (0.12)	-0.003 (0.03)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	13,319	13,319	9,810	9,810
R <sup>2</sup>	0.02	0.03	0.04	0.04
F Statistic	43.62***	39.26***	21.52***	22.93***

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 13: Electorate Size and Female Candidates' Electoral Success (5 percent marker)

	<i>Dependent variable:</i>			
	Female Vote (log)			Female Won (1 = Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.41*** (0.05)	0.43*** (0.05)	0.37*** (0.08)	0.05*** (0.02)
Num Candidates (logged)		0.16*** (0.03)	-0.002 (0.05)	-0.01 (0.01)
Electorate Turnout		-0.005** (0.002)	-0.01*** (0.003)	-0.001 (0.001)
Reserved		0.42*** (0.07)	0.50*** (0.09)	0.06*** (0.02)
Female Ever Winner			-0.19* (0.10)	-0.24*** (0.03)
Number of Parties			0.13*** (0.02)	0.01 (0.004)
Female Emp			-0.004 (0.003)	0.0003 (0.001)
Fem Lit			0.01*** (0.002)	0.001*** (0.0004)
Larger*Delimitation	0.06 (0.05)	0.05 (0.05)	0.01 (0.07)	-0.0002 (0.01)
Smaller*Delimitation	-0.12 (0.08)	-0.10 (0.08)	-0.11 (0.10)	-0.002 (0.02)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	13,319	13,319	9,810	9,810
R <sup>2</sup>	0.02	0.03	0.04	0.04
F Statistic	43.73***	39.35***	21.47***	22.93***

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 14: Electorate Size and Female Candidates' Electoral Success (Removing New State Constituencies)

	<i>Dependent variable:</i>			
	Female Vote (log)			Female Won (1 = Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.66*** (0.07)	0.65*** (0.07)	0.62*** (0.12)	0.07*** (0.03)
Num Candidates (logged)		0.15** (0.06)	-0.05 (0.08)	-0.02 (0.02)
Electorate Turnout		-0.001 (0.003)	-0.002 (0.004)	-0.0002 (0.001)
Reserved		0.62*** (0.12)	0.71*** (0.13)	0.09*** (0.03)
Female Ever Winner			-0.14 (0.13)	-0.24*** (0.03)
Number of Parties			0.12*** (0.03)	0.01* (0.01)
Female Emp			-0.01 (0.005)	0.0004 (0.001)
Fem Lit			0.003 (0.003)	0.001 (0.001)
Larger*Delimitation	-0.07 (0.09)	-0.08 (0.09)	-0.04 (0.09)	0.01 (0.02)
Smaller*Delimitation	-0.28** (0.14)	-0.26* (0.14)	-0.25 (0.16)	-0.01 (0.04)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	5,170	5,170	4,452	4,452
R <sup>2</sup>	0.05	0.07	0.07	0.05
F Statistic	39.41***	32.90***	20.33***	13.63***

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 15: Electorate Size and Female Candidates' Electoral Success (First Post-Delimitation Election)

	<i>Dependent variable:</i>			
	Female Vote (log)			Female Won (1 = Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.38*** (0.05)	0.39*** (0.05)	0.33*** (0.07)	0.04*** (0.02)
Num Candidates (logged)		0.20*** (0.04)	0.005 (0.06)	-0.004 (0.01)
Electorate Turnout		-0.01*** (0.002)	-0.01*** (0.003)	-0.001 (0.001)
Reserved		0.40*** (0.08)	0.48*** (0.09)	0.06*** (0.02)
Female Ever Winner			-0.45*** (0.13)	-0.30*** (0.04)
Number of Parties			0.12*** (0.02)	0.01** (0.005)
Female Emp			-0.01* (0.004)	-0.0001 (0.001)
Fem Lit			0.01*** (0.003)	0.001** (0.001)
Larger*Delimitation	0.10* (0.06)	0.09 (0.06)	0.09 (0.07)	0.002 (0.02)
Smaller*Delimitation	-0.06 (0.09)	-0.04 (0.09)	-0.06 (0.11)	-0.01 (0.02)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	10,648	10,648	7,225	7,225
R <sup>2</sup>	0.03	0.04	0.05	0.05
F Statistic	43.11***	36.71***	20.66***	21.30***

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 16: Electorate Size and Female Candidates' Electoral Success (Second Post-Delimitation Election)

	<i>Dependent variable:</i>			
	Female Vote (log)			Female Won (1 = Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.44*** (0.05)	0.45*** (0.05)	0.33*** (0.09)	0.02 (0.02)
Num Candidates (logged)		0.10*** (0.04)	-0.08 (0.06)	-0.02* (0.01)
Electorate Turnout		-0.003 (0.002)	-0.01* (0.003)	-0.001 (0.001)
Reserved		0.42*** (0.09)	0.50*** (0.11)	0.07*** (0.02)
Female Ever Winner			0.05 (0.13)	-0.14*** (0.03)
Number of Parties			0.14*** (0.02)	0.01 (0.005)
Female Emp			-0.01 (0.004)	-0.0002 (0.001)
Fem Lit			0.01*** (0.002)	0.002*** (0.0005)
Larger*Delimitation	0.02 (0.07)	0.01 (0.07)	-0.05 (0.08)	-0.001 (0.02)
Smaller*Delimitation	-0.17* (0.10)	-0.16 (0.10)	-0.15 (0.12)	0.01 (0.03)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	10,647	10,647	7,479	7,479
R <sup>2</sup>	0.02	0.03	0.04	0.02
F Statistic	40.24***	31.21***	15.61***	10.43***

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 17: Electorate Size and Female Candidates' Electoral Success (In Election with Female Candidates)

	<i>Dependent variable:</i>			
	Female Vote (log)			Female Won (1 = Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.16*	0.15*	0.10	0.05
	(0.08)	(0.09)	(0.14)	(0.04)
Num Candidates (logged)		-0.49***	-0.75***	-0.06***
		(0.06)	(0.08)	(0.02)
Electorate Turnout		-0.01*	-0.01*	0.0001
		(0.004)	(0.005)	(0.001)
Reserved		0.49***	0.56***	0.08**
		(0.11)	(0.13)	(0.04)
Female Ever Winner			-0.34***	-0.40***
			(0.09)	(0.03)
Number of Parties			0.19***	0.004
			(0.03)	(0.01)
Female Emp			-0.002	0.001
			(0.005)	(0.001)
Fem Lit			0.01**	0.002**
			(0.003)	(0.001)
Larger*Delimitation	0.12	0.13	0.01	0.003
	(0.09)	(0.09)	(0.11)	(0.03)
Smaller*Delimitation	-0.03	-0.01	0.01	-0.001
	(0.14)	(0.14)	(0.17)	(0.05)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	5,980	5,980	4,660	4,660
R <sup>2</sup>	0.01	0.04	0.07	0.09
F Statistic	8.08***	18.74***	14.25***	19.72***

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 18: Electorate Size and Female Candidates' Average Share of Total Votes Per Female Candidate

	<i>Dependent variable:</i>		
	Average Share of Votes per Female Candidate (log)		
	(1)	(2)	(3)
Delimitation	0.15 (0.11)	0.01 (0.11)	-0.11 (0.18)
Num Female Candidates (logged)		1.03*** (0.10)	1.02*** (0.11)
Num Candidates (logged)		-1.23*** (0.08)	-1.60*** (0.11)
Electorate Turnout		-0.01** (0.01)	-0.01** (0.01)
Reserved		0.50*** (0.15)	0.56*** (0.17)
Female Ever Winner			-0.37*** (0.11)
Number of Parties			0.28*** (0.04)
Female Emp			0.002 (0.01)
Fem Lit			0.01** (0.004)
Larger*Delimitation	0.17 (0.12)	0.23** (0.11)	0.04 (0.13)
Smaller*Delimitation	0.04 (0.19)	0.13 (0.18)	0.06 (0.21)
Constituency Fixed Effects	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes
Observations	5,980	5,980	4,660
R <sup>2</sup>	0.03	0.11	0.14
F Statistic	17.47***	44.24***	29.33***

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 19: Electorate Size, Delimitation and Number of Candidates (Logged)

	<i>Dependent variable:</i>		
	Number of Candidates (Logged)		
	(1)	(2)	(3)
Delimitation	0.04*** (0.01)	0.05*** (0.01)	0.06*** (0.02)
Electorate Turnout		-0.001 (0.001)	0.001 (0.001)
Reserved		-0.17*** (0.02)	-0.14*** (0.02)
Female Ever Winner			-0.001 (0.02)
Number of Parties			0.19*** (0.01)
Female Emp			0.001 (0.001)
Fem Lit			0.001** (0.0004)
Larger*Delimitation	0.02* (0.01)	0.03** (0.01)	0.03** (0.02)
Smaller*Delimitation	-0.07*** (0.02)	-0.07*** (0.02)	-0.08*** (0.02)
Constituency Fixed Effects	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes
Observations	13,319	13,319	9,810
R <sup>2</sup>	0.19	0.20	0.33
F Statistic	424.85***	337.58***	301.13***
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01		



Table 20: Electorate Size, Delimitation and Turnout

	<i>Dependent variable:</i>		
	Electoral Turnout		
	(1)	(2)	(3)
Delimitation	6.75*** (0.23)	6.82*** (0.23)	4.42*** (0.38)
Number of Candidates (Logged)		-0.15 (0.16)	0.20 (0.22)
Reserved		-3.43*** (0.29)	-3.00*** (0.34)
Female Ever Winner			0.07 (0.44)
Number of Parties			-0.68*** (0.10)
Female Emp			-0.01 (0.01)
Fem Lit			0.06*** (0.01)
Larger*Delimitation	-0.78*** (0.25)	-0.72*** (0.24)	-0.62** (0.28)
Smaller*Delimitation	1.84*** (0.39)	1.84*** (0.38)	1.68*** (0.44)
Constituency Fixed Effects	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes
Observations	13,319	13,319	9,810
R <sup>2</sup>	0.32	0.33	0.35
F Statistic	844.84***	667.44***	318.73***

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 21: Electorate Size, Turnout and Electoral Success in High Female Sex Ratio Constituencies

	<i>Dependent variable:</i>			
	Share of Fem Cand (log)	Female Ran (1=Yes)	Female Vote (log)	Female Won (1 = Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.62*** (0.12)	0.23*** (0.04)	0.22* (0.12)	0.02 (0.02)
Num Candidates (logged)	0.32*** (0.08)	0.23*** (0.03)	0.01 (0.08)	-0.003 (0.01)
Electorate Turnout	-0.004 (0.004)	-0.001 (0.002)	-0.004 (0.005)	0.0002 (0.001)
Reserved	0.31** (0.14)	0.10** (0.05)	0.40*** (0.15)	0.05 (0.03)
Female Ever Winner	-0.25** (0.12)	-0.10*** (0.04)	-0.31* (0.17)	-0.25*** (0.04)
Number of Parties	0.04 (0.04)	0.01 (0.01)	0.16*** (0.04)	0.02** (0.01)
Female Emp	-0.01 (0.004)	-0.002 (0.002)	-0.003 (0.004)	0.0000 (0.001)
Fem Lit	-0.0001 (0.003)	0.0001 (0.001)	0.005 (0.003)	0.001 (0.001)
Larger*Delimitation	-0.04 (0.10)	-0.03 (0.04)	0.06 (0.10)	0.01 (0.02)
Smaller*Delimitation	0.001 (0.14)	-0.01 (0.05)	0.24 (0.15)	0.06 (0.04)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	4,828	4,828	4,828	4,828
R <sup>2</sup>	0.04	0.06	0.03	0.04
F Statistic	9.36***	16.67***	6.40***	9.75***

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 22: Electorate Size, Turnout and Electoral Success in Low Female Sex Ratio Constituencies

	<i>Dependent variable:</i>			
	Share of Fem Cand (log) (1)	Female Ran (1=Yes) (2)	Female Vote (log) (3)	Female Won (1 = Yes) (4)
Delimitation	0.55*** (0.12)	0.20*** (0.04)	0.53*** (0.12)	0.07*** (0.02)
Num Candidates (logged)	0.26*** (0.07)	0.22*** (0.02)	-0.01 (0.07)	-0.02 (0.01)
Electorate Turnout	-0.002 (0.004)	-0.001 (0.001)	-0.01** (0.003)	-0.001 (0.001)
Reserved	0.56*** (0.11)	0.16*** (0.04)	0.65*** (0.13)	0.09*** (0.03)
Female Ever Winner	-0.02 (0.11)	-0.02 (0.04)	-0.15 (0.14)	-0.26*** (0.04)
Number of Parties	0.03 (0.03)	0.02* (0.01)	0.13*** (0.03)	0.01 (0.01)
Female Emp	-0.01 (0.01)	-0.003 (0.002)	-0.01** (0.01)	0.0003 (0.001)
Fem Lit	0.01*** (0.003)	0.003** (0.001)	0.01** (0.003)	0.001** (0.001)
Larger*Delimitation	-0.04 (0.09)	-0.02 (0.04)	-0.05 (0.10)	-0.01 (0.02)
Smaller*Delimitation	-0.35** (0.14)	-0.13** (0.05)	-0.39** (0.15)	-0.05 (0.03)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	4,982	4,982	4,982	4,982
R <sup>2</sup>	0.06	0.08	0.06	0.05
F Statistic	18.13***	23.19***	15.98***	14.44***

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 23: Electorate Size, Turnout and Electoral Success in High Female Literacy Constituencies

	<i>Dependent variable:</i>			
	Share of Fem Cand (log)	Female Ran (1=Yes)	Female Vote (log)	Female Won (1 = Yes)
	(1)	(2)	(3)	(4)
Delimitation	0.52*** (0.14)	0.17*** (0.05)	0.15 (0.13)	0.01 (0.02)
Num Candidates (logged)	0.36*** (0.08)	0.24*** (0.03)	-0.01 (0.07)	-0.01 (0.01)
Electorate Turnout	-0.01 (0.01)	-0.001 (0.002)	-0.005 (0.01)	0.0001 (0.001)
Reserved	0.52*** (0.15)	0.16*** (0.05)	0.52*** (0.16)	0.07** (0.03)
Female Ever Winner	-0.46*** (0.14)	-0.14*** (0.05)	-0.70*** (0.18)	-0.43*** (0.05)
Number of Parties	0.05 (0.04)	0.02 (0.01)	0.18*** (0.04)	0.01 (0.01)
Female Emp	-0.01 (0.005)	-0.003 (0.002)	-0.001 (0.005)	0.001 (0.001)
Fem Lit	-0.01 (0.005)	-0.001 (0.002)	0.001 (0.004)	0.001 (0.001)
Larger*Delimitation	-0.03 (0.11)	-0.001 (0.04)	0.09 (0.11)	0.004 (0.02)
Smaller*Delimitation	0.03 (0.14)	0.02 (0.05)	0.11 (0.15)	0.01 (0.03)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	4,846	4,846	4,846	4,846
R <sup>2</sup>	0.03	0.05	0.02	0.09
F Statistic	7.23***	12.69***	5.64***	22.38***

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 24: Electorate Size, Turnout and Electoral Success in Low Female Literacy Constituencies

	<i>Dependent variable:</i>			
	Share of Fem Cand (log) (1)	Female Ran (1=Yes) (2)	Female Vote (log) (3)	Female Won (1 = Yes) (4)
Delimitation	0.71*** (0.13)	0.26*** (0.05)	0.56*** (0.13)	0.07*** (0.03)
Num Candidates (logged)	0.30*** (0.07)	0.23*** (0.03)	0.05 (0.07)	-0.01 (0.01)
Electorate Turnout	0.001 (0.004)	0.001 (0.001)	-0.01* (0.004)	-0.0002 (0.001)
Reserved	0.49*** (0.14)	0.14*** (0.05)	0.52*** (0.16)	0.07** (0.04)
Female Ever Winner	0.06 (0.10)	-0.02 (0.04)	0.05 (0.14)	-0.16*** (0.04)
Number of Parties	0.01 (0.03)	0.01 (0.01)	0.09*** (0.03)	0.01 (0.01)
Female Emp	-0.0002 (0.005)	-0.0000 (0.002)	-0.01 (0.004)	0.0003 (0.001)
Fem Lit	-0.0002 (0.004)	0.0000 (0.001)	0.003 (0.004)	0.001 (0.001)
Larger*Delimitation	-0.07 (0.10)	-0.05 (0.04)	-0.03 (0.10)	-0.01 (0.02)
Smaller*Delimitation	-0.32** (0.16)	-0.13** (0.06)	-0.21 (0.19)	-0.01 (0.04)
Constituency Fixed Effects	Yes	Yes	Yes	Yes
Election Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	4,964	4,964	4,964	4,964
R <sup>2</sup>	0.06	0.09	0.06	0.03
F Statistic	17.67***	24.26***	16.02***	7.74***

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

## 6.5 Matching State Assembly Constituencies before and after the 2008 Delimitation using SHRUG data

SHRUG contains election data for state legislative assemblies from 1974 (after the 3rd delimitation) to 2022. The 4th delimitation exercise concluded in 2008, after which the boundaries for constituencies changed. The objective is to match constituencies from 1974-2007 to constituencies from 2008-2022. We do so by matching names; the key assumption is that if a constituency from pre-delimitation and post-delimitation have the same name, they denote the same constituency.

### 6.5.1 Identifying the list of constituencies before and after Delimitation

SHRUG's election data is organized as candidate-election-year. Each constituency-election has one unique identifier – ac07\_id (pre-2008 election) or ac08\_id (post-2008 election). This identifier consistently identifies all elections pre-2008 and post-2008 respectively, taking into account changes in state boundaries. It follows a XX-YYY format, where XX is a two-digit state code (as designated in 2001 population census) and YYY is the constituency number (as designated by the Election Commission in the last assembly before 2008 or first assembly after 2008). These SHRUG IDs allow us to track a single constituency for all elections either before 2008 or after 2008. The challenge is to track a constituency across delimitation, i.e. identify both ac07\_id and ac08\_id for a constituency. SHRUG provides no key to match legislative constituencies before and after delimitation.

To identify the two lists of unique constituencies before and after delimitation, we created a unique constituency ID. It takes the form of the two-digit state code from the SHRUG ID (either ac07\_id or ac08\_id) followed by SHRUG's constituency name. For example – “01karnah”.

### 6.5.2 Exact matches

Based on the alphanumeric ID we created, there are 4008 unique constituencies pre-2008 and 4120 unique constituencies post-2008. Of these, 2808 constituencies have the same ID pre and post-2008 - these are exact matches.

### 6.5.3 Inexact matches

We tried to fuzzy-match the remaining constituencies using Surf. Surf is an open-source software tool created by Trivedi Centre for Political Data to match Indian names.

Surf lets users upload a dataset, designate the variables for matching, and outputs clusters of observations that it identifies as similar based on the chosen string-matching algorithm. These clusters are merely suggestions – the user must hand-match pairs before Surf designates a unique ID to each cluster. We designate the SHRUG constituency name variable as the matching variable for Surf and match the remaining constituencies based on 3 algorithms.

First, we match using edit distance of 1. Using this, we match 155 additional constituencies. While hand-matching clusters, we take into account the state name and year of change in name. Next, we apply edit distance of 2 to the remaining constituencies and match 26 more constituencies. Lastly, using the token overlap (=2) algorithm, we match an additional 72 constituencies.

In total, we are able to match 3061 constituencies before and after delimitation using constituency names. For these, we can identify both the ac07\_id and ac08\_id for each constituency and track all other SHRUG data using these IDs.

## 7 Matching control variables

This is an overview of how we matched the SHRUG census data to the elections data to construct control variables.

SHRUG calculates census variables at the town/village level i.e. at the SHRID level. Then, keeping in mind changing boundaries of location identifiers such as constituency and district and applying some assumptions about the distribution of population within a SHRID, SHRUG provides census variables at the level of both constituency identifiers i.e. pre-delimitation and post-delimitation. For the same census data, there are two versions – one with `ac07_id` (pre-delimitation) as the unique identifier and `ac08_id` (post-delimitation) as the unique identifier.

Since the election data we’re interested in spans pre and post-delimitation years, we match census variables based on the respective period. We’re able to do this because while matching constituencies across delimitation, we identified both `ac07_id` and `ac08_id` for matched constituencies. For pre-2008 election observations, we match census variables using `ac07_id` and for post-2008 election observations, we match using `ac08_id`.

We draw control variables from the population (conducted every 10 years) and economic censuses (conducted every 8 years). Election and census calendars do not overlap perfectly and hence, we use lagged values. We fill control variables downwards; for instance, we impose the 2001 census variable value on all elections between 2001 and 2010, after which we use the 2011 census value.

The control variables in our panel include many missing values. There are two sources of missingness –

1. The census data matched to constituency identifiers by SHRUG is not perfect and many constituencies are missing from these datasets. As a result, in our panel, we’re only able to obtain control variables for 585 constituencies in 1991, 866 constituencies in 2001, and 1665 constituencies in 2011, of a total of 3060 matched constituencies.
2. The variables from different years do not overlap perfectly. For instance, the 1991 population census contains figures of main workers in sectors such non-household manufacturing, trade, construction, etc, all of which do not appear in the later censuses.