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## Can Quotas Increase the Supply of Candidates for Higher-Level Positions? Evidence from Local Government in India

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*MIT and IZA*

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## ABSTRACT

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# Can Quotas Increase the Supply of Candidates for Higher-Level Positions? Evidence from Local Government in India\*

A common argument for quota policies is that they can increase the participation of targeted groups in positions that are not directly subjected to quotas or after quotas are no longer in place. I investigate this hypothesis empirically in the context of India, where one third of local political leadership seats are randomly assigned to be held by a woman in each election cycle. Quotas increase the number of female candidates who later contest seats in state and national legislatures, where such policies do not exist. This effect arises from the candidacy of beneficiaries who gained experience in local government due to the quotas and career politicians who continue contesting in longer-exposed areas. Effect magnitudes imply that the policy accounts for a substantial portion of the increase in female candidates for these bodies since the start of the policy. The new candidates have a higher probability of a top finish when they run on major party tickets or contest in areas where the local constituency overlaps closely with that of the contested seat.

**JEL Classification:** J15, J45

**Keywords:** quotas, affirmative action, political candidacy, India

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# 1 Introduction

Quotas are a common tool to increase the representation of historically underrepresented groups, and they are applied to varied sectors including education, business and politics. Often implicit in their advocacy is an argument that quotas can increase the participation of targeted groups in a way that can eventually render the policy obsolete through institutional change. This argument can be observed in effect when quotas are implemented in a specific segment of an organizational structure rather than uniformly, with the idea that the targeted segment will be sufficient to generate follow-on or spillover effects. Whether such institutional change is possible has long been debated in the many contexts in which quotas or affirmative action policies have been proposed and advocated (Coate and Loury, 1993).

In this paper, I ask: *how do quotas for women in local elected bodies in India affect candidacy for and representation in higher offices?* Myerson (2011) points to the primacy of a strong supply of capable local leaders for effective state-building in a tiered and decentralized governance structure, and Acemoglu and Robinson (2012) make the case for inclusive institutions as a foundational tenet of economic development. The investigation to follow ultimately asks whether quotas intended to increase the inclusive nature of local political institutions can change the prospects for candidacy and representation of beneficiary groups in higher offices. I empirically test whether such a quota system can increase participation and representation in higher levels of government, and if so, through which channels. Whether electoral quotas can have broader effects in areas of governance to which they are not directly applied is an open question (Bhavnani, 2009; Iyer et al., 2012), and a burgeoning literature on the “personnel economics of the state” highlights the necessity of understanding the process by which individuals become candidates for public office (Finan, Olken, and Pande, 2015).

The Indian experience with quotas for women in local government provides an ideal en-

vironment to overcome several common empirical challenges. The first is identification: in implementing this policy, seat reservations were assigned across constituencies and over time so as to not be related to factors that otherwise might confound the election of female candidates with unobserved preferences. Second, I am able to estimate effects on margins of both candidacy and representation. Observing the set of candidates in other contexts where quotas are often applied (hiring or education) can be difficult, as typically only representation (hires or enrollment) is observed – despite candidacy being the margin on which representation gaps often first appear. Third, there is a sufficiently long study period available, allowing me to estimate longer-term effects which should be a primary focus given the nature of the potential mechanisms for quotas to affect higher-level candidacy. Finally, by linking the same candidate across different elections to observe partial career histories, I am able to trace the channels through which candidates for higher office respond to the policy.

I show that longer exposure to quota-induced female leadership at the local level increases the number of female candidates for higher office among both state and national legislatures. State legislature constituencies that experienced ten additional years of exposure to female leaders fielded .15 more female candidates than constituencies with zero exposure; parliamentary constituencies fielded .41 more female candidates. Since state assembly constituencies are approximately one-tenth the size of parliamentary constituencies, the candidacy effect in state legislatures is approximately four times the effect among parliamentary constituencies when areas of the same size are considered – evidencing a career-ladder structure for local politicians choosing to contest elections in higher levels of government. The overall magnitude of the candidacy effect is substantive, implying that the local quota policy was responsible for around 50 percent of the increase in the number of female candidates running for office in higher levels of government in recent elections studied. These findings are robust across various specifications and alternative estimators, are strong in areas where local government constituencies overlap closely with state legislature and parliamentary constituencies, and effects are homogeneous across areas with varying existing socioeconomic

and demographic characteristics.

By observing political career histories, I find the policy effect to be driven by two mutually exclusive groups of candidates. Approximately half of the increase in female parliamentary candidates is due to candidates who were likely beneficiaries of the quota system through previous service in local government. The remainder of the candidacy response is attributable to politicians who had previously contested, and lost, a state assembly election and continued contesting for higher office in areas that received longer quota exposure. Together, these findings suggest a combination of direct effects via cohorts of female politicians who contest elections at higher levels of government after gaining specific political experience provided by the quota system and indirect effects that make certain areas more conducive to continued female candidacy. Prior studies, notably Beaman et al. (2009), have established that voter attitudes change after exposure to female political leaders; this paper provides complementary evidence of a response among potential candidates to voters' exposure as well as specific supply-side effects of quotas on later candidacy for higher offices.

I then investigate why female candidates do not have a higher probability of winning in areas with longer exposure. Overall, female candidates perform approximately as well as the median candidate in the elections they contest, but most of these new candidates run as independents rather than as part of major or minor parties. This suggests that new female candidates are not being incorporated into parties, resulting in (among other things) a lack of visibility and access to resources for campaigns at higher levels of government. There are substantive representation effects of quota exposure among elections in which female candidates run on major party tickets or contest in areas where the higher-office constituency closely overlaps with a single local government constituency. Effects among voter turnout are minimal, if they appear at all – disqualifying the hypothesis that quotas induce changes in the political system through broader enfranchisement and voter turnout *per se*.

The following sections review related literature and briefly discuss the history of seat quotas in local government in India. I then detail the data used and the empirical strategy, and present results for political participation and representation, along with a set of robustness analyses and investigations into mechanisms. The final section concludes.

## 2 Background and Literature

### 2.1 Policy background and related literature

India has a federal system of government with direct elections for local, state, and national legislatures.<sup>1</sup> The country first introduced nationwide seat quotas for women in government in 1993 with the 73rd and 74th Amendments to the Indian Constitution, which formalized a historical decentralized local governance structure known as the panchayat. The 73rd Constitutional Amendment Act instituted a three-tiered system of local government in rural areas consisting of, in increasing size, the village, sub-district (block), and district levels. The Amendments, which were intended to provide large-scale devolution and decentralization of powers to the local bodies, stipulated that members of the local governance bodies were to be elected at five-year intervals and provided for one third of all seats at each governance level to be filled by women. These policies and their implementation have been the focus of a number of studies to date; further details can be found in Chattopadhyay and Duflo (2004a), Chattopadhyay and Duflo (2004b), Iyer et al. (2012) and Kalsi (forthcoming).

The 73rd Amendment stipulated that states had the responsibility to adjust or amend local elections to comply with its provisions. Most states eventually did so, often within a few

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<sup>1</sup>These three types of bodies are known as the panchayat, the state legislative assembly, and the parliament. The parliament consists of two houses, one of which is directly elected (Lok Sabha) and one appointed (Rajya Sabha). At the parliamentary level I investigate effects on elections for the Lok Sabha, and all references to the parliament will refer to this house.



years of the passing of the amendment (Iyer et al., 2012). The quota policy was applicable only to local governance, excluding state and national legislatures from having quotas for women. Once the provisions of the reform were implemented, one third of seats were reserved for women at any level of the local governance hierarchy; for single-seat leadership positions, reservations were assigned randomly across areas in each election cycle such that in aggregate, the one-third quota would be met. This feature of rotating leadership assignment has been used to assess the effects of female leaders in previous studies, including Beaman et al. (2012) and Iyer et al. (2012), among others. After several election cycles with the random assignment, there is considerable variation across areas in the *cumulative* number of years exposed to a woman in the leadership position; it is this variation in cumulative exposure to quotas applied to district leadership seats – at the highest level of this governance structure – that provides exogenous cross-sectional variation in exposure to female leaders used to identify dynamic cross-level effects in the political hierarchy.

This paper is most directly related to studies that investigate the effect of seat reservations in politics on the functioning of government and the welfare of constituents. One strand of this work assesses immediate effects on policy outcomes or changes outside the political system. In India, Chattopadhyay and Duflo (2004a) find differences in public good provision, while Beaman et al. (2012) find investments among young women attributable to changes in aspirations. Jensenius (2015), however, finds no effect of caste-based reservations on development outcomes in India over a period of 30 years in which these quotas were active. In terms of institutional change, Iyer et al. (2012) find evidence that political empowerment resulted in greater reporting of crimes against women. Brollo and Troiano (2016) find evidence of reduced political patronage by female mayors in Brazil, while Ferreira and Gyourko (2014) find no change in the policies under female mayors compared to male mayors in the United States. Bardhan et al. (2010) find contrary evidence that suggests that quota-mandated female representation in India may have worsened the provision of services for some groups. Beaman et al. (2009) show how perceptions of women improve once men

are exposed to women in leadership roles, and Khanna (2016) highlights the importance of understanding changed incentives for those who are not directly eligible for affirmative action policies. In this paper, I also look at effects of quotas outside the particular environment to which they are applied. Whereas earlier work focused on the effects of quotas outside of politics, I investigate follow-on effects within governance. Finally, the paper contributes to a new and developing literature investigating questions of personnel economics in the public sector (Finan et al., 2015) by asking whether temporary shocks can reduce the gender gap in representation among public servants via individual careers or institutional change.

Another strand of literature evaluates whether exposure to women in politics affects future candidacy via “legacy effects” of female political participation on both voters and candidates. While legacy effects have been found in a number of contexts for local politics, evidence is generally mixed, and effects on higher levels of government have rarely been investigated.<sup>2</sup> Bhalotra et al. (forthcoming) find positive effects of a woman winning an election on subsequent female candidacy in state legislatures in India, which is largely due to the same candidates contesting again. Ongoing work finds that competitively-won state legislature elections induces future female candidacy in parliamentary elections after the term of the elected legislator is completed (Brown et al., 2017). Broockman (2014) finds no effect among U.S. state legislature elections, and Uppal (2009) finds negative incumbency effects for men and women. Most closely related is Bhavnani (2009), who uses randomly assigned municipal council elections to determine the effects of seat reservation in municipal government in India on later candidacy in the same municipal councils, finding that quotas introduced women who continue running for office and demonstrated to the electorate that women could be viable candidates. Banerjee et al. (2017) use a similar approach to show that seat reservation had effects on incumbency and challenger entry. In the current work, I complement this literature by investigating the effects of female politicians across levels of government rather

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<sup>2</sup>Studies of the legacy effects of female politicians on future candidacies in local politics include Nagarajan et al. (2011) for India and Gilardi (2014) for Switzerland.

than within the same body.

This paper is also related to investigations of the effect of affirmative action and quotas in other sectors. Bertrand et al. (2014) study gender quotas for corporate boards in Norway and find that a mandated change in the gender composition of the upper echelons of firm governance yielded no effects on women outside these few positions in the same firm. In contrast, the Indian experience allows for an evaluation of the effect of quotas that would necessarily operate in the opposite direction to that studied by Bertrand et al. (2014) via the creation of a supply of experienced female candidates at a lower level of the organizational hierarchy. I next discuss the potential channels through which this relationship may be established in the context of electoral politics.

## **2.2 Channels for quotas to affect candidacy**

There are two channels by which exposure to quotas might increase the candidacy of women. A direct, supply-side channel provides a cohort of particular women with experience in the political arena in local government, and some portion of these same women continue in a political career by contesting for higher office. The single district-level leadership seats are particularly germane to focus on as potential conduits for individual politicians to translate experience into candidacy for higher office: the district constituencies served by the chairperson consisted of areas (populations) that are nearly an order of magnitude larger than state assembly constituencies. The power accorded these leadership positions is thus substantial relative to those at lower levels of the local government and has the potential to accord both experience and exposure to the public at a level necessary for politicians to consider candidacy at higher levels of government.

The other channel is a demand-side mechanism in which exposure to female politicians changes voter attitudes and thus the viability of female candidates contesting elections in

constituencies with greater exposure. (Empirical evidence for this channel has been established by Beaman et al. (2009) and Bhavnani (2009).) In order to disentangle these channels, I augment typical elections records by matching candidates over time and across levels of government to observe individuals' past candidacy and political career histories. Support for the candidate supply channel would be evidenced by the net policy effect being traced to individuals who served in local government due to quotas. While direct evidence for the demand-side effect would require voter-level information, response to changes in voter attitudes may be evidenced by candidacy response among women who were not previously involved in local government contesting in areas with greater exposure. While these two channels are not necessarily mutually exclusive as politicians created by the quotas may have candidacy responses due to a combination of these factors, I show that both are present and contribute approximately equally to the net candidacy response to quota exposure.

## 3 Data

### 3.1 Exposure to female leaders

Data on the timing and location of reserved chairperson seats are available from Iyer et al. (2012), who digitized archival data from various sources for ten states' history of district-level seat reservations since the implementation of the 73rd Amendment.<sup>3</sup> Figure 1 shows the variation in cumulative exposure to district chairperson reservations as of 2007 for this sample, where those districts that received more (less) exposure to the policy are more (less) heavily shaded.

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<sup>3</sup>Comprehensive information on seat reservations is not readily accessible from any public sources or records. For their study, the authors of Iyer et al. (2012) collected data from diverse sources, including filing Right to Information Act requests for the history of district leader reservation assignments since the implementation of the 73rd Amendment. Some states did not respond to these requests, resulting in the ten-state sample shown in Figure 1.

Table 1 contains summary statistics of the cross-district variation in cumulative exposure to district chairperson reservations as of 2007 by state (as shown in Figure 1). The mean level of exposure across states is relatively similar, but there is substantial within-state variation in years of exposure, reflecting the nature of the chairperson reservation assignments. Note, however, that some states (Haryana and Rajasthan, for example) have little variation in exposure across districts while other states (including Gujarat, Andhra Pradesh, and West Bengal) have exposure ranging from zero to 10 or 11 years.

Figure 2 depicts this same variation across states and districts. In this figure, each position on the vertical axis represents a separate district, with districts in the same states grouped together. For each district, the appearance of a filled line indicates that the district chairperson seat was reserved for a woman in that year (indicated on the horizontal axis). Districts that did not receive any period of reservation are indicated in gray within each state series. A few important patterns are worth highlighting. First, assignment of chairperson seat reservation is not perfectly rotated: at the end of each election cycle, some districts continue being reserved while others switch status. Second, a number of districts received no reservation at all; these are present in seven out of ten states. Third, Maharashtra followed a three year election/reservation cycle, while all other states followed a five year cycle. Additionally, there are two dimensions of exogenous variation arising after several election cycles: in cumulative exposure and in relative recency of exposure. In the analysis that follows, the variation in cumulative exposure will be used to identify net policy effects, while variation in recency will be used to explore whether the effects of quota exposure increase or diminish over time.<sup>4</sup>

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<sup>4</sup>Appendix Table A1 tests means of demographic measures from the 1991 Population Census for districts in the ten-state sample versus all other states. Districts in states in the sample are larger in terms of population, have a higher rural female literacy rate and female educational attainment, a lower SC/ST population share, and a higher female-to-male sex ratio. The ten-state sample consists of larger and more developed states (likely due to the nature of the data collection requiring historical records to be well-kept and available). Heterogeneity analyses performed below find minimal evidence of effect heterogeneity across a wide set of area and population characteristics.

## 3.2 Elections data

Digitized historical state assembly election data come from Jensenius (2013), and include vote counts and demographic information for candidates contesting state legislature elections through 2007. Due to elections being held in different years across states, the sample is constructed from the most recent election prior to and including calendar year 2007 for each state for the state assembly analysis. These records are then associated with cumulative policy exposure as of the election year.<sup>5</sup> Data from parliamentary elections comes from the Election Commission of India and contains the details of all candidates across all constituencies of the directly elected lower house of parliament (the Lok Sabha). The candidate data for both state assemblies and parliament are reported with a number of fields, most importantly candidate names, gender, vote shares, and constituency voter turnouts.

The candidate lists provide the potential to observe candidacy by the same individual across elections, which is used later to distinguish candidacy effects by candidates' career histories. Creating a viable candidate panel is not straightforward, however, because there is no unique identifier field associated with candidates and a given individual's name may not be spelled or registered the same way across elections (due to differences in transliteration, honorifics, or name abbreviations, among others). In order to match candidates across elections, I apply an approximate string matching algorithm that searches for each candidate name in a given state and election with potential name matches in the following election cycle in the same state and with the same gender. Potential matches are then selected among names that are within a given string distance; next, they are reviewed manually and a final match decision is made. Summary statistics can be found in Appendix Table A3, and the Appendix contains a full description of this process.

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<sup>5</sup>Appendix Table A2 shows the years in which the last assembly election was held prior to and including 2007.

### 3.3 Matching districts and political constituencies

Parliamentary and assembly constituencies comprise the focal units of analysis given that elections are conducted according to political boundaries; district boundaries, which determine exposure to chairperson seat reservations, do not overlap with parliamentary or assembly constituencies (see Appendix Figure A1). To calculate an accurate measure of a constituency’s exposure to female district leaders, I use GIS software to identify the intersection of the two sets of geographic areas in order to assign the respective portions of each district to its parliamentary constituency. This process then creates a set of unique geographic areas defined by the area pertaining to a unique combination of a district and constituency.<sup>6</sup> Table 2 provides summary statistics for these parliamentary and state assembly geographies.

## 4 Analysis

### 4.1 Identification

Causal identification hinges on the exogeneity of the reservations assignment such that for the estimating equation

$$Y_{s,d,c} = \delta_0 + \delta_1[Exposure_d] + \gamma_s + \mu_{s,d,c} \quad (1)$$

where  $Y_{s,d,c}$  is the outcome for state  $s$  in the unique area comprised of the overlapping area of district  $d$  and constituency  $c$ ,  $Exposure_d$  measures the cumulative number of years

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<sup>6</sup>It is important to note that this intersection process results in the basic geographic units that are the foundation of the empirical analysis. If districts are indexed by  $d$  and constituencies (either parliamentary or assembly) by  $c$ , any given unit thus has a particular definition as the area that comprises the unique intersection of district  $d$  and constituency  $c$ ; the area defined by  $[d, c]$ , in isolation, does not correspond to any existing administrative or political unit.

that the district leadership seat was reserved for a woman as of 2007, and  $\gamma$  represents a vector of state fixed effects; the residual is orthogonal to exposure, conditional on  $\gamma$ , *i.e.*,  $cov(\mu_{s,d,c}, Exposure_d | \gamma_s) = 0$ .

Identifying variation arises from two aspects of the policy. First, some areas were reserved for multiple election cycles within the first 15 years of implementation, while others were reserved only once or not at all. Second, some areas had not yet completed their reserved term of office as of the focal assembly or parliamentary election simply because they were assigned reservation in a later election cycle than other areas. The following section provides evidence that the variation in cumulative exposure is not correlated with observable characteristics of constituencies. That is, there is substantial evidence supporting the proper implementation of the random assignment of the leadership seat reservations across constituencies and election cycles.

## 4.2 Falsification tests for selection on observables

Figure 3 provides visual evidence of exogeneity in cumulative exposure to female leaders in district chairperson seats by plotting an area's eventual exposure level against a pre-policy measure of female political participation (the share of female candidates in the election prior to 1993). In the top panel, I show this relationship for state assembly constituencies: the left-hand graph shows the unconditional relationship, and the right-hand graph shows the relationship after removing state fixed effects (*i.e.*, the within-state variation shown in Figure 1 that will be used to identify effects as described in the empirical strategy). The bottom panel follows a similar pattern for parliamentary elections. In both cases, a flat line is evidence against a systematic relationship between cumulative exposure and preexisting differences in the propensity for women to be involved in elections for state and national legislatures.



For the analysis that follows, I focus on the relationship between policy exposure and constituency-level measures of female and male candidacy. To formalize the above falsification test, I collect a set of pre-policy measures of district socioeconomic characteristics from various sources and use them to predict the election outcomes that are the focus of analysis. This predicted outcome is then regressed on the policy measure to test whether this aggregate of pre-policy local characteristics encapsulated in the predicted outcome can be explained by later policy variation. These characteristics are taken from the 1991 population census, India’s household labor force survey carried out by the National Sample Survey Organization in 1987-88, and elections records for the 1991 general election. The indicators include demographic characteristics (average household size, sex ratios, ethnic mix), school enrollment rates, female literacy rates, household consumption per capita, and pre-policy measures of female political participation.

Table 3 presents these estimations. For both state and national legislatures, the policy measure has trivial explanatory power for the predicted outcomes. Another test lending support to exogeneity in the policy measure across area observables is a direct test of the degree to which pre-policy area characteristics can predict the policy measure. In Appendix Table A4, I show that an  $F$ -test of the vector of coefficients on the pre-policy area characteristics fails to reject the null hypothesis at any traditional level of significance. Taken together, these tests suggest strong within-state balance in pre-policy demographic, social, and political characteristics across districts receiving different eventual exposure intensities.

### **4.3 Estimation**

The empirical strategy is straightforward: I regress a focal measure of political participation on the contemporary cumulative exposure to female district leaders conditional on a vector of state fixed effects. Regressions are weighted by the population share in the constituency

based on data from the Gridded Population of the World (CIESIN, 2005) matched to the corresponding geographical area. By construction, the error terms are correlated by district (due to the policy variation) and constituency (the units for which elections outcomes are observable), so standard errors are two-way clustered by district and constituency.

Table 4 contains point estimates for the number of female and male candidates when separately regressed on cumulative years of chairperson reservations for the set of most recent state assembly elections across states prior to 2007. The first column of Table 4 shows that an additional year of seat reservation increases the number of female candidates for the state legislature by a small, but statistically distinguishable .015. That is, for a constituency that experienced two election cycles (ten years) of reservations relative to a constituency receiving no exposure, the former would expect to see .15 (or approximately .22 standard deviations) more female candidates in this higher level election. While there is a negative sign on the number of male candidates, this effect is not estimated precisely (column 2).

Because districts do not always overlap with political constituencies, we may be concerned about measurement error induced by the fact that candidates typically run in their home constituency. For example, say district A is bifurcated evenly by a parliamentary constituency boundary creating subareas A1 and A2. If district A received sufficient policy exposure to generate an additional candidate, that candidate is likely to contest future elections only in her home constituency. Policy exposure in the other area may therefore be being mismeasured, given that the exposure was not accruing to a potential candidate within its boundaries. Since this measurement error can only be positive, it is likely to lead to downward bias.

Although we cannot observe candidate residence, we can instead limit the sample to heavily overlapping areas in which this type of mismeasurement is less likely to be the case. In these cases, we are more sure that these areas will be “treated” in the sense that potential candidates are likely to live in and later contest from the constituencies they fall in. In

columns 3 and 4, we limit the sample to constituency areas that overlap more than 80% of their population with the underlying district.<sup>7</sup> This sample restriction only slightly increases the effect magnitudes among state legislature elections, which is expected due to the fact the most state legislature constituencies are uniquely contained within districts. There are, however, sizable differences when this is applied to parliamentary elections, discussed below.

Table 5 contains estimates of candidacy measures in parliamentary elections. Coefficient patterns are similar to effects among assembly elections, although the candidacy effect is substantially larger: for an additional ten years of exposure to female district leaders, there are an additional .41 female candidates (or approximately .4 standard deviations). At the mean level of exposure, almost one in six districts fielded an additional female candidate ( $0.041 \times 3.4 = .14$  additional female candidates per constituency). There is again no evidence of a response among male candidates in either direction. For both state legislatures and parliamentary elections, Panel B shows that results are similar in pattern and magnitude when controlling for pre-policy factors, including pre-policy female candidate shares and local demographic characteristics. When limiting to the sample of heavily overlapping area, the estimates increase in both magnitude and significance: unadjusted estimates in Panel A suggest an additional year of exposure increases female candidacy by 0.065 (50 percent larger than in the attenuated estimates) while adjusted estimates in Panel B are around 25 percent larger. Appendix Figure A2 shows the evolution of this effect across the distribution of sample restrictions.<sup>8</sup>

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<sup>7</sup>Note that because of the relative size of state assembly constituencies and parliamentary constituencies, we expect this mismeasurement to be an issue primarily among parliamentary elections.

<sup>8</sup>Appendix Figure A2 first plots coefficient magnitudes and  $t$ -statistics for the whole area sample, corresponding to estimates in Tables 4 and 5. I then remove units with small constituency area shares from the sample and reestimate the specification. The coefficient magnitudes and  $t$ -statistics are plotted according to the area share cutoff along the horizontal axis. The exercise begins with a cutoff of zero, and is then re-estimated for samples that increase the threshold until only areas that comprise 80 percent or greater of the total constituency area are left. For reference, the number of unique constituencies comprising the restricted sample are plotted at intervals of ten at the top of the graph. This leaves a sample of constituencies that cleanly overlap with a single district comprising the majority of their area, with the corresponding estimates plotted to the right of the graph.

The directional correspondence in effects of exposure to female leaders across two levels of government confirms that district leadership seats are a potentially pivotal role in according experience that is sufficient to enhance the viability of a candidate in other elected bodies. It is also important to note that there are an average of nine state legislature constituencies per district; scaling the coefficient then allows us to see that an additional two election cycles of exposure generates between one and two additional female candidates for the state legislature, compared to around .5 candidates for the parliament for a similar level of exposure and comparable area. That the effect is stronger at the state legislature level when comparing similar areas also suggests that the state legislature may be seen as a logical intermediate career step for politicians from previously reserved areas; the effect magnitude also very closely mirrors the number of district chairpersons that would have been available for higher office candidacy, with ten years/two cycles yielding approximately two new female politicians available to run for either office.

The estimated magnitudes of the policy effect are substantial in view of the total increase in the number of female candidates for office in these elections. There were 157 female candidates in these states in the 1991 parliamentary elections, compared to 265 in the 2009 elections. With an average of 3.4 years of exposure to the policy across 278 constituencies, the point estimate of 0.041 implies an additional 38.75 female candidates as a result of the policy, comprising approximately 35 percent of the increase in female candidacy seen in these states over this period. In state legislatures, the policy effect is smaller in magnitude, but it is similarly responsible for a large share of the increase in female candidates: with an average exposure of 2.8 years across 1,615 constituencies, the point estimate of 0.015 implies an additional 67.8 female candidates running for state legislatures – the majority of the increase from 705 to 802 female assembly candidates in these states from before the policy to the most recent election.

## 5 Robustness and effect heterogeneity

### 5.1 Non-linearities and moderators

Table 6 interacts the exposure measure with various local demographic and socioeconomic characteristics to explore whether the overall effects on candidacy are concentrated in areas with any particular characteristics.<sup>9</sup> Column 1 repeats the unconditional OLS specifications from Tables 4 and 5 in Panels A and B, respectively. Column 2 reports results from a specification including the square of the exposure measure, while columns 3-6 interact the exposure measure with rural female literacy rates and educational attainment, the population sex ratio, and the population share of lower-caste groups. Overall, the estimates of the main effect of exposure are remarkably robust across these specifications. One exception is the polynomial specification (column 2), in which effects are imprecisely estimated for parliamentary elections and the squared term becomes more prominent among the state assembly elections. Candidacy results are robust to the use of count data (Poisson) models in Appendix Table A5.

### 5.2 Sample construction and composition

An alternative to the current sample construction method would be to calculate the weighted average policy exposure for each constituency based on the various district components comprising the constituency. This also obviates the need for multi-way clustering of standard errors, although the resulting tests would be less conservative in rejecting the null due to uncorrected partial error term correlations. Appendix Table A6 shows these estimates for

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<sup>9</sup>This investigation also allows the ability to extrapolate about the generalizability of effects in the whole of India beyond the ten-state sample available for the analysis. Appendix Table A1 contains results from a test across samples in the same indicators used below, showing differences across in-sample and out-of-sample districts in their population size, female literacy rates and educational attainment, and female-to-male sex ratio.

both the state assembly and parliamentary elections, with results mirroring (or stronger than) those in Tables 4 and 5. Results are also robust to weighting observations by constituency area share instead of population, as seen in Appendix Table A7.

## 6 Causal channels for the candidacy effect

### 6.1 Prior exposure to politics

The results above suggest that exposure to female leaders via quotas at a lower level of the political hierarchy increases the political candidacy decisions of women running for higher office. To better understand the ways in which the policy affects the candidacy margin, I investigate characteristics of the candidates who are revealed to be moved by the policy. To do this, I first use the panel nature of the candidate dataset to incorporate historical information on candidacy and public service to determine if the effects in Table 5 are particularly concentrated among either repeat candidates or incumbents.

I segment candidates by various measures of prior political experience and exposure, with the focal outcomes now defined as the number of female candidates who are also (a) candidates with prior exposure in local government, (b) repeat (parliamentary) candidates, (c) previous candidates for lower office, and (d) candidates with known family involvement in politics (Labonne et al., 2015). Table 7 presents point estimates when estimating the same cross-sectional specification as above.

By observing partial career histories of individual candidates, we see that the policy effect among female candidates for parliament is due to two groups of women: those who had previously served in local government (column 1) and those who had previously contested (but not won) state assembly elections and continued in politics to contest parliamentary

elections (column 3). These two groups are almost entirely distinct (shown in Appendix Table A8). The third category, comprised of all other female candidates about whom no background information was found and in which new female candidates would be captured, does not exhibit any response to the policy exposure. The simplest explanation for this would be that policy exposure lowers the cost of candidacy only enough to affect those who have already incurred the fixed costs of establishing a political career – those having previously contested or served. These results are important for a number of reasons. First, the effects found at higher levels of the political organization come, at least partially, from individuals with repeat candidacies. Short-run effects arising through this channel are thus likely to be small – highlighting the need to examine these dynamics from a cumulative, longer-term perspective. Second, the “bottom-up” quota policy affects other levels of the organizational hierarchy at least in part through internal candidates, some of whom were originally introduced into politics through quotas. This stands in particular contrast to the lack of effects outside the upper echelons of corporate structures from the “top-down” quota policies for women in several European companies (Bertrand et al., 2014). Finally, this is evidence for both the candidate-supply mechanism (being the same individuals who gained experience in local government now contesting) and candidate response to changes in voter demand, where prior higher-office candidates continued contesting elections in areas that had historically been exposed to women politicians in positions of particular power. While changes in attitudes after exposure to female leaders has been found previously (Beaman et al., 2009), Table 7 provides evidence suggesting a response among candidates who were not direct beneficiaries of the quota policy themselves – potentially due to broader institutional changes in attitudes towards women as effective leaders and viable candidates in constituencies with greater past exposure to female leaders.

## 6.2 Recent versus past exposure and exposure intensity

I next separate variation in the main exposure measure into periods of recency relative to the focal election. If the effect of female leaders on candidacy was through some measure of salience or inspiration (either directly, or through expectations of immediately enhanced voter support or turnout), we might expect to see effect sizes increasing in recency; if the primary channel by which candidacy is affected is through providing opportunities for political experience, effect sizes may be less tied to particularly recent experience with quota exposure.

For this analysis, the policy measure is separated into three periods of exposure recency relative to the focal election: exposure in the preceding four years, exposure five to nine years prior, and early exposure in the first four years of the policy. These cutoffs are created in order to capture the fact that terms of office are five years long; this ensures, for example, that an area experiencing reservation five to nine years prior would necessarily have had a completed term of office for those in reserved seats at the time of the focal election. Estimates for state assembly elections are in columns 1 and 2 of Table 8; effects in parliamentary elections can be found in columns 3 and 4. Across both levels of government, it is clear that the main results from Tables 4 and 5 are largely driven by exposure in the moderate past, in which the particular leaders who would have been in the chairperson seat would have had time to complete their full term of office and used that experience to establish a foundation for or begin their next political campaign. For parliamentary elections, it is clear that short-term effects are small, and the most meaningful exposure comes from a moderately recent exposure period. This lack of effect among the most recent exposure category also refutes the hypothesis that female candidates run because there will be better cross-level support from those currently in office in local government via the quota system. In the parliament, it is clear also that effects of exposure decrease after moderate recency, suggesting an impermanence in the effects – further supporting the hypothesis that the effect



of quotas on later candidacies is concentrated specifically among those who gain political experience as a result of the quotas that can be drawn upon in soon-upcoming political campaigns. One can also segment the total amount of exposure to the policy into year ranges to gauge nonlinearity in effects. In Table 9, I split the policy exposure measure into four ranges: one to two years, three to five years, six to seven years, and eight years or more. In both state legislative assemblies and parliamentary elections, we see that the majority of the effect comes from those areas with greater than five years (i.e., more than one election cycle) of reservation. In Appendix Table A9, I estimate a district fixed-effects specification – the results of which correspond in direction to the main effects above, although are smaller and statistically insignificant.<sup>10</sup>

## 7 Representation Effects

### 7.1 Winning, election finishes, and effects on electoral competition

Table 10 estimates changes in the share of votes garnered by female candidates and in the (unconditional) probability of a woman winning the election or finishing either in the top five finishers or in the top 30 percent of finishers. Column 1 includes the change in the share of candidates who are female for a comparable reference. Column 2 shows female candidates capture at least a proportionate share of votes (although imprecisely estimated). This vote share effect is likely to be quite small if the marginal candidate garners a proportional (average) share of votes. Using the parliamentary elections as an example, for an additional female candidate in a pool of 13 candidates, the fraction of votes going to female candidates would increase by at most  $1/14$ , or 0.07. However, since the average

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<sup>10</sup>Because this is identified off of within-constituency changes, these coefficients capture more “contemporaneous” or immediate, rather than cumulative, effects of the policy.

effect on candidates is 0.041 individuals, the expected change in the vote share then becomes quite small:  $0.041 \times (1/14) = 0.00292$ . Despite the assumption regarding proportionality (which may be strong for the marginal female candidate), this is not far from the magnitude estimated in Table 10. Using the figures for state elections, the expected vote share increase ( $0.015 \times (1/9) = 0.00166$ ) is quite similar to the estimated value (0.00200). From this, we can conclude that the effects estimated are, in fact, consistent with marginal female candidates garnering an approximately proportional vote share.

Column 3 shows that there is no distinguishable increase in the probability of electing a female candidate in either state or national legislatures. This is important to note in the context of the findings of Bhalotra et al. (forthcoming), who show that political experience causes an increase in female candidacies through repeat candidates. In the present situation, the effect of the quota policy could be compounded with positive incumbency effects if the female candidates who contested as a result of quotas also likely to win elections. This is not the case, however, and provides one reason for the impermanence of cross-level effects of local quotas.

Focusing only on whether women win elections may understate changes in the viability of female candidates. To address this, I construct alternative measures of whether a female candidate finished in either the top five candidates or in the top 30 percent of candidates (to adjust for the size of the candidate pool). Columns 4 and 5 contain the results of these estimations and indicate there are not substantial effects on female candidates finishing in the top of the distribution of finishers in the elections in which they compete – suggesting the additional female candidates induced by the policy receive relatively low vote shares in the elections they contest, finishing no better or worse than the average candidate. However, there is some indication of a higher probability of a female candidate having a competitive finish (columns 4 and 5) in the parliament in highly overlapping areas (Panel D). Appendix Figure A3 shows the progression of these estimates when restricting the sample to more

similarly-overlapping areas.

The investigation into individual finishes does not allow for indirect effects of additional candidates on the election contest overall, given that marginal candidates may still cause changes in voting behavior of particular blocs to which they are particularly connected. In Table 11, I establish several facts about the characteristics of candidates who respond to policy exposure via parliamentary candidacy. To do this, I segment candidates into whether they ran for office as independents or as part of a major or minor party, and then look at the effect of policy exposure on the share of votes won by major party candidates. This establishes important points about the candidates who run for parliament in constituencies longer-exposed to quotas: (a) they largely run as independents rather than as party candidates (columns 1-3), and (b) policy exposure reduces the vote share going to major party candidates (column 4).<sup>11</sup> These marginal candidates may indirectly affect political outcomes through independent candidacies that disproportionately reduce the vote share going to major party candidates.

I next estimate the effect of quota exposure on the probability of a female candidate winning conditional on the presence of different types of female candidates. That is, does quota exposure have a stronger effect on the probability of a female candidate winning when the candidate has been incorporated into a major party? Table 12 presents the estimation of the specifications in columns 3, 4, and 5 of Table 8 conditional on the presence of a female candidate (Panel A), the presence of a major-party female candidate (Panel B), the presence of a minor-party female candidate (Panel C), and the presence of an independent female candidate (Panel D). Abstracting from selection concerns, a clear pattern emerges across panels: conditional on candidacy, women who are incorporated into major parties increase their chances of election when their constituency has previously had greater exposure to quotas, whereas this is the opposite for independent candidates. These results parallel the

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<sup>11</sup>There were four major party candidates in a constituency, on average, suggesting the expected vote share loss for major party candidates would be approximately ten percent of the magnitude in column 4.

findings among municipal elections of Bhavnani (2009) by showing that the most likely conduit to achieve follow-on representation effects for women after a quota regime is through the concurrent incorporation of female candidates into major parties. Conditioning the sample on the presence of a female candidate running on a major party ticket does introduce concerns about results being driven by an endogenously-determined sample arising from parties' candidate selection processes, however. Absent selection, this would suggest that representation effects of quota exposure can only be realized in combination with major party support. If these results arise due to selection, this could instead be taken as evidence of a change in major parties' assessment of female candidate viability in longer exposed areas – itself suggesting a different form of institutional change.

Finally, I interact the exposure measure with an indicator for the presence of an incumbent running in the election. If the lack of overall effects on representation were driven by the presence of strong incumbents, we might expect to see female candidates winning at higher rates in areas without a contesting incumbent compared to areas in which an incumbent is contesting. The presence of an incumbent, however, may drive selection of different types of female candidates in constituencies in which an incumbent is running compared to those for which this is not the case. To check for this selection effect, the first two columns of Table 13 estimate effects on the number of female candidates, with the incumbency indicator used defined as any incumbent present (Column 1) or a major party incumbent present (Column 2). The negative effect on the main incumbency indicator in Columns 1 and 2 suggests substantive negative effects of the presence of an incumbent on the presence of female candidates. The effects in Columns 3 and 4 on whether a female candidate wins an election may then be understood as driven by selection on candidate ability: incumbents generally discourage female candidacy, and those women who do contest an election with an incumbent running may be particularly strong candidates. The presence of an incumbent is not meaningfully related to policy exposure, so it is likely that selection mainly occurs among female candidates – limiting the conclusions that can be drawn about whether incumbents

themselves are related to a lack of representation effects.

## 7.2 Effects on voter turnout

I use measures of voter turnout in parliamentary and assembly elections to investigate whether there is evidence that female candidacy is increased indirectly by expectations of enhanced voter turnout by groups potentially more likely to vote for female candidates. For both parliamentary and state assembly constituencies, voter turnout measures are available separately by sex; Table 14 reports point estimates from the same empirical framework as above. While there is a precisely estimated zero effect of female leaders on measures of voter turnout in parliamentary elections, there is some increase in turnout in state assembly elections (column 4), which appears to be due largely to an increase in female voter turnout (column 6). Effect magnitudes imply that an additional two terms of exposure to the quota reservation increases female voter turnout by a fraction of .03 – an increase of five percent over the mean, or approximately .23 standard deviations – suggesting some potential for quota-based leadership to encourage the political participation of female voters.

## 8 Conclusion

This paper provides evidence that a quota policy for women in local government increased the candidacy, but not representation, of women in higher offices. Using a natural experiment in which one third of leadership seats in local government were randomly reserved for women across election cycles, I identify a causal response to these seat quotas among women contesting seats in later elections for state legislative bodies and the national parliament. This suggests additional, longer-term effects of quotas on political dynamics and effects outside the particular bodies in which the quotas were active. Estimate magnitudes

imply these quotas were responsible for a majority of the increase in female candidates in state legislature and parliamentary elections since the policy went into effect.

The cross-level effects of quotas in politics were linked to two distinct groups of individuals. These were candidates who had either gained previous experience in local government due to the quotas, or individuals who were not direct beneficiaries of the policy but were previous candidates who continued contesting for office in areas that had greater exposure to local female leaders. There was no overall increase in the probability of electing a woman despite the increase in female candidates, although there is some indication of a higher likelihood of a competitive finish by female candidates in longer-exposed areas. There is also suggestive evidence that female representation increases when women are able to run on major party tickets. Effects on the extensive margin of voting are limited, although the additional female candidates do disproportionately reduce the vote share going to major party candidates. If a policy goal is to increase substantive representation throughout politics, quotas in local government have distinct, but limited, effects on representation in higher levels of the political structure.

The findings have implications for the understanding of how quotas can affect later candidacy for higher-level positions in the occupation in which they operate. India's one-third quota policy for women in local politics has increased the substantive representation of women in local government over the previous two decades; the relative success of these quotas in local government, however, has not yet translated into an increase in representation by women in higher levels of government. Follow-on representation effects are not automatic, and they may only be accessible in environments where candidates can avail sufficient resources needed to compete for higher-level positions.

Table 1: Average years of exposure district chairperson quotas

State	Mean	St. Dev.	Min.	Max.	<i>N</i>
Andhra Pradesh	4.1	2.6	0	11	22
Bihar	1.0	0.9	0	2	27
Gujarat	3.7	2.6	0	10	17
Haryana	4.3	0.9	3	5	12
Kerala	4.3	1.8	0	8	14
Maharashtra	4.1	2.2	0	8	27
Orissa	4.1	1.7	1	7	13
Punjab	3.2	2.8	0	8	12
Rajasthan	4.3	1.0	3	5	26
West Bengal	3.6	2.9	0	10	16
Overall sample	3.6	2.3	0	11	186

**Note:** Source: Author's calculations using data from Iyer et al. (2012).

Table 2: Summary statistics, intersected constituency returns datasets

Variable	Mean	Std. Dev.	Min.	Max.
<i>Panel A: Assembly constituencies</i>				
Candidates	8.184	3.977	2	33
Number of female candidates	0.427	0.677	0	4
Whether area had any female candidate	0.337	0.473	0	1
Whether female candidate won election	0.063	0.243	0	1
Vote share for female candidates	0.069	0.161	0	.973
Years exposure to chairperson reservation	2.759	2.458	0	10
Number of constituencies		1,615		
Number of districts		186		
<i>N</i>		2,995		
<i>Panel B: Parliamentary constituencies</i>				
Candidates	13.495	5.911	4	38
Number of female candidates	0.857	1.087	0	5
Whether area had any female candidate	0.520	0.500	0	1
Whether female candidate won election	0.109	0.312	0	1
Vote share for female candidates	0.085	0.175	0	.904
Years exposure to chairperson reservation	3.396	2.315	0	11
Number of constituencies		278		
Number of districts		186		
<i>N</i>		1,375		

**Note:** Summary statistics reflect unconditional means across parliamentary and state assembly constituencies intersected with district boundaries in the ten-state sample shown in Table 1.

Table 3: Testing policy variation in explaining pre-policy predicted outcomes.

	Outcome: covariate-predicted measures of candidacy			
	State legislatures		Parliament	
	Female cand.	Male cand.	Female cand.	Male cand.
	(1)	(2)	(3)	(4)
Years reserved	-0.000 (0.002)	-0.005 (0.016)	0.007 (0.005)	0.007 (0.032)
Mean of outcome	0.42	7.86	0.90	12.5
St. dev. of outcome	0.20	2.92	0.28	3.52
<i>N</i>	2,995		1,375	

**Note:** This table reports coefficient estimates of the effect of an additional year of exposure to female leaders on measures of candidacy as predicted by pre-policy observables. Coefficients are from the estimation of equation (1) in the text estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.



Table 4: Effect of exposure to female leaders on state legislature candidacy.

	Full sample		Heavily overlapping sample	
	Female cand. (1)	Male cand. (2)	Female cand. (3)	Male cand. (4)
<i>Panel A: Unconditional</i>				
Years reserved	0.015* (0.009)	-0.054 (0.058)	0.016* (0.009)	-0.057 (0.060)
<i>Panel B: Including covariates</i>				
Years reserved	0.014* (0.008)	-0.051 (0.057)	0.016* (0.008)	-0.054 (0.059)
Mean of outcome	0.43	7.22	0.44	7.76
St. dev. of outcome	0.68	4.16	0.68	4.23
<i>N</i>	2,995		1,409	

**Note:** This table reports coefficient estimates of the effect of an additional year of reservation on constituency-level metrics of candidacy. Coefficients are from the estimation of equation (1) in the text estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Table 5: Effect of exposure to female leaders on parliamentary candidacy

	Full sample		Heavily overlapping sample	
	Female cand.	Male cand.	Female cand.	Male cand.
	(1)	(2)	(3)	(4)
<i>Panel A: Unconditional</i>				
Years reserved	0.041*	0.113	0.065**	0.106
	(0.021)	(0.109)	(0.027)	(0.148)
<i>Panel B: Including covariates</i>				
Years reserved	0.035*	0.109	0.044*	0.009
	(0.022)	(0.103)	(0.025)	(0.008)
Mean of outcome	0.89	12.61	0.89	12.48
St. dev. of outcome	1.04	5.64	1.05	5.55
<i>N</i>	1,375		176	

**Note:** This table reports coefficient estimates of the effect of an additional year of reservation on constituency-level metrics of candidacy. Coefficients are from the estimation of equation (1) in the text estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \*  $< .1$ , \*\*  $< .05$ , \*\*\*  $< .01$ .

Table 6: Non-linearities in policy effects.

Outcome:	Count of female candidates					
Interaction:		Exposure	Literacy	Educational attainment	Sex Ratio	Low-caste population share
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A: State assemblies</i>						
Years reserved	0.015*	-0.026	0.016*	0.015*	0.016*	0.014*
	(0.009)	(0.019)	(0.009)	(0.009)	(0.009)	(0.008)
Interaction		0.056**	0.053	0.026	0.051	0.117
		(0.026)	(0.066)	(0.060)	(0.055)	(0.082)
<i>N</i>	2,995					
<i>Panel B: Parliament</i>						
Years reserved	0.041*	0.049	0.043**	0.043**	0.041*	0.041*
	(0.021)	(0.056)	(0.020)	(0.020)	(0.021)	(0.021)
Interaction		-0.009	-0.090	-0.253	-0.045	0.035
		(0.055)	(0.206)	(0.243)	(0.183)	(0.245)
<i>N</i>	1,375					

**Note:** This table reports coefficient estimates of the effect of an additional year of reservation on the number of female candidates by constituency. Coefficients are from the estimation of equation (1) in the text, including an additional interaction term with the measure indicated in column headers. Measures of local characteristics used in columns (3)-(6) are unit standardized and main effects of the interaction terms are unreported. Estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Table 7: Effect of exposure to female leaders on parliamentary candidacy via career politicians.

Effect channel:	<i>Candidate supply</i>	<i>Response to voter demand</i>		<i>Other</i>
Measure:	Prior local politician (1)	Female prev. Parl. candidate (2)	Female prev. state leg. candidate (3)	Known political family (4)
Years reserved	0.015* (0.007)	0.003 (0.002)	0.026*** (0.009)	0.016* (0.009)
Mean of outcome	0.09	0.02	0.19	0.14
St. dev. of outcome	0.32	0.15	0.39	0.39
<i>N</i>			1,375	

**Note:** This table reports coefficient estimates of the effect of an additional year of reservation on constituency-level metrics of within-level and cross-level repeat candidacies. Coefficients are from the estimation of equation (1) in the text estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Table 8: Separating effects of recent and past exposure.

	State legislatures		Parliament	
	Female cand.	Male cand.	Female cand.	Male cand.
	(1)	(2)	(3)	(4)
Years reserved, 10-15 years prior	0.022 (0.027)	0.070 (0.139)	-0.031 (0.038)	-0.003 (0.198)
Years reserved, 5-9 years prior	0.021 (0.017)	-0.125 (0.105)	0.091** (0.036)	0.168 (0.172)
Years reserved, 0-4 years prior	0.003 (0.016)	-0.028 (0.104)	0.012 (0.045)	0.150 (0.234)
Mean of outcome	0.43	7.22	0.89	12.61
St. dev. of outcome	0.68	4.16	1.04	5.64
<i>N</i>	2,995		1,375	

**Note:** This table reports coefficient estimates of the effect of an additional year of reservation in different periods of recency on constituency-level metrics of candidacy and election outcomes. Coefficients are from the estimation of this modified form of equation (1) in the text estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \*  $< .1$ , \*\*  $< .05$ , \*\*\*  $< .01$ .

Table 9: Effect of exposure to female leaders on state and parliamentary election outcomes: heterogeneity by exposure intensity.

	(1)	(2)	(3)	(4)
	State (full sample)	State (overlapping sample)	Parl. (full sample)	Parl. (overlapping sample)
1-2 yrs. reserved [0/1]	-0.167** (0.069)	-0.165** (0.075)	0.256 (0.201)	0.235 (0.275)
3-5 yrs. reserved [0/1]	-0.009 (0.046)	-0.017 (0.047)	0.222 (0.159)	0.220 (0.196)
6-7 yrs. reserved [0/1]	-0.002 (0.075)	0.010 (0.081)	0.626*** (0.230)	0.806** (0.335)
8+ yrs. reserved [0/1]	0.224** (0.110)	0.245** (0.119)	0.286 (0.215)	0.670** (0.293)
Mean of outcome	0.43	0.45	0.89	0.89
St. dev. of outcome	0.68	0.69	1.04	1.05
<i>N</i>	2995	1409	1375	176

**Note:** This table reports coefficient estimates from the estimation of the main specification where the primary regressor has been transformed into a vector of indicators for differing levels of cumulative exposure intensity. Coefficients are from the estimation of this modified form of equation (1) in the text estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Standard errors are two-way clustered by constituency and district. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Table 10: Effects of policy exposure on female candidates' election finishes.

Outcome:	Female share of candidates (1)	Female vote share (2)	Female winner (3)	Female finish in: Top 5      Top 30% (4)      (5)	
<i>Panel A: State assemblies – full sample</i>					
Years reserved	0.00307** (0.00154)	0.00200 (0.00218)	0.00110 (0.00268)	0.01096 (0.00793)	0.00239 (0.00577)
<i>N</i>	2,995				
<i>Panel B: State assemblies – overlapping sample</i>					
Years reserved	0.00339** (0.00168)	0.00245 (0.00237)	0.00106 (0.00287)	0.00432 (0.00635)	0.00142 (0.00528)
<i>N</i>	1,409				
<i>Panel C: Parliament – full sample</i>					
Years reserved	0.00274 (0.00204)	0.00546 (0.00509)	0.01147 (0.01010)	0.01541 (0.01221)	0.01705 (0.01161)
<i>N</i>	1,375				
<i>Panel D: Parliament – overlapping sample</i>					
Years reserved	0.00480* (0.00256)	0.00993 (0.00724)	0.01443 (0.01503)	0.02854* (0.01591)	0.03045* (0.01624)
<i>N</i>	176				

**Note:** This table reports coefficient estimates of the effect of an additional year of exposure to female leaders on segments of elections outcome finishes. Coefficients are from the estimation of equation (1) in the text. Estimated via OLS. All specifications in all panels include a vector of state fixed effects. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Table 11: Effect of exposure to female leaders on parliamentary party competition.

	Female candidates, major party (1)	Female candidates, minor party (2)	Female candidates, independent (3)	Vote share, major party cand. (4)
Years reserved	0.014 (0.017)	0.005 (0.012)	0.022** (0.011)	-0.030** (0.015)
Mean of outcome	0.30	0.24	0.31	0.47
St. dev. of outcome	0.53	0.50	0.62	0.60
<i>N</i>			1,375	

**Note:** This table reports coefficient estimates of the effect of an additional year of exposure to female leaders on constituency-level metrics of female candidates by party type. Coefficients are from the estimation of equation (1) in the text estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.



Table 12: Effect of exposure to female leaders on the election of female candidates conditional on party type.

Outcome:	Female winner (1)	Female finish in: Top 5      Top 30% (2)      (3)	
<i>Panel A: Female candidates &gt; 0</i>			
Years reserved	0.016 (0.015)	0.011 (0.012)	0.013 (0.013)
<i>Panel B: Major party female candidates &gt; 0</i>			
Years reserved	0.034* (0.021)	0.023* (0.012)	0.023 (0.017)
<i>Panel C: Minor party female candidates &gt; 0</i>			
Years reserved	0.022 (0.022)	0.021 (0.023)	0.046** (0.023)
<i>Panel D: Independent female candidates &gt; 0</i>			
Years reserved	-0.032* (0.017)	-0.012 (0.016)	-0.032* (0.019)

**Note:** This table reports coefficient estimates of the effect of an additional year of reservation on an indicator for a female candidate winning the election. Coefficients are from the estimation of equation (1) in the text estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Table 13: Effect of exposure to female leaders on the election of female candidates conditional on presence of incumbent in parliamentary elections.

	Female candidates		Female winner	
	Any incumbent (0/1) (1)	Major party incumbent (0/1) (2)	Any incumbent (0/1) (3)	Major party incumbent (0/1) (4)
Years reserved	0.022 (0.033)	0.017 (0.034)	-0.001 (0.012)	-0.002 (0.012)
Years reserved * incumbent present	0.038 (0.047)	0.052 (0.048)	0.024* (0.012)	0.027** (0.012)
Incumbent present	-0.231 (0.177)	-0.306* (0.185)	-0.096 (0.061)	-0.110* (0.059)
Mean of outcome	0.86	0.86	0.11	0.11
St. dev. of outcome	1.08	1.08	0.31	0.31
<i>N</i>	1,375			

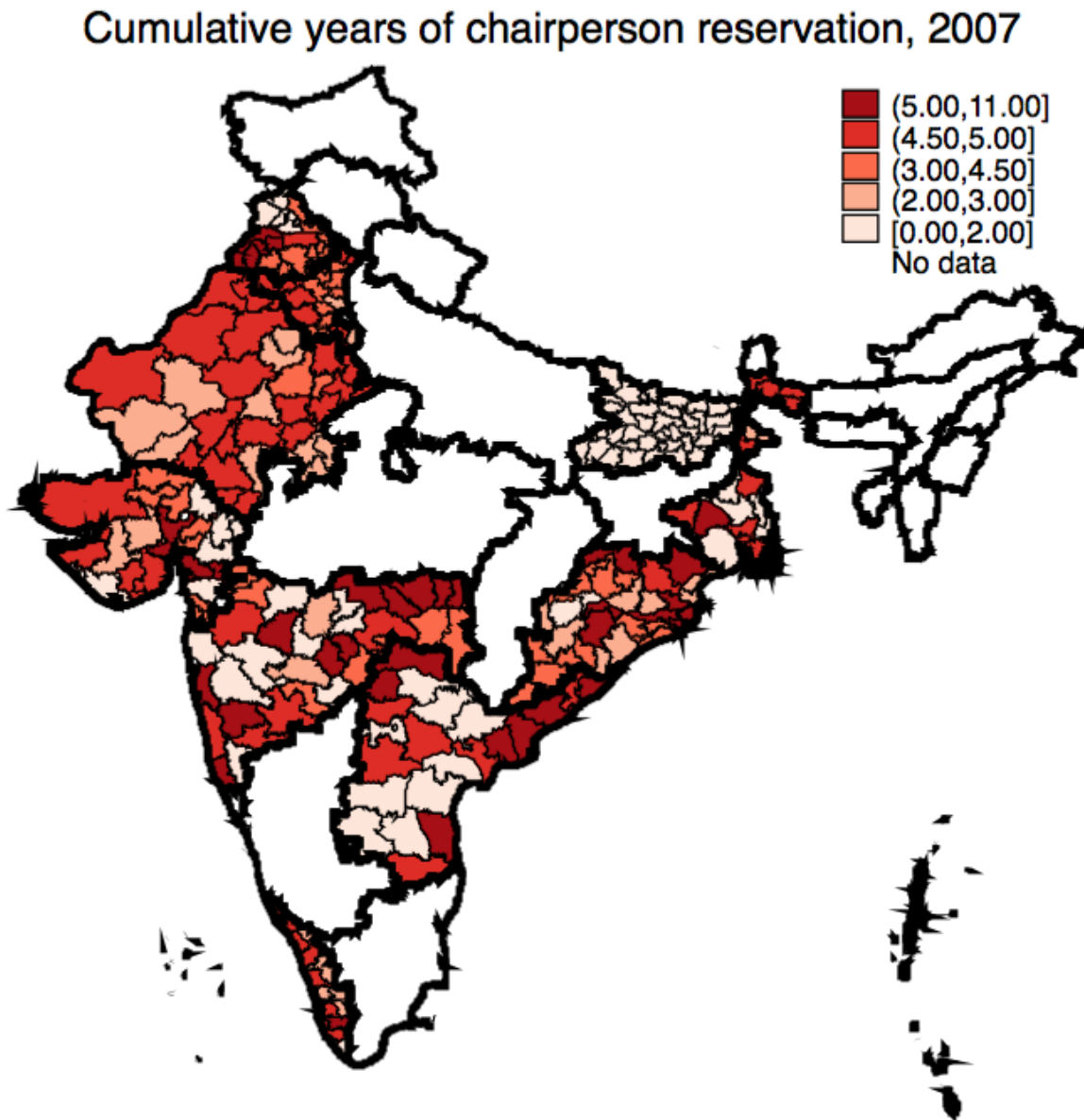
**Note:** This table reports coefficient estimates of the effect of an additional year of reservation on the number of female candidates and whether a female candidate wins the election. Coefficients are from the estimation of equation (1) in the text, including an additional interaction term with the incumbency indicator indicated in column headers. Estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Table 14: Effect of exposure to female leaders on voter motivation and turnout.

Level:	Parliament			Assemblies		
	Voter turnout (1)	Female share voters (2)	Female voter turnout (3)	Voter turnout (4)	Female share voters (5)	Female voter turnout (6)
Years reserved	0.00073 (0.00158)	0.00037 (0.00052)	0.00082 (0.00183)	0.00302* (0.00170)	-0.00004 (0.00031)	0.00296 (0.00190)
N	1375	1375	1375	2995	2993	2993
Mean of outcome	0.62	0.46	0.60	0.67	0.49	0.65
St. dev. of outcome	0.15	0.04	0.16	0.13	0.02	0.13

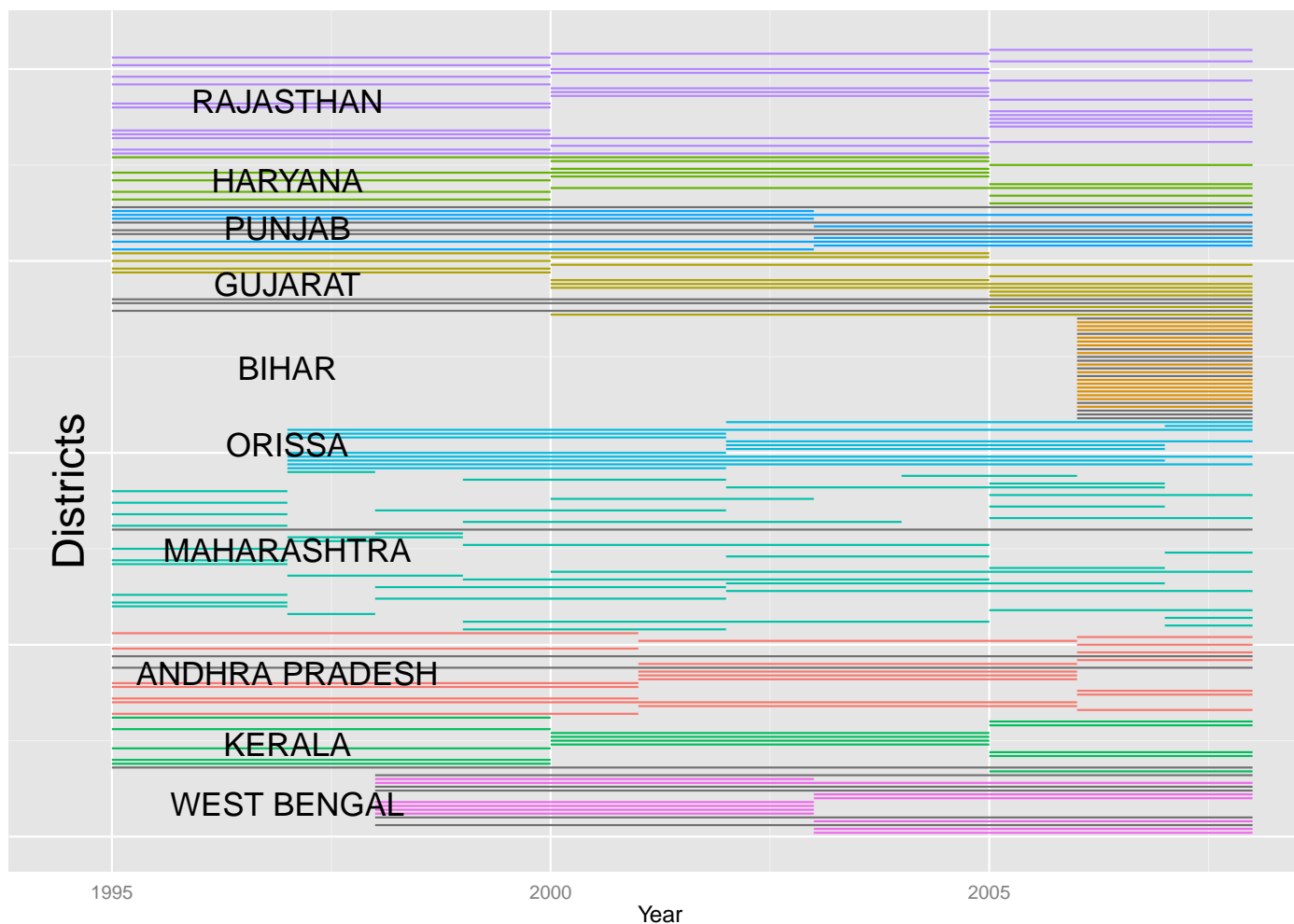
**Note:** This table reports coefficient estimates of the effect of an additional year of reservation on constituency-level metrics of voter turnout outcomes. Coefficients are from the estimation of equation (1) in the text estimated with OLS. All specifications contain a vector of state fixed effects and an unreported constant term. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Figure 1: Policy variation in district chairperson exposure



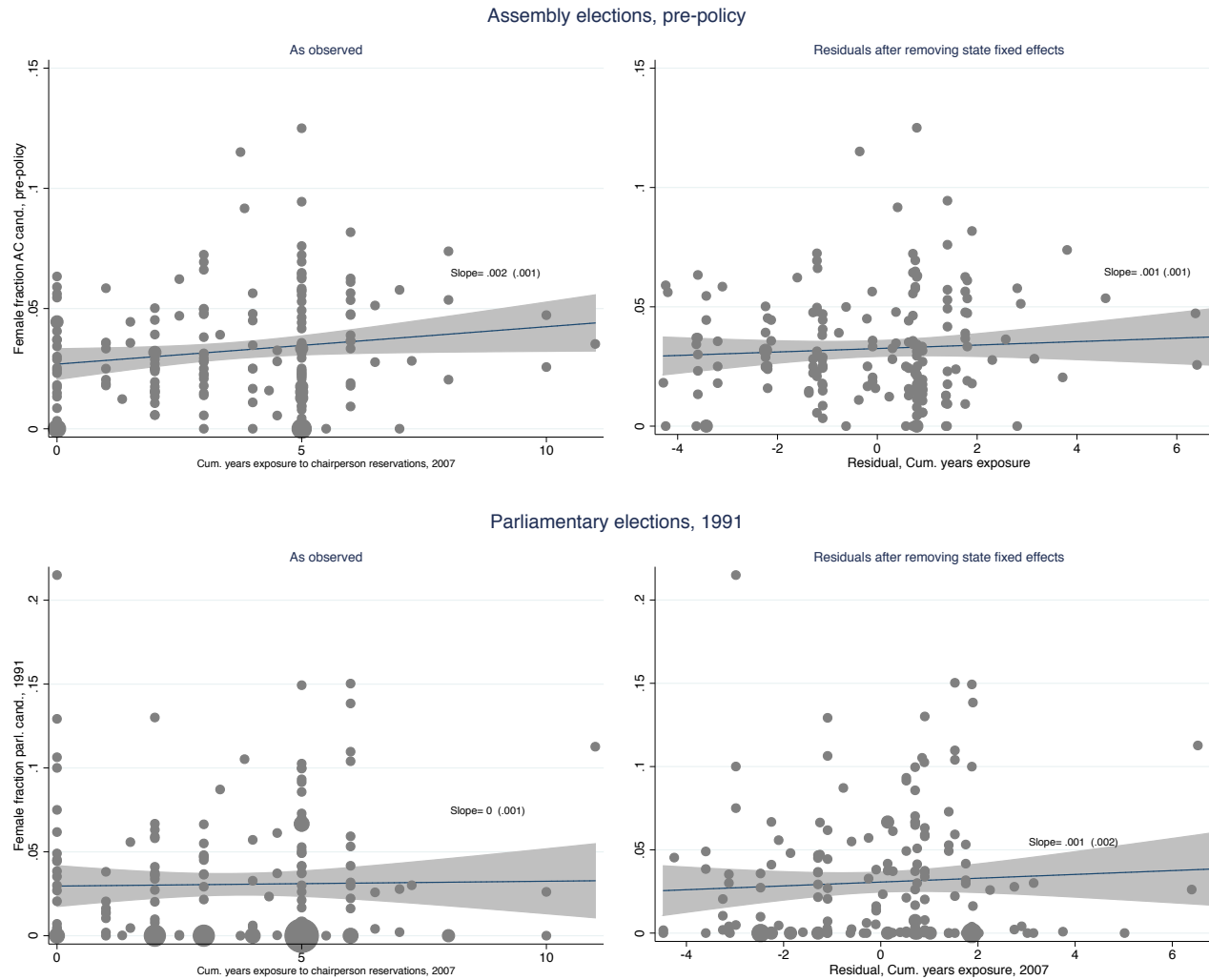
Source: Author's calculations using data from Iyer et al. (2012).

Figure 2: Variation in district exposure to seat reservations: timelines.



Notes: Author's calculations using data from Iyer et al. (2012). In this figure, each position on the vertical axis represents a separate district, with districts in the same states grouped together. For each district, the appearance of a filled line indicates that the district chairperson seat was reserved for a woman in that year (indicated on the horizontal axis). Districts that did not receive any period of reservation are indicated in grey within each state series. States are ordered based on relative geographical position.

Figure 3: Falsification: predicting pre-policy female political participation with cumulative exposure.



**Note:** These figures show the unconditional (left) and conditional (right) relationship between pre-policy female political participation as measured through state and national legislature candidacy rates and years of exposure to women leaders via seat quotas from 1995 to 2007. A flat line indicates no relationship between pre-policy measures and eventual exposure.

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## A1 Candidate Panel dataset

Similar to transparency efforts in many other countries in recent decades, the Indian government has undertaken a large-scale process to digitize a great deal of its official records and make them easily accessible to the public; elections data now available from various sources (all ultimately sourced from the Elections Commission of India) are a prime example of this. The Elections Commission ([eci.nic.in](http://eci.nic.in)) publishes numerous internet and PDF documents, as well as digitized databases, containing detail on elections outcomes for directly elected bodies, including the Lok Sabha and state legislative assemblies. Currently, digitized candidate lists and outcomes by constituency are available for the entire history of the Lok Sabha; digitized data for state assembly elections have been made available as part of Jensenius (2013).

Candidate linking was performed for all Lok Sabha elections from 1991 to 2014. Candidates were linked by taking all candidates in the focal year and assessing the closest name match in the same state and constituency in the target year, up to a .2 Levenshtein distance. This results in one closest name match (or multiples, in the case of an exact tie) in the target year for each candidate in the focal year. Each match is then reviewed manually for sufficient similarity across the two candidate name entries and a final match decision is made. Many candidates had exact name matches. There are important aspects of this process to note:

1. The use of the closest match only induces the propensity for undercounting repeat candidates, whose second or third match in the target year may have been proper (but ignored by the current algorithm).
2. Some names were difficult to fully verify either way, particularly in the cases of candidates only having a single (usually given) name listed, in the case of common given-surname pairs, and/or in the case of election “fraud” or the running of several candidates with the same name. In the absence of other information, exact or near matches

of this nature were recorded as separate individuals.

Sufficient criteria for assessing a positive match largely proceeded according to the following rules:

1. reordering of surname, given name, and/or
2. reordering or removal of an alias or honorifics, and/or
3. spelling differences via differences arising from name transliteration or spelling/typos.

In the case of the use of a single initial for a candidates' given name in official records, records were given closer scrutiny and required exact matching of the abbreviated name in both records. Appendix Table 3 contains a summary of the matching process as it applied to the state and national elections used in the analysis.

Table 3 highlights a number of facts about politics and politicians in India. First, repeat candidacies in both levels of government are substantial, and a substantial share of these repeat candidacies are by individuals who previously *lost* an election. (See for example, 6,870 repeat candidacies in state assembly elections contesting 4,094 seats; similarly in the parliament, 1,004 repeat candidacies contesting 543 seats). Second, there is also substantial movement of candidates across levels, with more than 1,000 candidates for the 2009 parliamentary elections having previously contested a state assembly seat. Third, the probability of a woman contesting for parliament after a state legislature candidacy is three to four times higher than for a previous male candidate, and this difference exists both for those who won and lost their state legislature contest. Because of this, the parliamentary candidacies by former assembly candidates are dominated by men and women who previously *lost* their contest for state legislature seats. There is a non-trivial subset of candidates who contest higher levels of political office over time, and these trajectories are not necessarily impeded by a prior loss, either at the same or a lower level of government.

Any matching process of this nature is subject to some degree of error. False negatives are most likely to arise in the cases of candidates using either a single (or a very common) name that cannot be definitively assigned across elections, or in the case of a candidate's name being represented or recorded substantially differently across elections so as to appear a different candidate. False positives are likely to occur only in the case of very common names or in the extreme case of multiple individuals running in the same state with very similar (or exactly matching) names. The above is unlikely to induce bias in the analysis for two reasons: these occurrences are far less common for female candidates simply due to the number of female candidates, who are more readily identifiable and less likely to present false positives, and there is no reason for such cases to be related to variation in exposure to women leaders.

## **A2 Assigning constituency treatment levels and population weights**

As mentioned in the text, district boundaries, which determine exposure to chairperson seat reservations, do not overlap with parliamentary constituencies (shown in Appendix Figure 1 above) or state assembly constituencies.

I begin with an administrative shapefile of Indian districts as of 2001. (Note that the district chairperson information has been adjusted to account for changes in district definitions relative to 2001 definitions.) I then overlay boundary files for the 2009 Lok Sabha constituencies and pre-delimitation (2007) state assembly constituencies.

I then find the intersection of district and constituency boundaries to create distinct units that correspond to polygons defined by unique overlaps of district-constituency pairs. This process creates a set of unique geographic areas defined by the area pertaining to a unique

combination of a district and constituency.

Using data from the Gridded Population of the World for India (adjusted population counts by 2.5 arc-minute grid), I then assign population counts to the unique area produced by the above process for both the parliamentary-constituency-district and state assembly constituency-district intersected areas. A GIS-format workspace containing the original boundaries and constructed intersections and joins is available in the supplementary materials posted on the author's website.

It is important to note that boundary segments that are coterminous in reality may not be defined precisely so in mapping files. Deviations in the path of overlapping boundaries will cause this process to generate small areas that incorrectly indicate an erroneous district-constituency overlap. (Such occurrences are most obviously seen when an overlapping area is defined by a constituency-district pair in different states: neither districts nor constituencies comprise areas in multiple states.) For both state assembly and parliamentary constituencies, I partially correct for this process by dropping any overlapping areas from district and constituencies indicated to be in from different states (such occurrences are not possible). Summary statistics of these areas are presented in Appendix Tables 4 and 5.

### **A3 Web research on 2009 Parliamentary candidates**

Because there is no single resource detailing the background of political candidates, I relied on web research to capture basic fields about 2009 female parliamentary candidates. These included information on whether the candidate was previously involved in local government, in other (state or national) government, and/or whether the candidate was related to any known politicians.

Searches for this information was undertaken by:

1. Searching the [full/part name] of the candidate in the [state] Election Commission website
2. Searching the [full/part name] of the candidate with “panchayat election” added
3. Searching the [full/part name] of the candidate with “zilla parishad” added
4. Searching the [full/part name] of the candidate with “municipal election” added
5. Searching the [full/part name] of the candidate with [party name] added
6. Searching the [full/part name] of the candidate with [history/background] and [political party name] added
7. Searching the [full/part name] of the candidate in the past (before 2009) [panchayat/zilla parishad/municipal] election results available from the [state] election commission website

There were several additional considerations made when identifying the candidate matched to information found. Whenever there was confusion about whether the person found is the focal candidate, any of a combination of the following validation steps were undertaken:

1. Category is the same - General/SC/ST/OBC
2. The place of residence/earlier political activity of the candidate falls under the Lok Sabha constituency from which the candidate stood for the 2009 Lok Sabha election
3. Party is the same. (Note that this may not be true always as sometimes the candidates leave their party.)
4. Age - if the candidate age is 25 at the time of the 2009 Lok Sabha election then when sourcing the results of earlier elections, say from 2004 or before, if the same name is encountered and even the political party name matches still that candidate would be

not assigned that particular political history since it is unlikely that a candidate at the age of 20 or less would be contesting in an election.

Appendix Table 8 contains a summary of the information found; further detail (by candidate) on this research can be found in the supplementary materials posted on the author’s website.

## A4 Appendix Tables and Figures

Appendix Table A1: Differences in district characteristics, ten-state sample versus all others, 1991 Population Census Indicators.

Variable	In sample	Out of sample	Difference	p-value	<i>N</i>
ln(population)	14.592	14.245	0.347***	<0.01	364
Rural female literacy rate	0.274	0.235	0.039**	0.02	360
Share of rural women attaining middle-school education	0.093	0.069	0.024***	<0.01	360
Share of population SC/ST	0.275	0.331	-0.056***	<0.01	360
Sex Ratio (female per male)	0.949	0.928	0.022***	<0.01	360

Table presents a test of means across districts in the ten-state sample and rest of India. District definitions based on consolidations made for consistency over time. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Appendix Table A2: Timing of state assembly elections

State	2003	2004	2005	2006	2007
Andhra Pradesh		X			
Bihar			X		
Gujarat					X
Haryana			X		
Kerala				X	
Maharashtra		X			
Orissa		X			
Punjab					X
Rajasthan	X				
West Bengal				X	

Source: Table presents indicators for the calendar year in which state assembly elections are observed.

Appendix Table A3: Summary statistics, state assembly and parliamentary candidate panel dataset

	State Assemblies (2003-2009)	Parliament (2009)
<i>Panel A: Aggregates</i>		
Num. candidates, men	34,129	7,257
Num. candidates, women	2,220	543
<i>Frac. candidates, women</i>	0.061	0.070
Men elected	3,838	485
Women elected	256	58
<i>Frac. elected, women</i>	0.063	0.107
Repeat contest, men	6,493	1,062
Repeat contest, women	287	42
Prior AC candidate, men	-	1,009
<i>of which was elected in prior AC</i>	-	101
Prior AC candidate, women	-	138
<i>of which was elected in prior AC</i>	-	22
<i>Panel B: Constituency-level measures</i>		
Number of constituencies	4,078	543
Avg. number candidates	9	15
Avg. number female candidates	0.538	1
Frac. const. with any female candidate	0.392	0.600
Frac. const. electing a female candidate	0.063	0.107
Frac. const. electing a female candidate, conditional	0.159	0.178
Frac. of votes for female candidates (net)	0.068	0.086

Source: Author's calculations from candidate panel dataset constructed using data from Jensenius (2015) and the Indian Elections Commission. Table shows aggregate candidacy measures across state and national legislatures by gender (top panel) and constituency-area summary statistics (bottom panel).



Appendix Table A4: Predicting cumulative exposure with pre-policy district characteristics.

	(1)
School enrollment rate, 1987	-1.899 (1.559)
Women's literacy rate, 1991	2.090 (2.831)
Mean household cons. per cap., 1987	-0.007 (0.005)
Average household size, 1987	-0.282 (0.220)
Sex ratio, 1987	3.332 (3.808)
Share SC/ST, 1991	-0.104 (1.147)
Female fraction parl. cand., 1991	3.488 (4.853)
Female fraction AC cand., pre-policy	-0.535 (11.742)
N	179
F-statistic on test of joint significance	.792

**Note:** This table reports the test of joint significance of measures of pre-policy area conditions on eventual policy exposure as of 2007. Estimated with OLS. Heteroskedasticity-consistent standard errors in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Appendix Table A5: Effect of exposure to female leaders on state legislature candidacy – count data models.

	State assembly		Parliament	
	Female cand. (1)	Male cand. (2)	Female cand. (3)	Male cand. (4)
<i>Panel A: Unconditional</i>				
Cum. years exposure	0.028* (0.016)	-0.008 (0.009)	0.049** (0.025)	0.010 (0.009)
State fixed effects	Yes	Yes	Yes	Yes
<i>Panel B: Including covariates</i>				
Cum. years exposure	0.025* (0.015)	-0.008 (0.009)	0.044* (0.025)	0.009 (0.008)
State fixed effects	Yes	Yes	Yes	Yes
Mean of outcome	0.43	7.72	0.89	12.61
St. dev. of outcome	0.68	4.16	1.04	5.64
<i>N</i>	2,995		1,375	

**Note:** This table reports coefficient estimates of the effect of an additional year of exposure to female leaders on constituency-level metrics of candidacy. Coefficients are from the estimation of equation (1) in the text. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Appendix Table A6: Effect of exposure to female leaders on candidacy: aggregated sample.

	OLS		Poisson	
	Female cand. (1)	Male cand. (2)	Female cand. (3)	Male cand. (4)
<i>Panel A: State Legislatures</i>				
Years reserved	0.013 (0.008)	-0.032 (0.031)	0.026* (0.016)	-0.005 (0.005)
State fixed effects	Yes	Yes	Yes	Yes
Mean of outcome	0.44	7.72	0.44	7.72
St. dev. of outcome	0.68	4.11	0.68	4.11
<i>N</i>	1,615			
<i>Panel B: Parliament</i>				
Years reserved	0.051* (0.029)	0.147 (0.132)	0.060* (0.032)	0.012 (0.011)
State fixed effects	Yes	Yes	Yes	Yes
Mean of outcome	0.89	12.7	0.89	12.7
St. dev. of outcome	1.04	5.74	1.04	5.74
<i>N</i>	279			

**Note:** This table reports coefficient estimates of the effect of an additional year of exposure to female leaders on constituency-level metrics of candidacy. Coefficients are from the estimation of equation (1) in the text. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Appendix Table A7: Effect of exposure to female leaders on candidacy: size-weighted estimations.

	State Assemblies		Parliament	
	Female cand. (1)	Male cand. (2)	Female cand. (3)	Male cand. (4)
Years reserved	0.014*	-0.030	0.045**	0.090
	(0.008)	(0.060)	(0.021)	(0.107)
State fixed effects	Yes	Yes	Yes	Yes
Mean of outcome	0.43	7.22	0.89	12.61
St. dev. of outcome	0.68	4.16	1.04	5.64
<i>N</i>	2,995		1,375	

**Note:** This table reports coefficient estimates of the effect of an additional year of exposure to female leaders on constituency-level metrics of candidacy. Coefficients are from the estimation of equation (1) in the text. Heteroskedasticity-consistent standard errors clustered by district and constituency in parentheses. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Appendix Table A8: Candidate histories summary

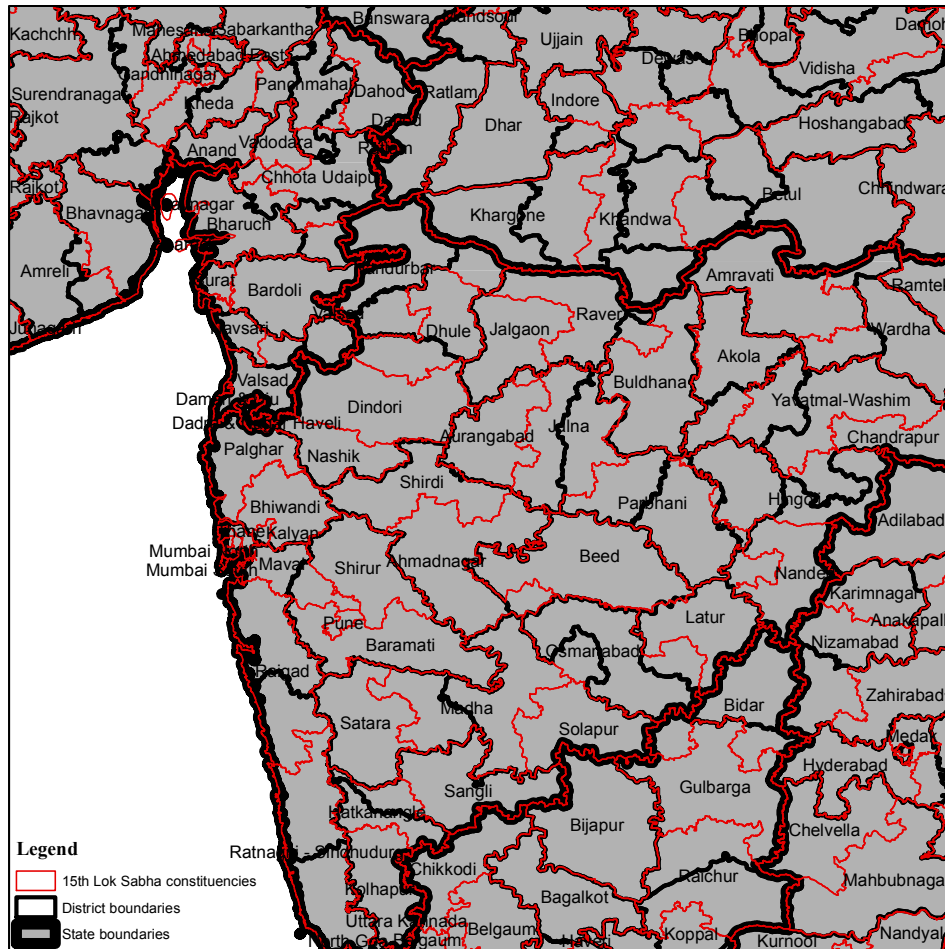
<i>N</i> female candidates	265	
Background information found	102	
<b>Background</b>	<b>Candidates</b>	<b>Share</b>
Prior higher office candidacy	60	58.8
Prior local government service	27	26.5
Higher office candidacy and local government experience	4	3.9
Prior higher office candidacy and political family	21	20.6
Prior local government and political family	2	2.0
Only family ties	19	18.6

Appendix Table A9: Effect of exposure to female leaders on parliamentary election outcomes: panel data fixed effect specifications.

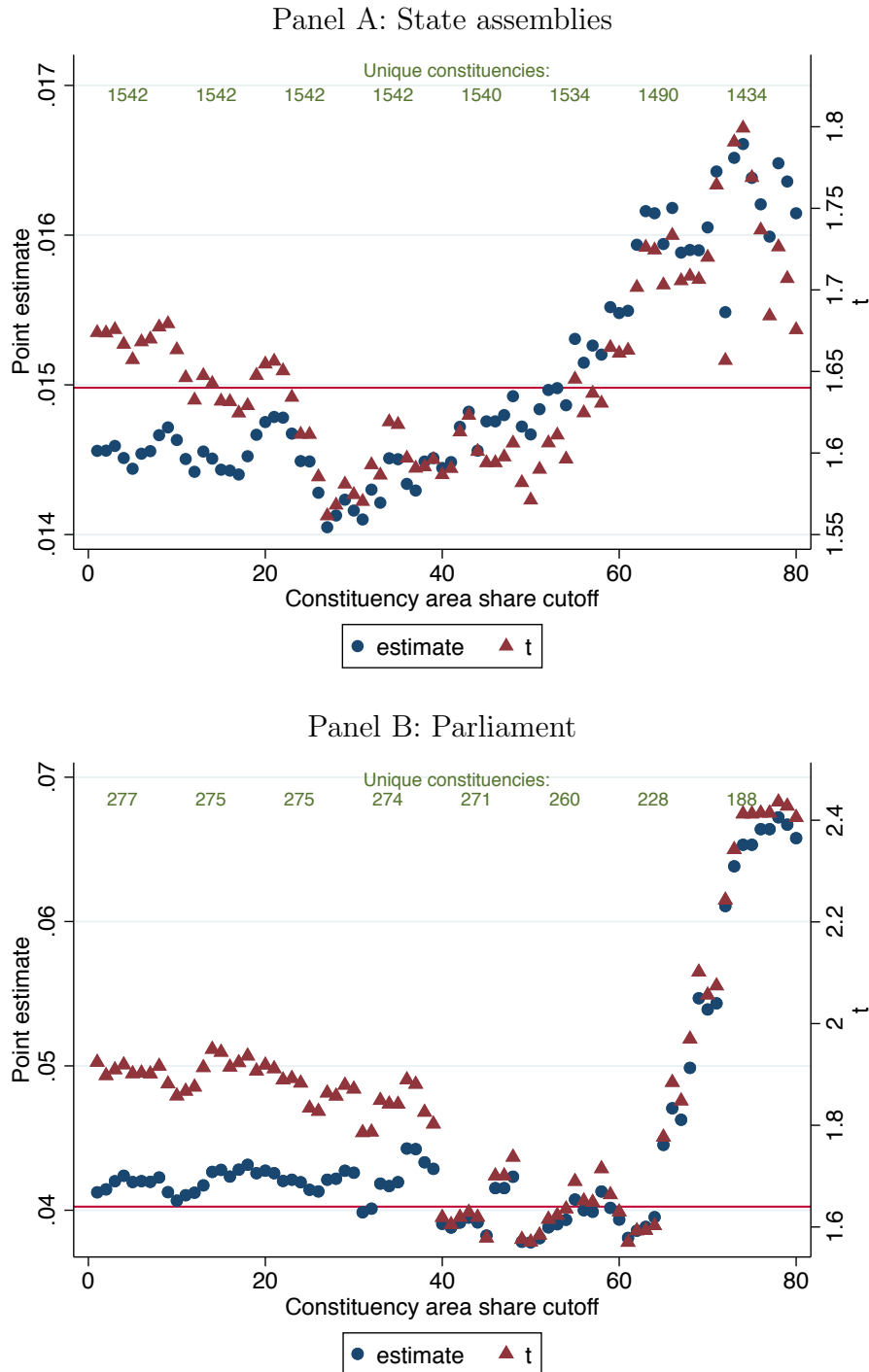
	Female candidates (1)	Female vote share (2)	Female cand. winner (3)
Cumulative terms of reservation	0.053 (0.068)	1.564 (1.046)	0.011 (0.021)
<i>N</i>	5292	5297	5297
<i>R</i> <sup>2</sup>	0.41	0.47	0.41
Mean of outcome	0.59	7.46	0.08
St. dev. of outcome	0.85	17.47	0.27

**Note:** This table reports coefficient estimates from the estimation of a fixed-effects specification and includes vectors of fixed effects for constituencies, districts, and election year, along with an unreported constant term. Standard errors are two-way clustered by parliamentary constituency and district. Significance levels are indicated by \* < .1, \*\* < .05, \*\*\* < .01.

Appendix Figure A1: District and parliamentary constituency boundaries in Maharashtra.

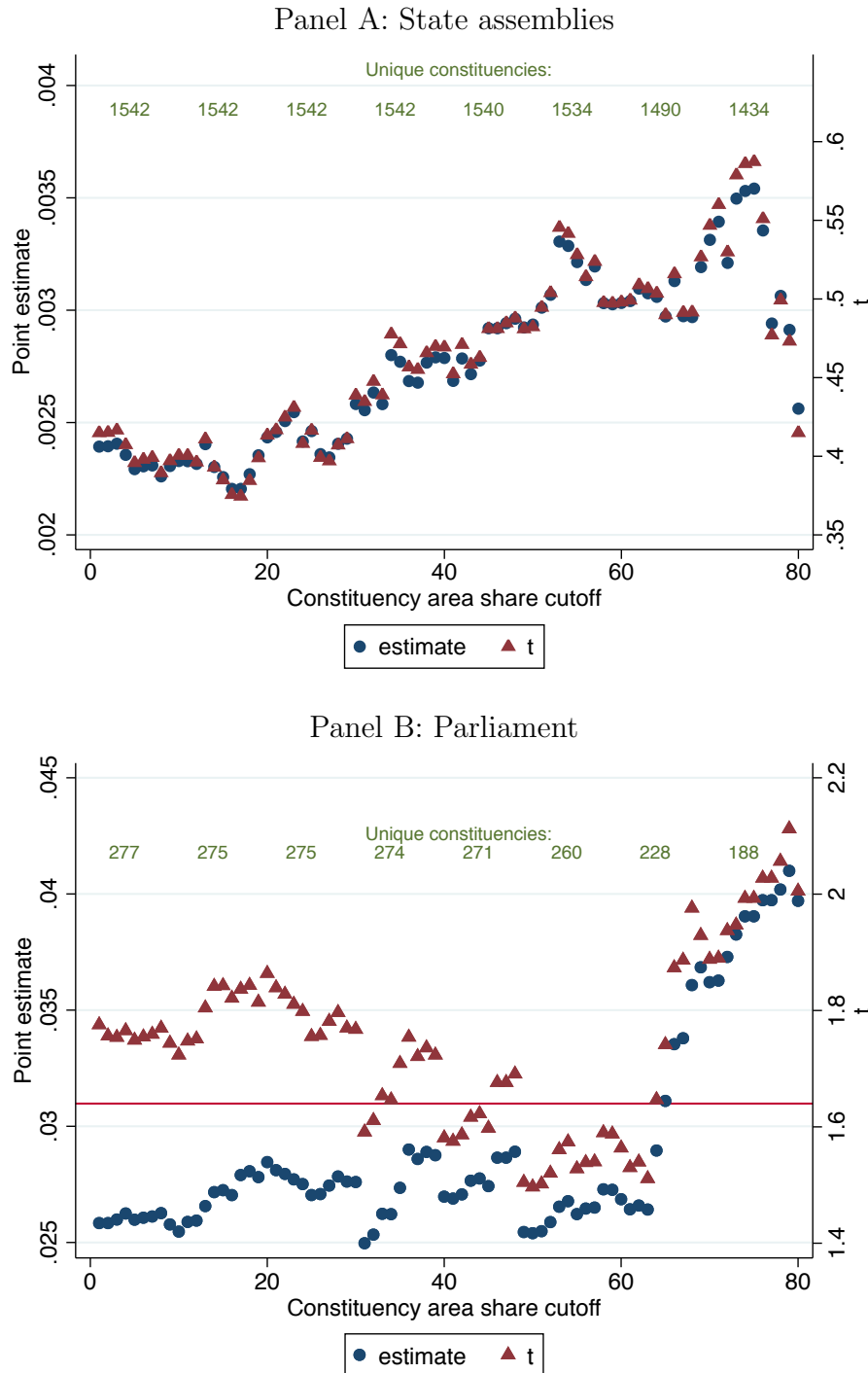


Appendix Figure A2: Coefficient magnitude and significance under varying sample restrictions: female candidacy.



**Note:** Figures depict coefficient magnitudes and  $t$ -statistics from estimations of the number of female candidates across samples that progressively drop larger component areas based on constituency population share, ranging from zero to up to 80 percent of constituency population share.

Appendix Figure A3: Coefficient magnitude and significance under varying sample restrictions: finish in top 30%.



**Note:** Figures depict coefficient magnitudes and  $t$ -statistics from estimations of whether a female candidate finished in the top 30% of vote winners in the election across samples that progressively drop larger component areas based on constituency population share, ranging from zero to up to 80 percent of constituency population share.