DISCUSSION PAPER SERIES

DP16605

Women Legislators and Economic Performance

Sonia Bhalotra, Thushyanthan Baskaran and Yogesh Uppal

DEVELOPMENT ECONOMICS

POLITICAL ECONOMY

ISSN 0265-8003

Women Legislators and Economic Performance

Sonia Bhalotra, Thushyanthan Baskaran and Yogesh Uppal

Discussion Paper DP16605
Published 04 October 2021
Submitted 27 September 2021

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

Women Legislators and Economic Performance

Abstract

There has been a phenomenal global increase in the proportion of women in politics in the last two decades, but there is no evidence of how this influences economic perfor- mance. We investigate this using data on competitive elections to India's state assemblies, leveraging close elections to isolate causal effects. We find significantly higher growth in economic activity in constituencies that elect women and no evidence of negative spillovers to neighbouring male-led constituencies, consistent with net growth. Probing mechanisms, we find evidence consistent with women legislators being more efficacious, less corrupt and less vulnerable to political opportunism.

JEL Classification: N/A

Keywords: N/A

Sonia Bhalotra - sonia.bhalotra@warwick.ac.uk
University of Warwick and CEPR

Thushyanthan Baskaran - thushyanthan.baskaran@gmail.com
University of Siegen Germany

Yogesh Uppal - yuppal@gmail.com
Youngstown State University USA

Women Legislators and Economic Performance

Thushyanthan Baskaran[†] Sonia Bhalotra[§] Brian Min[††] Yogesh Uppal[*‡]
[†]University of Siegen, [§]University of Warwick,
[††]University of Michigan, Ann Arbor, [‡]Youngstown State University

September 26, 2021

Abstract

There has been a phenomenal global increase in the proportion of women in politics in the last two decades, but there is no evidence of how this influences economic performance. We investigate this using data on competitive elections to India's state assemblies, leveraging close elections to isolate causal effects. We find significantly higher growth in economic activity in constituencies that elect women and no evidence of negative spillovers to neighbouring male-led constituencies, consistent with net growth. Probing mechanisms, we find evidence consistent with women legislators being more efficacious, less corrupt and less vulnerable to political opportunism.

Keywords: Political representation, identity, India, gender, women legislators, economic growth, luminosity, corruption, roads, close elections, electoral incentives
JEL codes: D72, D78, H44, H73

[*]All errors are our own. UNU-WIDER Helsinki invited this study in connection with our Keynote Address at the 17th Nordic Conference on Development Economics. We acknowledge support from the International Growth Center for the project "Female politicians and economic growth" (IGC G2015-73). Bhalotra acknowledges partial support for her time from ESRC Grants ES/L009153/1 and ES/S003681/1 awarded to the Research Centre for Micro-Social Change at ISER, University of Essex. Sonia is Research Associate at CAGE Warwick and Research Fellow IEA, CEPR, IZA. We are grateful to Ray Fisman, Siddharth George and Dan Keniston for sharing their data with us, and to Sam Asher, Irma Clots-Figueras, James Fenske, Lakshmi Iyer and Paul Novosad for useful discussions.

1 Introduction

More than a hundred countries have introduced quotas for women in parliament or in party lists in the last two decades (Pande and Ford, 2012; Besley et al., 2017; Dahlerup, 2006) and the percentage of women in parliament worldwide has more than doubled, standing at 25.2 percent in October 2020.[1] The feminization of politics is one of the most exciting political phenomena of our time. Yet, we do not know what it portends for growth, the rising tide that is thought to lift all boats. In this paper we present the first systematic examination of whether women politicians are good for economic growth.

The association of women with redistributive policies and a tolerance of higher taxes (Edlund and Pande, 2002; Edlund et al., 2005; Campbell, 2004) makes it plausible that, at least in the short to medium term, women politicians are less effective than men at promoting growth. Women have been shown to favour public goods investments, such as in education and health (Bhalotra and Clots-Figueras, 2014; Clots-Figueras, 2012), which may have only long term returns. However, women legislators might promote growth if women who select into public office have a stronger sense of public mission, are more motivated to meet higher expectations, or are less corrupt (Beaman et al., 2006; Brollo and Troiano, 2016; Dollar et al., 2001; Swamy et al., 2001; Mauro, 1995; Prakash et al., 2019).[2]

We know of no causal estimates linking economic performance to the gender of politicians, but a few recent studies examine impacts on firm performance of women on corporate boards. The results of these studies are ambiguous, suggesting negative impacts or no impact (Ahern and Dittmar, 2012; Matsa and Miller, 2013; Gagliarducci and Paserman, 2014). However, this evidence base is too small to be conclusive, and the gender composition of decision makers may influence economic performance differently in the political and corporate sectors.

Two factors probably contribute to the scarcity of causal evidence on the relationship between legislator gender and economic performance. The first is that constituency level data on economic activity are not available in most countries. We use satellite imagery of nighttime luminosity as a measure of growth in economic activity. A number of studies examine the validity of this measure, and use it to proxy growth, including studies set in India, see Henderson et al. (2012), Chen and Nordhaus (2011), Costinot et al. (2016), Donaldson and Storeygard (2016), Bruederle and Hodler (2018) and Baragwanath et al. (2019).[3] We also show, using constituency-level data, that women are more effective than men at overseeing road building and at raising the share of non-farm employment, and that women are less prone to corruption. Each of these is an indicator of economic progress in its own right.

[1] In contrast, only 12 percent of corporate board members are women.

[2] See, for instance, http://www.forbes.com/sites/kerryhannon/2010/11/19/top-five-reasons-why-women-flock-to-nonprofit-jobs/).

[3] We demonstrate a positive association of nighttime luminosity growth with GDP growth using available state-level data for India. We discuss three potential sources of measurement error in the use of night time lights to estimate economic activity: saturation, low sensitivity and blooming, and show that our estimates are not sensitive to these issues.

A second reason for the paucity of causal research on women legislators and growth is that it poses an identification challenge. Constituencies in which women win elections may be systematically different in ways that are correlated with economic performance. To isolate the role of legislator gender from voter preferences and other potentially omitted variables at the constituency level, we use a regression discontinuity design on close elections between men and women. In first-past-the-post elections in which the winner takes all, there is a sharp discontinuity at the zero vote margin between the top two candidates. In this setting, the identity (and hence gender) of the winner can be considered quasi-random (Lee, 2008; Eggers et al., 2015; Imbens and Lemieux, 2008). Comparing constituencies in which a woman wins against a man by a narrow margin ('treated') with those in which a man wins against a woman by a narrow margin ('control') can thus isolate the causal influence of legislator gender.[4]

We examine data for 4265 state assembly constituencies for 1992–2012, during which time most states had four elections. This is a period of strong economic growth in India. It was also a period in which the share of female state legislators increased from about 4.5 percent to close to 8 percent. Moreover, there was vast regional variation in both the gender composition of state legislators and luminosity growth (see Figures A.1 and A.2).

We find that women legislators in India raise economic performance in their constituencies by 2.3 percentage points per year more than male legislators. We also find that the share of non-farm employment is higher under women than under male legislators by 0.84% points per year.[5] Now, if women-led constituencies do better on account of winning resources away from male-led constituencies, then overall impacts on economic growth of increasing the share of women legislators would depend upon the size of these negative spillovers. Assessing this by mapping growth in neighbouring constituencies to legislator gender in the index constituency, we reject negative spillovers.[6] Thus, our estimates suggest that increasing the share of women legislators favours economic progress.

In probing mechanisms using the same close election strategy, we find evidence that women legislators are more likely than their male counterparts to achieve completion of road infrastructure projects and that they are less corrupt, by two different indicators of corruption. In a different exercise that compares the male-female gap in performance in close vs non-close elections, we find evidence consistent with women being less prone to distortions arising from

[4] In Section 2 we describe the many powers that state legislators in India have.

[5] We explained above that it is often hard to find a measure of economic growth at the constituency level. However, even at an aggregate level, measurement of growth in developing countries is made difficult by the size of the informal sector and the income volatility that many agrarian and self-employed households face. Classical models of growth associate it with structural change, a marker of which is the share of non-farm employment.

[6] The estimated coefficient, though imprecise, is positive, consistent with yardstick competition between neighbours (Besley and Case, 1995) and with positive externalities of public infrastructure like electricity and roads for neighbours, for instance, infrastructure does not stop abruptly at constituency boundaries. Also our finding- discussed next- that women are less corrupt is consistent with women achieving higher growth without necessarily bringing more resources from the state to their constituencies.

electoral incentives. Each of these potential mechanism variables has been shown in previous work to impact growth. Thus, this sequence of results supports and strengthens our finding that women increase economic growth. Indeed, each of these results, on its own, is a contribution to the literature and, pulled together, they point to likely improvements in economic growth under women's leadership.

We now elaborate the evidence on these intermediate outcomes. Since economic infrastructure is an important input to economic growth, especially in developing countries (Jacoby, 2000a), we analyzed legislator performance in implementation of a massive federally-funded village road construction program involving state legislators bidding for federal funds and delivering goods at the local level. Using administrative programme data we find that, although male and female politicians are equally likely to negotiate federal projects for road building in their constituencies, women are more likely to oversee completion of these projects. The share of incomplete road projects in woman-led constituencies is 22 percentage points lower than in male-led constituencies, a mechanism that plausibly contributes to the better growth performance of woman-led constituencies. Like George (2019), we interpret the share of projects completed vs stalled as a measure of politician effort.

The existing literature on women legislators has focused attention on whether they act to serve the interests of women citizens.[7] Since road construction has higher returns for men (Asher and Novosad, 2019), our finding indicates that women politicians are not exclusively focused upon serving the interests of women voters, but are also more generally effective in providing public goods.

To investigate corruption, we use asset growth in office, a measure devised and validated in Fisman et al. (2014) (who do not look at gender differences). We find that the rate at which women accumulate assets while in office is 12 percentage points lower per annum than for men. We analyse an alternative measure of (potential) corruption that is measured before the legislator enters office, which is an indicator for whether the contestant has pending criminal charges against them. Comparing characteristics of male and female legislators in the close election sample, we find that men are about three times as likely as women to contest with pending charges. Following Prakash et al. (2019), we estimate the growth penalty associated with criminal legislators on our sample. Using this parameter, we estimate that criminal tendencies can explain close to one fourth of the identified difference in growth between male and female-led constituencies.[8] India is a large country and there is considerable variation

[7]For instance, see Chattopadhyay and Duflo (2004); Iyer et al. (2012); Brollo and Troiano (2016); Bhalotra and Clots-Figueras (2014); Clots-Figueras (2012); Miller (2007); Edlund et al. (2005); Chaney et al. (1998); Thomas (1991); Svaleryd (2009); Bhalotra et al. (2017, 2019). Amongst the findings of these studies are that women in politics have influenced the passage of abortion laws in the US, equal inheritance rights legislation, the reporting of crime against women, and the promotion of public health inputs to child survival in India; government spending on childcare, expenditures on education and elderly care in Sweden; and maternal mortality decline in developing countries. A few studies find no significant influence of the gender of local politicians on policy choices (Ferreira and Gyourko, 2014; Rigon and Tanzi, 2012).

[8]Neither Fisman et al. (2014) nor Prakash et al. (2019) look at legislator gender.

across the states in governance or in opportunities for corruption. Using a crude marker of this, we divide the states into two samples which we refer to as more and less developed. We find a larger difference in economic performance in favour of women in the sample of less developed states. This is mirrored in larger gender difference in both criminality and corruption in office in the less developed states. However the legislator gender gap in road completion rates is not significantly different between the more and less developed states. These results suggest that, as economic development progresses, the growth advantage from electing women may narrow but is unlikely to be eliminated.

The results for intermediate outcomes serve two purposes. First, they lend plausibility to the main result by identifying mechanisms by which women legislators achieve higher luminosity growth. It is compelling to find that women do better on five different outcomes, drawn from different data sets. Second, they allay potential concerns over what luminosity growth captures. Consider two likely concerns. One is that luminosity growth captures expansion of street lighting, and that women leaders invest more in street lighting to ensure the safety of women in public places. There is some evidence that increasing public safety for women increases women's economic participation which in turn increases economic activity (Borker, 2020; Siddique, 2020). Another natural contention is that our results for luminosity growth demonstrate that electricity provision improves under women legislators. This would be consistent with women legislators improving growth as electricity is the lifeblood of the modern economy and electricity supply is a known constraint on output in India (and other developing countries) (Allcott et al., 2016; Dinkelman, 2011; Rud, 2006; Lipscomb et al., 2013).[9] Nevertheless, for the skeptic who is not persuaded by the evidence for India and other countries that luminosity growth proxies economic growth (Section 4.1), our findings for road infrastructure, non-farm employment and corruption point to women legislators improving growth prospects. To summarise, if women leaders do improve street lighting and electricity provision (outcomes that we are unable to measure at constituency level over time), (a) these outcomes are growth-enhancing, and (b) our results for the five outcomes we can analyse show that women leaders achieve more than this.

Recent research by economists on women in politics has been rather dominated by research on India because of the opportunities for identification created by randomisation of local government gender quotas. A constitutional amendment mandating that a random one third of village council positions be reserved for women was passed in India in 1993. A number of studies analyse these reservations, for example, Chattopadhyay and Duflo (2004); Beaman et al. (2009); Iyer et al. (2012); Afridi et al. (2017). The evidence in this study is different for four reasons. First, we analyse the performance of women vs men who win in competitive elec-

[9] A number of recent studies highlight the relevance of political control over electricity distribution in India, though no previous work isolates the role of women leaders. We discuss the evidence on these points in Section 4.1, where we also explain that there are no constituency-level electrification data with which we could directly test impacts on electrification versus luminosity.

tions, which is not comparable to relative performance if women are elected to reserved seats. Second, we analyse state legislatures, which have different powers and functions compared to village councils in India. Third, the village gender quota was implemented jointly for council membership and council leadership, while we isolate the role of membership of the state legislature. Fourth, previous studies of women competitively elected to state legislatures have focused upon the composition of state-provided public goods ((Bhalotra and Clots-Figueras, 2014; Clots-Figueras, 2012)), while we focus on growth and plausible determinants of growth. This is a step change because while there is considerable evidence that men and women in government have different preferences or priorities, it is unclear how a social planner would determine the trade-offs that arise. Economic growth, on the other hand, shifts the entire possibilities frontier outward.

As regards internal validity, the data satisfy a suite of checks on the RDD design. We show that there is no evidence of sorting at the threshold, and that a rich set of constituency-level pre-determined electoral and demographic covariates are balanced around the threshold. This mitigates concerns that the estimates are driven by pre-existing differences in constituency characteristics, in particular the weaker performance of men cannot be attributed to mean reversion or to their being elected in places with weaker growth potential. Luminosity growth (and, similarly, road completion rates and non-farm employment share) in the preceding election term exhibit balance at the threshold. We nevertheless conduct a stricter test to allay the concern that constituencies in which women are narrowly elected against men are different in ways that favour growth. We posit that unobservable imbalance between constituencies with female and male legislators will tend to be smaller among neighbouring constituencies, and re-estimate the main equation limiting the estimation sample to constituencies with female legislators and their neighbours (mostly male-led). The coefficient of interest is almost identical, suggesting balance on unobservables in the original sample. We further evaluate the RD design by re-estimating the model with a series of placebo thresholds, demonstrating that the placebo coefficients are smaller than the true coefficient, and not significantly different from zero.

In considering external validity of our results it is important to highlight that a third of all mixed-gender races are won with narrow margins (i.e. are in the close election sample). Indian elections are competitive in general, the share of all elections that is close also being a third. So elections in which women contest against men are neither more nor less competitive. Figure A.1 shows that constituencies in which women win are geographically dispersed, so our analysis does not pertain to a specific region. Women are also not significantly more likely to be from any one of the main political parties, though we nevertheless show that our estimates are robust to controlling for legislator party. Overall, neither close elections nor women who win competitively are a special case.

Estimates outside the RD bandwidth are potentially contaminated by selection, but they indicate that men who win against women with wide (non-close) margins achieve growth rates similar to women (note that there is no victory margin at which men do better). It is of descriptive interest to consider whether men who win against women with narrow margins are negatively selected relative to men who win against women with wide margins. We find no significant difference in constituency or candidate characteristics between these two groups of men, except that men winning in close elections are more likely to have dynastic links. Since dynasts are less effective leaders over an election term (George, 2019), this may contribute to the better performance of men further away from the RD threshold. However, dynastic links cannot explain the better performance of women because, in the close election sample, men and women are equally likely to be dynasts.[10] To investigate whether men who win in close elections are negatively selected on unobservables, we adapt a strategy suggested in George (2019), using swings in the state-level vote share of the candidate's party as a measure of luck. Candidates who narrowly win when their party faces a positive swing are poorer quality candidates than those who win by a narrow margin when their party faces a negative swing. We show that our results are robust to accounting for negative selection among men in close elections. Even if we focus only on higher quality candidates (who won despite a negative party swing), women outperform men.

To explain why women appear to do no better than men (though no worse) in non-close elections while decisively doing better in close elections, we highlight that electoral incentives are sharper in close than in non-close election constituencies, and posit that men and women respond differently to these incentives. In particular, women are less likely than men to distort economic policies to pursue a narrow electoral agenda. We provide descriptive evidence consistent with this, showing that re-election rates for women vs men are lower in close elections, while being similar in non-close elections.[11] Recall that it is only the close election analysis that is identified and, in the close election sample, we show balance on election rates of men and women in the preceding election.

We contribute new evidence to a literature on political identity and substantive representation (Osborne and Slivinski, 1996; Besley and Coate, 1997) that has tended to focus more narrowly upon differences in priorities and hence on the composition of government spending, rather than on growth. This is relevant as this is a time when women are increasingly participating in government across the globe. In India, a historic constitutional amendment proposing to reserve one third of all federal and state assembly seats for women was passed

[10] We are grateful to Siddhartha George for sharing his data on dynastic links.

[11] Re-election rates of women in close elections are similar to the re-election rates of men and women in non-close elections. Consistent with the pattern of growth results, the re-election rate of men in close elections is distinctly higher. These findings cohere with our earlier analysis of mechanisms for behaviour within the close sample, consistent with women having greater intrinsic motivation. Other studies have highlighted the potential for electoral incentives to distort economic choices, e. g. generating electoral cycles (Cole, 2009), vote buying (Mitra et al., 2017), or pork-barrel politics (Arulampalam et al., 2009) but with the exception of Brollo and Troiano (2016), these studies do not distinguish men and women.

by the upper house of the federal parliament in 2010. However, it was not voted on in the lower house and lapsed in 2014. Our findings are of considerable interest beyond India, given the scarcity of evidence on the question of how legislator gender is associated with economic performance, and in view of the fact that the share of women in government is small but rising in many (rich and poor) countries. In addition to contributing the first causal estimates indicating how election of a female vs male legislator influences luminosity growth, we also provide new causal evidence on how legislator gender influences road infrastructure, sectoral change and corruption and we present evidence suggesting that men and women respond differently to electoral incentives. We conclude the paper with remarks on how the growth premium associated with women leaders might evolve with economic development.

The remainder of this paper is structured as follows. Section 2 offers contextual information on Indian elections and women's political participation. Section 3 presents our empirical strategy. In Section 4, we discuss the electoral, luminosity, road building and candidate characteristics data. Section 5 presents the main results. Section 6 explores geographical spillovers. In Section 7, we investigate mechanisms. Section 8 presents a number of extensions, and section 9 concludes.

2 Context

India is a large federal country with highly competitive multi-party elections monitored by an independent electoral commission. Electoral fraud is uncommon, although some areas suffer from clientelism and elite capture (Anderson et al., 2015). The current 29 states of the Indian Union are parliamentary democracies in which, typically, a new legislative assembly is elected every five years. There is a high degree of turnover at the state level with state governments often voted out of office. In contrast to the case of the USA, but similar to Brazil, incumbents in India are less likely to win than challengers (Uppal, 2009). Members of Legislative Assemblies (legislators) are chosen according to a first-past-the-post system in single member constituencies. Voters vote for individual candidates rather than party lists. Successful candidates are typically fielded by an established party.[12] While there are political quotas for certain minority tribes and castes at the local, state and national level, gender quotas in India are only at the local level (village, town) and only since 1993 (Chattopadhyay and Duflo, 2004).

State legislators shape policy. They influence the flow of federal funds and the financing of village councils and they are responsible, inter alia, for roads, electricity, law and order, health and education. Political manipulations by state governments can influence the allocation of federal transfers (Khemani, 2006) and of federally funded development programs

[12] In fact, parties are crucial arbiters of political careers given the high costs of running for office in India. In the 2009 federal elections, the average cost of winning a seat was around 2 million US dollars (Tiwari, 2014), a sum that most candidates would struggle to raise without the support of sophisticated party organizations.

(Gupta and Mukhopadhyay, 2016). Legislators can also influence economic conditions in their constituencies by, for instance, improving the supply of public services (Baskaran et al., 2015; Min, 2015), attracting pork by lobbying the state government, exerting effort to pursue development opportunities, and implementing federal or state government programs more or less effectively.

Evidence emerging from political quotas in village and town councils and analysis of close elections to state assemblies suggest that women politicians have different priorities from men, tending to favor the concerns of women and children (see references in Section 1). Despite a secular increase in the share of women legislators, women remain vastly under-represented in Indian federal and state politics, their share oscillating around 10 percent in recent years (Beaman et al., 2012). This reflects not so much lower chances of winning conditional on standing, but that fewer women come forward as candidates (Bhalotra et al., 2017). This may be because women dislike competitive or corrupt environments or because party leaders discriminate against women in the nomination process (Spary, 2014).

3 Empirical Strategy

We aim to estimate the causal effect of election of a woman legislator on economic activity in her constituency. If the election of women was randomly determined, constituencies that elected a man would serve as a valid counterfactual. However, the election of women is unlikely to be random. For instance, one might expect that constituencies with more progressive voters are more likely to elect women. This creates the identification challenge that unobserved differences between constituencies that elect women vs. men are potentially correlated with the outcome (economic activity).

To address this challenge, we exploit the discontinuity in electoral outcomes that arises in first-past-the-post electoral systems by comparing female and male winners in close elections, defined as elections in which the margin of victory between the winner and the runner-up is arbitrarily small. Previous work shows that, in these circumstances, the identity of the winner is quasi-random (Lee, 2008).

The estimated model is :

$$y_{ist} = \alpha + \tau * femalelegislator_{ist} + f(margin_{ist}) + \varepsilon_{ist} \quad (1)$$

where y_{ist} is average growth of light in constituency i in state s over the election term t. We calculated the growth of light as the difference in the logarithm of light density in years $t+1$ and t.The margin of victory in constituency i in state s for election in t ($margin_{ist}$) is the forcing variable. Since we restrict the sample to elections in which the top two vote winners are a man and a woman, $margin_{ist}$ is defined as the difference between the vote shares of the female and the male candidate. So, by construction, it is positive when a woman wins against a male runner-up and negative when a male wins against a female runner-up. At a (notional) margin of zero, the gender of the constituency leader changes discontinuously from male to female. We can think of the treatment $femalelegislator_{ist}$, as an indicator for the winner being a woman, defined as follows:

$$\begin{aligned} femalelegislator_{ist} &= 1 \; if \; margin_{ist} > 0 \\ &= 0 \; if \; margin_{ist} \leq 0, \end{aligned} \tag{2}$$

The RD design considers a close neighbourhood, λ, around the threshold margin of zero and premises that as λ goes to 0 the differences between constituencies that elected a female candidate and those that elected a male vanish, allowing us to identify the causal effect of electing a woman legislator:

$$\lim_{\lambda \to 0^+} E[y_{ist} \mid 0 < margin_{ist} \leq \lambda] - \lim_{\lambda \to 0^-} E[y_{ist} \mid -\lambda \leq margin_{ist} < 0] = \tau, \tag{3}$$

This is the difference in the average outcomes of constituencies that barely elected a female legislator against a male runner-up and constituencies that barely elected a male legislator against a female runner-up. The RDD assumption that the distribution of the error term, ε_{ist}, is continuous in the forcing variable is weaker than the identifying assumptions that other selection-on-observables methods rely upon. Since there is no within election term variation in our treatment variable ($femalelegislator_{ist}$), we average the growth of light over an election term. Standard errors are clustered at the constituency level to allow for within constituency correlation of the errors over different election terms.

We estimate the discontinuity using local linear regressions as suggested in Gelman and Imbens (2019). We report results for several bandwidth choices including the optimal bandwidth procedure suggested in Imbens and Kalyanaraman (2012). In further robustness checks, we retain only neighbours of female-led constituencies as any unobservable differences are likely to be smaller and we investigate sensitivity of our results to an alternative definition of the victory margin, using the larger sample of all races in which a female contested, irrespective of whether or not she was ranked among the top two in voteshare (Meyerson, 2014). We also show results conditional on party, allowing for measurement error and we show results for the early vs late years of the electoral term. We then present estimates for spillovers and potential mechanisms before investigating heterogeneity in impact. The empirical specifications for these extensions of the main analysis are presented together with the findings below.

4 Data

Table A.1 lists the sources and Table A.2 provides summary statistics of the main outcome variables (Panel A) and the predetermined covariates (Panel B) in our data. It also provides summary statistics for variables available from the candidate affidavits (Panel C). In this section, we discuss the electoral data and the data on luminosity, road construction and non-farm employment.

4.1 Night lights data

We use nighttime light imagery data gathered by satellites from the U.S. Air Force Defense Meteorological Satellite Program's Operational Linescan System. The data are processed by the National Oceanic and Atmospheric Agency to exclude pixels with low quality data due to clouds, stray light, lunar illuminance, auroral lights, and active fires. Annual composites are produced by averaging across all remaining good quality data from across the calendar year. Each pixel is encoded with a measure of its annual average brightness on a 6-bit scale from 0 to 63, and geo-referenced onto a 30 arc-second grid (approximately 1 km^2 at the equator). Night lights data were first digitized in 1992 and our electoral data run through to 2012.

We overlaid a map of 4265 Indian State Assembly constituencies to create constituency level light density data as the sum of total light emitted by each pixel within constituency boundaries divided by the area of the constituency. Figure A.2 shows considerable growth in the intensity and spread of lit areas over time, consistent with the substantial economic growth during this period.

To examine the relationship between growth in nighttime light output and economic growth, we use state-level GDP data, which is the smallest administrative unit for which consistent time series data are available. Figure A.3 plots the data, showing a strong correlation. Panel data estimates, conditional on state and year fixed effects, indicate that a 1 percent increase in night lights is associated with a 0.15 percent increase in GDP (see Appendix Table A.3).[13]

Henderson et al. (2012) argue that although GDP data is widely reported, it is often unreliable in developing countries where accounting biases arise because the informal sector is large, making it harder to verify inputs, outputs, incomes and profit (see also Jerven (2013); Bhalotra and Umana-Aponte (2015)). Thus GDP and night lights are both error-prone measures of economic activity, and it is unclear which is measured with more error.

[13]Using Indian district level GDP data that is available for a few recent years, Bickenbach et al. (2013) estimate of elasticity of 0.107. Using global data, Henderson et al. (2012) estimate an elasticity of about 0.3. Weidmann and Schutte (2017)) show that local level nighttime lights emissions are positively correlated with economic wealth in a cross-section of clusters in the Demographic and Health Survey of 56 countries, the average rank order correlation being 0.73. The last association is higher than in the preceding studies because it is cross-sectional; within-cluster associations over time are smaller. Indeed, conditional on state but not year fixed effects, our estimates of the association in Indian state-level panel data is 0.34.

The compelling advantage of nighttime lights data, exploited here, is that it is available for disaggregated areas and can be measured for state assembly constituencies.

We nevertheless consider three technical limitations of the sensor that may generate measurement error in the use of night time lights to estimate economic activity: saturation, low sensitivity and blooming. Saturation occurs because of the limited dynamic range of the satellite sensor, leading to a limitation in recording high levels of brightness on the ground. This results in data censoring, with the brightest pixels being assigned the highest digital number value of 63 pixels. This is most common in the centers of large cities and will tend to result in an underestimate of growth if growth occurs within city centers where light output is saturated. On the other hand, the limited sensitivity of the sensors implies that dimly lit areas are not detectable, and assigned a value of zero.[14]

In the close mixed-gender election sample, we have 7 cases (also 1% of observations) with a luminosity of zero and also 7 cases of top-coding (1% of observations). In the robustness checks section, we re-estimate the baseline model excluding these cases and, to anticipate those results, they are very similar in magnitude and not statistically significantly different. In the main analysis we have retained the top-coded cases and added 1 to each zero value before taking logs. If instead we use the inverse hyperbolic transformation, we get similar results, available on request.

The third potential source of measurement error is blooming, which refers to light output from a brightly lit area dispersing over neighbouring areas. Blooming is most prominent around the edges of large cities and can increase in the presence of nearby water sources that reflect light into space. This decreases the precision of light output measurement. If blooming occurs within constituencies, there is no problem. However, there is potential for bias in our estimates if substantial increases in light output in bright constituencies spill over into neighbouring constituencies. We will report a specification in which we estimate spillovers to neighbouring constituencies, and discuss there a robustness check in which we drop brightly lit areas to adjust for blooming.

Henderson et al. (2012) provide a detailed discussion of the satellite data, and the premise for interpreting light growth as economic activity. As most lights observable from space are from electric illumination, in principle, electricity consumption could be used to predict GDP growth, but electricity data are unavailable at the constituency level both for India and more generally. Among studies documenting an association of night lights and electricity use are Chand et al. (2009); Shi et al. (2016); Xie and Qihao (2016), the first for India and the other two on a global scale.

Electricity is the lifeblood of the modern economy. The quality and quantity of electricity service provision, including hours of supply, are a known constraint on output, see Allcott et al.

[14]That said, Min et al. (2013) show that rural villages in Senegal with as few as 20 streetlights are detectable in satellite imagery and, in another field test by Tuttle et al. (2014), light produced by a single 1000 watt high pressure sodium lamp was reliably detected by the satellite.

(2016); Dinkelman (2011); Rud (2006); Lipscomb et al. (2013).[15] Politicians can influence availability of electricity through providing more connections and ensuring higher reliability (fewer power cuts), and electricity often features as one of the top priorities of Indian voters in election surveys (Chhibber et al., 2004). A number of recent studies highlight the relevance of political control over electricity distribution in India, see Burgess et al. (2020); Mahadevan (2019); Dubash (2018); Kale (2014); Baskaran et al. (2015). However, none of these studies is focused on distinguishing the behaviour of male and female politicians.

4.2 Election data

The election data are drawn from successive editions of the Statistical Reports on General Elections to Legislative Assembly of States, published by the Election Commission of India. For each election, the reports contain candidate names, vote counts, gender and party affiliation; assembly constituency names and codes, year of the election, size of the electorate, total number of votes cast, and number of valid votes. India currently has 29 states. Our data, which cover about 99% of the population in India, include all states and the union territory of Delhi, and exclude the disputed northern state of Jammu and Kashmir and smaller union territories.[16]

A constitutional amendment in 1976 fixed the boundaries of constituencies until 2001 to avoid adversely affecting representation of states that implemented population control measures. The fourth Delimitation Commission empowered by the Delimitation Act of 2002 set out to redraw constituency boundaries based on the 2001 census data. However, the Commission's order was only accepted in 2008 and the first election to use new boundaries was held in 2008 in the state of Karnataka. Due to non-comparability of the pre- and the post-delimitation constituencies, we only consider elections held before 2008. However, our data extend until 2012 for states which had not yet held new elections under the newly drawn boundaries.[17]

In the analysis period, 1992-2012, there are 16,857 constituency-election years. Of these, 1,709 (10.3%) constituency-election years are in the mixed-gender sample, defined as a sample

[15]We note that Burlig and Preonas (2016) show that a rural electrification programme in India that acted on the extensive margin had limited impacts on growth- this was, however, a programme targeting very poor households

[16]In 2000, three states, namely Bihar, Madhya Pradesh, and Uttar Pradesh, were partitioned to make three additional states. The newly formed states are Chhattisgarh (from Madhya Pradesh), Jharkhand (from Bihar), and Uttarakhand (from Uttar Pradesh). Chhattisgarh was allocated 90 constituencies from Madhya Pradesh and Jharkhand was allocated 81 constituencies from Bihar. The constituencies themselves remained unchanged. Uttarakhand was allocated 22 constituencies from Uttar Pradesh which were redrawn into 70 new constituencies.

[17]The data include: Bihar till 2009, Assam, Kerala,Tamilnadu and West Bengal till 2010; Goa, Gujarat, Himachal Pradesh, Manipur, Punjab, Sikkim, Uttar Pradesh, and Uttarakhand till 2011; Meghalaya, Mizoram, Nagaland, and Tripura till 2012. The remaining states appear in our sample till 2008.

in which a woman and a man are the top two vote-winners.[18] Among mixed-gender elections, 471 (27.6%) are close elections, defined as elections with a victory margin of less than 5%. In fact a third of all Indian elections are won with a victory margin of less than 5%, a marker of how competitive Indian elections are in general. So elections in which women contest against men are, in general, neither more nor less competitive. Figure A.1 shows that constituencies in which women win are fairly evenly distributed across the country, so our analysis does not pertain to a specific region.[19]

We utilize data on candidate characteristics drawn from affidavits submitted to the Election Commission of India. The submission of an affidavit became mandatory for all political candidates following a Supreme Court of India order in 2003, the Right to Information Act. The Election Commission of India publishes the affidavits and they contain information on education, assets, liabilities, and pending criminal charges. The Association of Democratic Reforms (ADR), an election watchdog, has compiled the information since 2004.[20] The part of the analysis using candidate characteristics is thus restricted to state elections held between 2004–2008, encompassing one election for each state.

4.3 Road construction data

We investigate acquisition and completion of federally awarded village road building contracts as a proxy for public goods provision at the constituency level. We use administrative data on a centrally sponsored rural roads construction program, Pradhan Mantri Gram Sadak Yojana (PMGSY), launched in 2000 that aims to provide all weather road connectivity in rural areas, and forms an integral part of the Government of India's poverty reduction strategy. This program is unprecedented in its scale and scope (Aggarwal, 2017). We obtained road sanctioning and completion dates. The data are available at the census block level, a sub-district census administrative unit. We matched the roads data to state assembly constituencies.[21]

[18] It is notable that when a woman wins, in 91% of cases, the runner up is a man. However, when a man wins, it is only in 6% of cases that the runner-up is a woman. This is because it is only in 30% of constituency-years that at least one woman contests. The question of what inhibits women's candidacy in India is discussed in Bhalotra et al. (2017).

[19] There is a widespread perception that Indian women suffer discrimination on account of their gender. This is true in many domains and Bhalotra et al. (2017) suggest that Indian women may face party bias in being less likely to be put forward as candidates, as appears to be the case in Spain (Casas-Arce and Saiz, 2015). However, they also show that, conditional upon contesting, women are more likely than men to win, which undermines the possibility of voter bias against women.

[20] `www.myneta.info` first accessed in March 2014.

[21] The roads data are at `http://omms.nic.in/`, first accessed in May 2015. While there is significant geographical overlap between a census block and an assembly constituency (sharing on average 80% of villages), a census block can span more than one assembly constituency. We assign block-level road variables to an assembly constituency if the constituency contains at least 50% of villages in the block.

4.4 Non-farm employment data

In general, it is difficult to find conventional measures of economic activity such as GDP at the constituency level, but luminosity can be mapped to any coordinates. Recently, Asher et al. (2019) have made available constituency level data on non-farm employment. We use this share as a proxy for economic activity. The data are drawn from the Socioeconomic High-resolution Rural-Urban Geographic Data Platform for India (SHRUG), sourced from the 3rd through the 6th rounds of the Economic Census of India, covering the years 1990, 1998, 2005, and 2013. The Economic Census is a complete enumeration of all non-crop producing economic establishments in India including both public and private firms in the formal and non-formal sectors. The SHRUG files are available aggregated at the constituency-year level. Since the data are not annual, we assume that non-farm employment is constant between rounds. This is not ideal but as it is difficult to obtain constituency level economic activity data, we nevertheless use these data to provide a crude check on the luminosity data. As we do not have total employment at the constituency level we normalise on constituency-level population to arrive at the share of non-farm employment.

5 Results

5.1 Validity of RD Design

Validity of the RD design requires continuity of predetermined characteristics of constituencies across the threshold of a zero victory margin. We use a rich set of variables determined before the election in t, either variables from the previous election in $(t-1)$, or outcome variables averaged over the previous electoral term. These include the growth of night lights, the share of incomplete road projects, the share of non-farm employment, electorate size (i.e. number of registered voters), number of candidates, turnout, female turnout, whether the legislator was a woman, whether the legislator (in $(t-1)$) was an incumbent, whether the head of the winning party was a woman, as well as whether the constituency was reserved for lower castes (Scheduled Castes or Scheduled Tribes), aligned with the state government, and aligned with the central government.

Figure 1 reports graphical evidence of the validity of the continuity assumption, and Table A.4 shows tests of mean differences and the corresponding RD regression results. To elaborate the graphs in Figure 1, consider Panel (a) which plots average growth of light output in the previous election term against the margin of victory in t. The scatter plot depicts the local averages of growth of light in each successive interval of 0.5% of the margin of victory. The local linear curve is estimated using a triangular kernel and a 5% bandwidth and the 95% confidence interval is shown. The average growth of light in the previous term is a continuous function of the margin of victory. So there is no evidence here that women are more likely to be elected in constituencies that were performing either less well or better on luminosity growth in the electoral term preceding their election. Put differently, the balance test shows us that there is no differential pre-trend in the outcome in the "treated" constituencies (women win) as compared with the "control" constituencies (men win). We also find balance on the many other constituency characteristics listed above. Overall, the evidence suggests that only the gender of the legislator changes abruptly at the zero margin of victory and that, therefore, we can take the RD design as identifying the causal effect of the election of a woman.

Another RD validity check that we did is for sorting around the cutoff. Sorting has been documented in the case of close elections between Republicans and Democrats in the United States, and associated with manipulation of the margin of victory that renders the close election experiment invalid (Snyder, 2005; Caughey and Sekhon, 2011; Grimmer et al., 2012). To investigate this, Figure A.4 depicts the density of the margin of victory as suggested in McCrary (2008). There is no apparent discontinuity in the density around the cutoff. The point estimate of the discontinuity is 0.043 with a standard error of 0.075. This suggests there is no evidence of sorting in our sample of close mixed-gender races, and female and male candidates are equally likely to win. Observe that Figure A.4 also shows that the distribution of the margin by which women win is broadly similar to the distribution of the margin by which men win in mixed-gender races.

5.2 Results: Legislator Gender and Economic Performance

In this section we present estimates of the causal effect of female relative to male legislators on economic activity over the electoral term in the constituency from which they were elected. The RD estimate of the impact of electing a woman rather than a man is the difference in luminosity at the zero margin of victory.

The regression estimates are in Table 1. We estimate a local linear regression of growth of night lights on the margin of victory in the RD framework. The bandwidth is calculated using the optimal bandwidth procedure suggested by Imbens and Kalyanaraman (2012) (IK). We find that annual luminosity growth averaged over the electoral term is 15.25 percentage points higher in constituencies in which a woman won by a small margin than in constituencies in which a man won by a small margin, and this difference is significant at the 5% level (column 1). Using our estimate (from state-year data) of an elasticity of GDP to night lights of 0.15 (see Appendix Table A.3), a 15.25 percentage point difference in luminosity growth translates into a 2.3 percentage point difference in GDP growth. Given that average growth in India during the period of study was about seven percent per year, our estimates indicate that the growth premium for constituencies stemming from them having a female legislator is about 32 percent.

The RD plot is in Figure 2, which depicts average growth in luminosity against margin of victory. The data are averaged across bins that each cover 0.5 percentage points in the margin of victory and provide local linear smooths of the underlying data using a bandwidth of 5 percent. We observe a discontinuous jump in light output at the threshold margin of victory of zero, in line with the regression results. The graph plots coefficients for elections with victory margins larger than the optimal RD bandwidth, where we see the difference even out. These estimates are potentially contaminated by selection, which we examine in relation to the external validity of the RD results in the penultimate section of the paper.

Sensitivity to bandwidth. Estimates using bandwidths that are half and twice the size of the optimal bandwidth are in Columns (2)-(3) of Table 1. The estimated coefficient declines as the bandwidth increases, but remains statistically significant. We do not expect coefficient stability as we move outside the optimal bandwidth, but it is useful as a marker of how selection sets in as we move away from the threshold, and we discuss this later. Column (4) shows that estimates with a second order local polynomial smoother are similar to those estimated with a local linear control function in Column (1). Gelman and Imbens (2019) argue against the use of polynomials in RD of higher order than the quadratic.

Controlling for pre-determined covariates. While we have shown that pre-determined covariates are balanced at the RD threshold, a straightforward test for the effect of any imbalances is to directly control for pre-determined covariates. In Column (1) of Table 2, we thus re-estimate our RD specification for the optimal bandwidth while controlling for the pre-determined covariates discussed in Section 5.1 as well as constituency fixed effects. The resulting estimate is 18.07 percentage points, which is statistically similar to the baseline estimate.

Neighbour sample. We investigated the validity of the RD design using another strategy as follows. The idea is that any (unobservable) imbalances between constituencies with female and male legislators should be particularly small among neighbouring constituencies. We thus re-estimate the main equation limiting the estimation sample to constituencies with female legislators and their neighbours; see Column (2) of Table 2. The estimates are similar to those in Table 1, which suggests the absence of significant imbalances.

Placebo estimates. Yet another strategy to evaluate our RD design is to estimate Equation 1 with placebo thresholds using subsamples of only male and female winners, respectively. We estimate 62 placebo coefficients (and their confidence intervals) and collect them in Figure 3 (see the figure notes for further details regarding the placebo regressions). We also include the true coefficient estimate in red. We find that all placebo coefficients are clearly smaller than the true coefficient (and also generally insignificant).

Gender vs party. We may be concerned that we are capturing the effects of party of the winning legislator rather than of their gender. This seems unlikely since we checked that women are not significantly more likely to be from any one of the main parties. Nevertheless, to investigate this concern, we included indicators for whether the legislator is from the Congress or the BJP (with all other parties as the omitted category). The estimates are robust to this (Column (3), Table 2).

All mixed gender elections. As a further sensitivity test, we estimated regressions with a larger sample that includes all mixed-gender races in which a woman contested, rather than just races in which a woman ranked among the top two, as in Meyerson (2014). The margin of victory is again defined as the difference in the vote shares of the top-ranked female and the top-ranked male candidate, except that now the top-ranked female may not be one of the top two vote-winners.[22] The results are similar to those in Table 1; see Column (4) of Table 2. This is because the victory margin in the additional races that are incorporated is likely to be away from the discontinuity and hence unlikely to influence estimates that exploit variation around the threshold of a zero victory margin.[23]

Trimming to address measurement error. In the Data section, we discussed that luminosity data are subject to measurement error at the two ends of the distribution. To address this we performed various checks. We dropped all constituencies that are top-coded with respect to their luminosity, all observations with zero luminosity, and both top-coded and zero luminosity constituencies. The estimates are essentially unchanged, see Columns (5)-(7) of Table 2.

Distribution of effects through the electoral term. So as to investigate how the growth effects of having a female rather than a male legislator evolve, we re-estimated the model separating the first two years of growth from the last two years of growth in the electoral term. The coefficients are imprecise in these split samples and not significantly different from one another. However, the growth difference (between women and men) is more than twice as large later in the electoral term, consistent with any legislator activity cumulating or taking effect with an administrative lag (Table A.5).[24]

Non-farm employment share. Non-farm employment share is a proxy for structural change, a process associated with economic growth as productivity in manufacturing and services tends to be higher than in agriculture. Using recently available data on non-farm employment at the constituency level we find that women perform better by 4% points over the electoral term, or 0.84% points p.a., see Table 3. This result is also robust to using different bandwidth choices and a local polynomial. Panel (a) in Figure 4 is the corresponding RD plot, which displays a jump in non-farm employment at the threshold. Later we will show

[22]The margin is by construction positive for races in which women win. The runner up is typically the top-ranked man, there being very few races in which the top two vote winners are women (bout 0.5% of all the races in our time period) and negative for races in which men win.

[23]If we use the full sample of all elections and obtain OLS estimates conditional on constituency and year fixed effects, we find no significant impact of legislator gender on growth. There is similarly no correlation between parliamentarian gender and GDP growth in cross-country data, see Appendix Figure A.5). Thus the causal effect of women on growth is not evident in observational data, and it is important to investigate this relationship using techniques for causal identification in other settings.

[24]Compared with the term-averaged coefficient of 15.25 percentage points, we estimate 8.55 percentage points in the first two years and 20.41 percentage points in the last two years.

that heterogeneity in impacts of legislator gender on luminosity is mirrored in heterogeneity in impacts of legislator gender on non-farm employment share.[25]

6 Spillovers

We have shown that women are more effective than men at raising growth in their own constituencies. If this comes at the cost of lower growth in other constituencies, then effects of increasing the share of women on total growth are ambiguous. We therefore examine spillovers to contiguous constituencies. Spillovers can, in principle, go in either direction. They may be negative if legislators play a zero-sum game with fixed state resources. Alternatively positive spillovers may arise for the following reasons. First, legislators may build roads or electricity networks that continue across constituency boundaries, or road construction in one constituency may increase access to markets in neighbouring constituencies. Second, the success of women legislators may encourage yardstick competition if voters evaluate politicians in their jurisdiction by comparing outcomes with those in neighbouring jurisdictions (Besley and Case, 1995).

To implement this test, we define the dependent variable as light growth averaged over neighbours of constituency j identified using a constituency map. The mean (s.d.) of number of neighbours of a constituency is 5.8 (1.6).[26] The independent variable of interest is as before: the gender of the legislator in constituency j. The sample is still restricted to mixed gender races for j, and we use the RD approach described for the main analysis. This yields estimates of the difference in light growth in constituencies neighbouring female vs male led constituencies.

The estimated coefficient is positive, but the difference is not significant (Panel A of Table 4). As discussed in the Data section, blooming in the night lights data could bias estimates of geographic spillovers from highly luminous constituencies. To assess the potential of any such bias to influence the estimates here, we dropped constituencies with top-coded light levels, and the results are robust to this- see Panel B of Table 4. Overall, there is no evidence of negative growth spillovers from female-led to neighbouring constituencies, allowing us to conclude that women legislators have a positive impact on overall growth.

7 Mechanisms

[25] Table A.7 provides the descriptive association of non-farm employment share with luminosity growth. Our main purpose is to validate the measures by demonstrating a positive association. We do not wish to attach much weight to this estimate as it is not identified but we note that the association shown suggests that the estimated increase in non-farm employment under women legislators can account for about half of the estimated increase in luminosity growth.

[26] The reported results restrict to within-state neighbours as we analyse state legislators and the concern is around competing demands on state budgets. However, if we relax this restriction, we get the same results, as the mixed-gender ACs within the bandwidth we use are not at state borders.

7.1 Road Infrastructure

We first investigate a hard outcome that is growth producing. In general and especially in developing countries, road infrastructure is a key ingredient to growth. Rural roads are estimated to have significant positive effects on local economic outcomes including growth and structural transformation, involving the decline of agricultural work in favour of wage work (which we also capture in the share of non-farm employment) (Jacoby, 2000b; Shrestha, 2015; Jacoby and Minten, 2009; Casaburi et al., 2013; Asher and Novosad, 2019). In one of the few previous studies that uses luminosity growth to measure changes in economic activity in India, Asher and Novosad (2019) estimate that construction of a village road increases village-level luminosity by 2.5 percent per annum.

We use administrative data from the Prime Minister's Village Road Program (PMGSY) described in Section 4.3. The PMGSY is a flagship programme that, between 2000 and 2015, funded the construction of over 400,000 km of roads (in over 100,000 new roads), benefiting almost 200,000 villages at a cost of almost 40 billion US dollars (Asher and Novosad, 2019). It is a program of considerable political and economic significance and effective delivery of this program is a good marker for public goods delivery, involving state legislators bidding for federal funds and delivering goods at the local level. PMGSY is federally funded but responsibility for road construction is delegated to state governments, and the program by definition involves village-level roads.

Program eligibility involved the village having a population above 1000 till the year 2003 and above 500 after then. Therefore validity of the RD design we use requires that constituencies won by men vs women in close elections are not systematically different in population size, in particular around these thresholds. Using the 2001 census files, and using both threshold and average population figures at the village level, we test this premise just like we test for continuity across the zero vote margin threshold for other constituency characteristics. The results are in Appendix Table A.6 and show no significant differences in population size.

Using data for 2004–2012 and the RD approach used for the main analysis, we investigate whether the share of incomplete roads relative to awarded road projects is a function of legislator gender. Table 5 reports the point estimate of the discontinuity. We find no significant difference in contracts allocated (Panel B of Table 5).[27] However, the share of incomplete roads is 22 percentage points lower in constituencies with female legislators (Panel A of Table 5).[28] This difference is significant across a range of bandwidth choices and robust to replacing

[27]Okuyama (2018) finds that, contrary to a widespread concern in Japan that women are less qualified politicians than men, legislator gender does not affect the size of per capita intra-governmental transfers.

[28]On our sample we estimate a descriptive association of road completion rates and luminosity growth (conditional upon number of road contracts awarded) using a fixed effects model- Table A.7 confirms that it is positive and statistically significant. Using this association, our back of the envelope estimate is that the higher road completion rates under women legislators can explain about a third of the increase in luminosity growth under women.

the linear with a quadratic smoother.[29] Panel (b) of Figure 4 shows the RD plot of the share of incomplete roads against the margin of victory. [30] We observe a discontinuous drop in the share of incomplete roads at the threshold margin of victory of zero, in line with the regression results.[31]

Our findings reject the presumption that men are more effective at delivering growth-producing infrastructure. Since road construction in India has been shown to produce higher returns in terms of job mobility for men than for women (Asher and Novosad, 2019), our findings establish that women deliver public goods beyond those that serve the interests of women. The qualities that lead women to achieve higher completion rates may include efficiency, mission or lower corruption, all of which are related to effective delivery of public goods. In the next section we examine corruption and in the section on external validity we discuss evidence consistent with women legislators having greater intrinsic motivation than men.[32]

7.2 Corruption in Office

Following Fisman et al. (2014), we use growth in assets during office as a proxy for corruption. Since assets are only recorded in affidavits submitted by candidates when standing for election, Fisman et al. (2014), restrict the sample to candidates who contest for two consecutive elections, whether or not they win. They find higher asset growth for winners than for runners-up in close races, estimated as a difference of 3 to 5% p.a. and interpret this as evidence that politicians leverage public office for private benefits by engaging in rent-seeking activities.[33]

[29]The mean number of road contracts won (by male and female legislators alike) in the close mixed-gender election sample is 3.5. If an additional fifth of these is left incomplete in male-led constituencies, that implies about 0.7 fewer roads on average. We also examined costs associated with a project and found no significant differences in constituencies led by female and male legislators.

[30]The data are averaged across bins that each cover 0.5 percentage points in the margin of victory and provide local linear smooths of the underlying data using a bandwidth of 5 percent.

[31]We re-estimate the impact of legislator gender on luminosity growth using the (smaller) data sample used for analysis of road construction. See Panel A of Table A.8 where, in line with the results in Table 5, we find an estimate of the same order of magnitude as in Table 1, albeit it is imprecise in this smaller sample.

[32]We report results for roads because we have access to unusually good local-level data on a public infrastructure programme of large political and economic significance. We could not find similar data for other infrastructure. In India, electricity is, like roads, an important state provided infrastructural good (Lal, 2005). Refer discussion of electricity in the subsection on nightlights in the Data section above. When we use night lights data as a proxy for economic activity it is implicit that it is a proxy for electricity demand, as this will tend to scale with economic activity. However, to the extent that women legislators provide electricity better (for the same reasons that they provide roads better), some of the better performance of women leaders may reflect better electricity supply. As this is growth-producing, it does not substantively alter the interpretation of the results.

[33]In a section labeled External Validity, they acknowledge potential selectivity into the two-contests sample associated with a runner-up not re-contesting because they are hit by a negative wealth shock. They argue that this will tend to create a downward bias, making the estimates conservative. The same applies in the current analysis.

Fisman et al. (2014) do not distinguish between male and female legislators. We adopt their sampling and measurement strategy but rather than compare winners with runners up in close races, we compare women who won in a close race with men who won in a close race. Regression estimates are in Table 6. Column (1), using the IK bandwidth, shows that asset growth during an electoral term is about 60 percentage points lower among female legislators. This translates into a 12 percentage point per annum difference in the rate at which male vs female legislators accumulate rents in office.[34] As a benchmark, note that the mean annual growth rate of assets in the sample (averaging over all legislators) is 23 percentage points.

If we half the bandwidth, this coefficient is similar but less precisely determined (column 2). If we double the bandwidth, the coefficient falls a bit more but is statistically significant. The result is robust to replacing the linear with a quadratic polynomial (column 4). Across the columns, the coefficients are not significantly different from the coefficient in the first column. Panel (c) in Figure 4 plots asset growth between elections t and t+1 against the margin of victory between winners and losers (of opposite gender) in election t, confirming a discontinuity in asset growth at the zero margin of victory.[35]

Overall, this constitutes compelling evidence that women legislators are less likely than men to exploit their office for personal financial gain. It indicates lower corruption as one likely contributor to the economic advantage of women legislators given evidence that lower corruption is conducive to economic growth (Dollar et al., 2001; Swamy et al., 2001; Mauro, 1995; Prakash et al., 2019).[36]

A possible take on our finding of lower corruption among women legislators is that they tend to have less political experience and have not yet learned the ropes. If this were the case, gender differences in corruption would disappear as women's political tenure lengthens. We respond to this potential concern in three ways. First, we note evidence that the association of experience in politics with corruption is not necessarily positive.[37] than gender were driving

[34] While Fisman et al. (2014) use growth in net assets (total assets minus total liabilities), we use growth in gross assets because liabilities of Indian politicians may not reflect their actual net wealth. For example, with reference to Pakistan, Khwaja and Mian (2005) show that politicians can easily get loans from public sector banks without paying them back. However, if we use net asset growth the results are similar- the coefficient in column 1 is -0.5 instead of -0.6 and significant.

[35] We re-estimate the impact of legislator gender on luminosity growth within the subsample used for establishing the legislator gender on asset growth. See Panel B of Table A.8 which shows a large and positive effect of female legislators on luminosity growth. This increases confidence in our suggestion that legislator identity impacts on asset growth contribute to explaining their impacts on luminosity growth.

[36] Using the descriptive association of corruption in office and luminosity growth in Table A.7 we estimate that this can explain about 7% of the male-female gap in luminosity growth.

[37] Comparing women appointed to village council headship under quotas with men in unreserved seats in the Indian state of Andhra, Afridi et al. (2017) find that they are initially more corrupt and they attribute this to their being inexperienced and therefore subject to elite capture - indeed, by the end of their tenure women are neither more nor less corrupt than men. Studying cross-sectional differences in different states, Beaman et al. (2009) find women are less corrupt. These studies are not comparable to ours because we study women competitively elected to state legislative assemblies. First, quotas distort quality, and may lead to "'lower quality"' women taking office (Chattopadhyay and Duflo, 2004). Second, state leaders are less vulnerable to elite capture than village leaders (Bardhan et al., 2010). Direct comparison is further invalidated by these studies having looked at particular states, whereas we analyse all-India data.

this result, policies the world over that are introducing *new* women into politics will tend to lead to lower corruption. Second, in the following section we investigate a measure of corruption that is available before the candidate takes office. If we were to find gender differences in this measure of criminality that project onto differences in growth once the candidate is elected, this result would indicate a role for corruption that is independent of legislator tenure. If at all, we may expect larger differences in pre-election characteristics if politicians in office face stricter scrutiny and are subject to a re-election constraint which encourages them to act in more accountable ways. Alternatively, they may develop a sense of duty once they attain office if "office ennobles" (Brennan and Pettit, 2002; Benabou and Tirole, 2003).[38]

7.3 Candidate Characteristics

In India, following passage of the Right to Information Act, all political candidates are required to file affidavits that include various information including whether or not they are carrying pending criminal charges. Using these data, we compare characteristics of male and female legislators in the analysis sample of mixed-gender close elections, see Appendix Figure A.6 and Table A.9. In the close election sample (and also in the full sample of all mixed gender elections), there is no significant difference in education and wealth between male and female legislators. However, women legislators are significantly less likely than men to be carrying criminal charges and slightly younger on average.

In the close election sample, about 10% of women legislators face pending charges[39], in contrast to about 32% of men.[40] It seems plausible that legislators with a criminal record are more likely to practice corruption, to have priorities other than economic development and, to be less likely to provide a stable business environment for growth. Using the RD approach developed in (Prakash et al., 2019) on the expanded set of states in our sample, we estimate that luminosity growth is 16.8% points smaller in constituencies led by a legislator carrying pending criminal charges. Scaling this (gender-neutral) estimate by the difference in the propensity for criminality between men and women (a 21.8 percentage points difference in our close election sample – see Table A.9) suggests that it can explain about 24% of the estimated growth premium associated with women legislators.

While the validity of a close election design depends on balance in constituency characteristics around the RD threshold (which we demonstrated above), it does not require balance on candidate characteristics. In fact, if men and women were identical, then the question of

[38]The two measures are related- although the coefficient is not statistically significant it is sizeable- legislators who enter office carrying criminal charges experience higher asset growth if office.

[39]The criminal charges here refer to cases in which an indictment or a charge sheet has been filed. The judicial process in India is very slow and most are never convicted.

[40]This is a larger difference than in the overall sample that includes elections won by a wide margin. In the overall sample, male legislators are only twice as likely to be carrying charges.

whether legislator gender influences economic performance would be void.[41] However, if criminality were to predict winning this could be problematic for our identification strategy. We therefore examined this on the mixed-gender sample, and we find no evidence of it (Appendix Table A.10).

Differences in criminality between men and women legislators are consistent with experimental evidence that women are more risk-averse than men (Eckel and Grossman, 2008) and more patient (Silverman, 2003) since risk taking and high discount factors are positively associated with crime (Mastrobuoni and Rivers, 2016). If experimental evidence captures inherent personality traits, then differences in criminality are unlikely to erode over time, as more women join politics, or as women acquire longer political tenure.

8 Heterogeneity

In this section we investigate differences in the relative performance of male and female legislators in sub-samples distinguished by party alignment and gender of the state minister, the education and incumbency status of the legislator and an indicator of human development (a correlate of corruption) at the state level. The differences in coefficients reported in this section are not statistically significant but, in most cases, are of a considerable magnitude. In Appendix Table A.11, we repeat the exercise replacing luminosity with non-farm employment share. It is striking that we find the same pattern of results.[42]

Party alignment and gender of state minister. State governments may have an incentive to favor aligned politicians in allocation of public resources (Brollo and Nannicini, 2012; Asher and Novosad, 2017). If aligned legislators have more resources to work with and if the growth results emerge from women legislators making better use of these resources, then we should expect to see larger differences in female vs male led constituencies in the sample of constituencies that is aligned. This is what we find. The difference between female and male legislators is 50% larger in the aligned sample. Although the difference between the two samples is not statistically significant, it is large. See columns 1-2, Table 7.[43]

On the other hand, if female chief ministers favor female legislators, women may outperform men under female chief ministers not because they use resources better but because they are favoured. To investigate this, we estimate the baseline RD specification on subsamples of states ruled by female vs male chief ministers (column 3-4, Table 7). We find no evidence of favoritism along the lines of gender. The sample with male chief ministers, which contains

[41] As with most studies of gender differences in outcomes, the design identifies systematic differences in outcomes of men and women in elections in which their assignment as leaders is quasi-random. We additionally confirm that, in close elections, they are balanced on education and wealth.

[42] We do not show non-farm employment by caste because we do not have statistical power.

[43] The alignment status of a constituency may change within a term, for instance, if a coalition at the state-level breaks down. To account for this we set the alignment dummy to equal one if the constituencies was aligned throughout the term and to zero if it was either not aligned or aligned for part of the term.

85% of cases (states) exhibits a growth difference in favor of female legislators similar to the full sample results, while the smaller female chief minister sample shows a small and insignificant coefficient.[44]

Education, caste and incumbency of legislator. We showed earlier that there is on average no significant difference in the level of education of female and male legislators in the close mixed-gender sample. So education is unlikely to be a mechanism. However, given an interest in the relationship between politician education and policy choices (Besley et al., 2011), we investigate whether the relative success of women emerges from samples of more or less educated legislators. We separate the sample into constituencies led by legislators with at least ten years of education vs those with less (column 5-6, Table 7). Growth in luminosity is only higher in women-led constituencies in the sample in which leaders are more educated. The results are similar if we cut at twelve years of education. Examining heterogeneity by caste of the legislator (columns 7-8), we find that the growth premium derived from electing women leaders is driven by high caste women. This is consistent with high caste women being more educated.[45] Finally, dividing the sample into incumbents and non-incumbents, we identify a larger male-female growth difference among incumbents (columns 9-10). Our proposed explanations of these results are speculative but they line up with our earlier results in suggesting that women use available resources with more effect for growth than men, insofar as their education and experience are such resources.

Institutional environment. If clean governance is a reason that women-led constituencies experience higher growth, we may expect that women make a larger difference in institutional environments where (male-dominated) corruption is pervasive. Using the Human Development Index as a proxy for the prevailing quality of government (Sen and Dreze, 2005) and splitting the sample into states with HDI above or below the median value in 1999, we find that women are only significantly better than men at producing growth in the less developed states, where the coefficient is twice as large, see columns 9-10, Table 7.

8.1 Analysis of behaviour outside the RD sample

Our first result, that luminosity growth is discontinuously lower when a man rather than a woman wins by a narrow margin was displayed in Figure 2. The RD estimate shows a statistically significant difference. However, Figure 2 also shows that outside the IK bandwidth (which, as noted in the Tables, is roughly 6%) luminosity growth in constituencies won by men vs women is similar (note that men do not do better at any victory margin). It is not unusual that the causal RD estimates for close victory margins differ from the descriptive estimates

[44] The shares of women and men in the estimation sample who are aligned is 54.8% and 40.7%. The shares of women and men in states with a female chief minister is 8.3% and 11.1%.

[45] Given long-standing caste segregation in India, and that gender norms are stronger in high caste groups, it may be that personality traits like an aversion to corruption exhibit a larger difference in the high caste group- though this is admittedly no more than one rationalisation of the result.

for non-close victory margins as the latter are potentially contaminated by selection. In this section we discuss how representative close elections are likely to be of all elections in India, and then consider selection into the close election sample at constituency and candidate level.

Close mixed-gender elections in India are representative of all mixed-gender elections. In particular, a third of all mixed-gender elections are within the optimal bandwidth and about half have a victory margin of less than 10%. The median victory margin is 10.5% for women and 10.4% for men in the entire sample (the 25th percentile is about 4% and the 75th percentile is about 19% for both female and male winners). This directly diminishes concerns that our results have limited validity. We nevertheless now consider why men who win with narrow margins perform worse than men who win with wider margins to address the possible concern that the poorer performance of men relative to women in close elections stems from their being a bad lot.

Constituency characteristics. Constituencies won by men with narrow margins may have been a bad selection compared with constituencies won by men with wider margins. For example, they may have historically struggled with generating growth. However, the balance plots in Figure 1 and the corresponding data in Panel A of Table A.12 show no meaningful differences between these two sets of constituencies.[46]

Candidate characteristics including dynastic links. An alternative possibility is that men who win in narrow races are selectively worse than men who win with wide margins. We find no evidence of this using characteristics available in the affidavit data, including education and wealth, see Panel B of Table A.12. Using data recently created by George (2019), we compare the dynastic links of candidates, that is, whether a parent or spouse preceded them in political office. We find that men who win in close elections are more likely to have dynastic links (17.4%) than men who win with wide margins (13.6%). Since dynasts are less effective leaders over an election term (George, 2019), this can explain their poorer performance, evident in the dip to the left of the threshold in Figure 2. However, dynastic links cannot explain the male-female performance gap in close elections. Using our RD design, we show that the probability that the winner is a dynast is invariant to the victory margin (Figure A.7). In close elections, the share of dynasts is 15.9% among women and 17.4% among men, and the difference is not statistically significant.[47]

Unobservable candidate characteristics- quality. We further investigate if men who win in close races are negatively selected on unobservables, adapting to our setting a test proposed in George (2019). The idea is that candidates who win with a narrow margin -

[46]Among constituencies which have at least one mixed-gender election, nearly 60% have had only one or two mixed-gender elections over a period of three decades (Bhalotra et al., 2017). This suggests that the RD estimates do not capture features specific to certain constituencies. Similarly, Figure A.1 showed that constituencies in which women win against men by a narrow margin are not clustered but, rather, fairly evenly distributed across the country.

[47]If the main results showing better performance of women who win close races were related to their dynastic links then we would expect (Figure A.7) to mimic the patterns seen in Figure 2 with a discontinuity at the threshold and a dip to the left of the threshold.

relative to candidates who win with a wide margin- are either weaker candidates or unlucky. The trick is to use swings in the state-level vote share of the candidate's party to measure luck, as aggregate party swings constitute a shock to the individual candidate's victory margin. The party swing of the winning candidate, Swing_i, in a mixed-gender race is defined as follows:

$$\text{Swing}_i = \Delta\text{Party of winning candidate}_t - \Delta\text{Party of losing candidate}_t. \tag{4}$$

Δ_t is the state-level vote share of candidate k's party in the state election in t minus the same share in the preceding state election in *t-1*. Swing_i hence captures the swing experienced by the party of the winning candidate i, relative to the party of the runner-up.[48] Candidates who win in a close race in a year with a positive net party swing ($\text{Swing}_i > 0$) are a relatively "bad" selection (they won with a narrow margin despite a positive party swing) and those winning during a negative party swing are a relatively "good" selection. We estimate impacts of legislator gender on luminosity growth for candidates winning during positive vs negative swings. The estimates are similar and statistically indistinguishable, see Table A.13. This makes it unlikely that candidate quality drives our results. Our main result is robust to accounting for negative selection among men in close elections. Even if we focus only on good candidates (who won despite a negative party swing), women perform better than men.

Electoral incentives. A potential explanation of the difference in outcomes of close vs non-close elections is that legislators who win in close races face more stringent electoral incentives than those who win with comfortable margins (because their re-election is more uncertain). That politicians pursuing a narrow electoral agenda have an incentive to distort economic policies has been discussed in a literature on distributive politics, which highlights this as a drawback of democratic politics (see e.g., Mani and Mukand (2007); Cole (2009); Golden and Min (2013)). Politicians may induce electoral cycles, engage in vote buying, or target resources to key electoral groups for purely electoral reasons; see Cole (2009); Mitra et al. (2017); Arulampalam et al. (2009) for evidence from India. With the exception of Brollo and Troiano (2016), this literature provides limited evidence of whether men are more likely than women to fall prey to electoral incentives.

We argue that if men are more opportunistic than women then we may expect the pattern seen in Figure 2. We find (descriptive) support for this in comparing re-election rates of men and women in the mixed-gender election sample, see Table A.14. Men and women elected with wide margins are equally likely to be re-elected, the chances being 30%-35%. Among legislators who win in close races, men have a similarly high re-election rate of 27%, but women have a substantially lower re-election rate of about 18%, *despite* their better growth

[48] On average, the winning party has a positive swing of up to 3 percentage points and the losing party a negative swing of the same order of magnitude. We obtain data on state-level party vote shares for all state elections during 1980-2008 from Jensenius and Vernier (2017) available at `https://www.francesca.no/data-2`. The results are robust to leaving out the index candidate's voteshare when estimating the state-party level swing.

performance.[49] These estimates are consistent with women being less likely to engage in economic distortions even if it costs them electoral defeat. The results generalize in the sense that if a non-close man were to find himself in a close election, he would also behave opportunistically. We note again that close elections are not special cases, a third of all elections being close.

There are other possible explanations of lower growth in competitive constituencies with male legislators. One is that politicians with shorter expected tenure have less influence over the promotion of bureaucrats. In line with this, Nath (2016) shows that the performance of bureaucrats is worse in such constituencies. Women may be able to improve bureaucratic performance even without explicit control over promotions if they are more efficacious or intrinsically motivated. For instance, our result that road completion rates are higher in constituencies with female legislators is consistent with women exerting more effort to monitor bureaucrats effectively.[50]

9 Conclusion

We estimate that women legislators in India raise economic growth (GDP) in their constituencies by 2.3 percentage points per annum more than male legislators. We find no evidence of negative spillovers from female-led constituencies, which suggests considerable overall growth gains. These are, as far as we know, the first causal estimates of the impact of legislator gender on economic activity.

Investigating mechanisms we find that women legislators are more effective at overseeing completion of road infrastructure projects (the share of incomplete projects being 22 percentage points lower) and increasing non-farm employment (by 0.84% points p.a.), they are less likely to rent-seek while in office (personal asset growth is about 12 percentage points p.a. lower), and only about a third as likely as men to be carrying pending criminal charges when they enter office. We also find evidence consistent with women legislators being less likely than men to distort economic policies in order to achieve electoral gains. Thus it seems that economic activity improves under women legislators on account of them being more efficacious, less corrupt and more intrinsically motivated. We note that this array of results makes it unlikely that what we capture is only that street lighting or electrification (which manifest

[49] These figures refer to the unconditional re-election probability. The results are similar for the probability of re-election conditional on re-contesting. Conditional on re-contesting, comfortably elected men and women have a similar re-election probability of about 50%-55%. Barely elected men also have a high re-election probability of 44%, while barely elected women have a re-election probability of 29%. We do not observe any meaningful difference in the likelihood of re-running among barely and comfortably elected men and women.

[50] Anecdotes and media coverage in India often highlight that women in Indian politics are mission oriented, see for instance, https://www.thebetterindia.com/4721/mla-jyoti-how-an-abandoned-musahar-girl-stepped-on-to-the-political-stage/ and https://www.dnaindia.com/ahmedabad/report-once-jobless-phd-woman-slays-5-time-bjp-mla-from-unjha-2569652.

in luminosity growth) improve under women leaders, also noting that both are potentially important contributors to growth in developing countries.

A lower initial share of women in government implies that the marginal female entrant will be higher ability than the marginal male entrant (also see Besley et al. (2017)), and this may be reinforced by discrimination against women. Against this, as the share of women grows, average female tenure will fall. Our results are consistent with female politicians having higher ability.[51] Our findings are potentially relevant to the many (richer and poorer) countries in the world that have a small but growing share of women in the legislature.

To the extent that opportunities for corruption decline with development, any female-advantage that derives from lower corruption will tend to dissipate with development. In line with this, we found some evidence that the gender gap in legislator performance is smaller in the more developed states of India but, in general, it is unclear that these differences will disappear altogether if lower criminality and corruption are intrinsic to women. Gender differences in intrinsic motivation may persist, and our finding that women achieve higher road completion rates is not significantly different in more vs less developed states of India. Overall, our analysis suggests that differences in economic performance by legislator gender may narrow but not necessarily close with economic development. Further work in other settings is merited.

References

Afridi, F., V. Iversen, and M. R. Sharan (2017). Women political leaders, corruption and learning: Evidence from a large public program in india. *Economic Development and Cultural Change 66*(1), 1–30.

Aggarwal, S. (2017). Do rural roads create pathways out of poverty? Evidence from India. Mimeo (Indian School of Busines).

Ahern, K. and A. Dittmar (2012). The changing of the boards: The impact on firm valuation of mandated female board representation. *Quaterly Journal of Economics 127*, 137–197.

Allcott, H., A. Collard-Wexler, and S. D. O'Connell (2016). How do electricity shortages affect productivity? evidence from India. *American Economic Review 106*(3), 587–624.

Anderson, S., P. Francois, and A. Kotwal (2015). Clientelism in Indian villages. *American Economic Review 105*, 1780–1816.

Arulampalam, W., S. Dasgupta, A. Dhillon, and B. Dutta (2009). Electoral goals and center-state transfers: a theoretical model and empirical evidence from India. *Journal of Development Economics 88*, 103–119.

[51] This result is non-trivial because we do not know a priori whether the underlying ability distribution is the same for men and women, and we do not know how unobserved ability vs tenure translate into growth.

Asher, S., T. Lunt, R. Matsuura, and P. Novosad (2019). The socioeconomic high-resolution rural-urbangeographic dataset on india (shrug). Unpublished Manuscript.

Asher, S. and P. Novosad (2017). Politics and local economic growth: Evidence from India. *American Economic Journal: Applied Economics 9*(1), 229–273.

Asher, S. and P. Novosad (2019). Rural roads and local economic development. *American Economic Review 110*, 797–823.

Baragwanath, K., R. Goldblatt, G. Hanson, and A. K. Khandelwal (2019). Detecting urban markets with satellite imagery: An application to india. *Journal of Urban Economics (forthcoming).*

Bardhan, P., D. Mookherjee, and M. P. Torrado (2010). Impact of political reservations in west bengal local governments on anti-poverty targeting. *Journal of Globalization and Development 1*(1), 1–38.

Baskaran, T., B. Min, and Y. Uppal (2015). Election cycles and electricity provision: Evidence from a quasi-experiment with indian special elections. *Journal of Public Economics 126*, 64–73.

Beaman, L., R. Chattopadhyay, E. Duflo, R. Pande, and P. Topalova (2009). Powerful women: can exposure reduce bias? *Quarterly Journal of Economics 124*, 1497–1540.

Beaman, L., E. Duflo, R. Pande, and P. Topalova (2006). Women politicians, gender bias, and policy-making in rural India. The state of the world's children 2007, background paper.

Beaman, L., R. Pande, and A. Cirone (2012). *The impact of gender quotas*, Chapter 13. Oxford: Oxford University Press.

Benabou, R. and J. Tirole (2003). Intrinsic and extrinsic motivation. *Review of Economic Studies 70*, 489–520.

Besley, T. and A. Case (1995). Incumbent behavior: vote-seeking, tax setting, and yardstick competition. *American Economic Review 85*(1), 25–45.

Besley, T. and S. Coate (1997). An economic model of representative democracy. *Quarterly Journal of Economics 112*, 85–114.

Besley, T., J. G. Montalvo, and M. Reynal-Querol (2011). Do educated leaders matter? *Economic Journal 121*(554), 205–227.

Besley, T. J., O. Folke, T. Persson, and J. Rincke (2017). Gender quotas and the crisis of the mediocre man: Theory and evidence from Sweden. *American Economic Review 107*(8), 2204–2242.

Bhalotra, S., D. Clarke, J. Gomes, and A. Venkataramani (2017). Women's political voice and maternal mortality. IZA Discussion Paper Number 11590.

Bhalotra, S. and I. Clots-Figueras (2014). Health and political agency of women. *American Economic Journal: Economic Policy 6*, 164–197.

Bhalotra, S., I. Clots-Figueras, and L. Iyer (2017). Path-breakers? Women's electoral success and future political participation. *Economic Journal 128*(613), 1820–1843.

Bhalotra, S., J. Slapin, and M. F. Sierra (2019). Gender and rebellion in the UK House of Commons – evidence from text-data analysis. Mimeo (University of Essex).

Bhalotra, S. and M. Umana-Aponte (2015). Recession, women and work in africa. In A. Fosu (Ed.), *Gowth and Institutions in African Development*. UNU/WIDER, Routledge.

Bickenbach, F., E. Bode, M. Lange, and N. P. (2013). Night lights and regional gdps.

Borker, G. (2020). Safety first: perceived risk of street harassment and educational choices of women. Mimeograph, World Bank.

Brennan, G. and P. Pettit (2002). Power corrupts, but can office ennoble? *Kyklos 55*, 157–178.

Brollo, F. and T. Nannicini (2012). Tying your enemy's hands in close races: the politics of federal transfers in Brazil. *American Political Science Review 106*, 742–761.

Brollo, F. and U. Troiano (2016). What happens when a woman wins an election? Evidence from close races in Brazil. *Journal of Development Economics 122*, 28–45.

Bruederle, A. and R. Hodler (2018). Nighttime lights as a proxy for human development at the local level. *PLoS ONE 13*(9).

Burgess, R., M. Greenstone, and A. Ryan, N. Sudarshan (2020). The consequences of treating electricity as a right. *Journal of Economic Perspectives 34*, 145–169.

Burlig, F. and L. Preonas (2016). Out of the darkness and into the light? Development effects of rural electrification. EI at Haas WP 268.

Campbell, R. (2004). Gender, ideology and issue preference: Is there such a thing as a political women's interest in Britain? *British Journal of Politics and International Relations 6*, 20–44.

Casaburi, L., R. Glennerster, and T. Suri (2013). Rural roads and intermediated trade: Regression discontinuity evidence from Sierra Leone. Mimeo.

Casas-Arce, P. and A. Saiz (2015). Women and power: Unpopular, unwilling, or held back? *Journal of Political Economy 123*(3), 641–669.

Caughey, D. and J. S. Sekhon (2011). Elections and the regression discontinuity design: lessons from close U.S. House races, 1942-2008. *Political Analysis 19*, 385–408.

Chand, T. R. K., K. V. S. Badarinath, C. D. Elvidge, and B. T. Tuttle (2009). Spatial characterization of electrical power consumption patterns over India using temporal DMSP-OLS night-time satellite data. *International Journal of Remote Sensing 30*, 647–661.

Chaney, C., M. R. Alvarez, and J. Nagler (1998). Explaining the gender gap in US presidential elections, 1980-1992. *Political Research Quarterly 51*, 311–339.

Chattopadhyay, R. and E. Duflo (2004). Women as policy makers: evidence from a randomized policy experiment in India. *Econometrica 72*, 1409–1443.

Chen, X. and W. D. Nordhaus (2011). Using luminosity data as a proxy for economic statistics. *PNAS 108*, 8589–8594.

Chhibber, P., S. Shastri, and R. Sisson (2004). Federal arrangements and the provision of public goods in India. *Asian Survey 44*, 339–352.

Clots-Figueras, I. (2012). Are female leaders good for education? Evidence from India. *American Economic Journal: Applied Economics 4*, 212–244.

Cole, S. (2009). Fixing market failures or fixing elections? Agricultural credit in India. *American Economic Journal: Applied Economics 1*, 219–250.

Costinot, A., D. Donaldson, and C. Smith (2016). Evolving comparative advantage and the impact of climate change in agricultural markets: Evidence from 1.7 million fields around the world. *Journal of Political Economy 124*(1), 205–248.

Dahlerup, D. (2006). *Women, Quotas and Politics*. New York: Routledge.

Dinkelman, T. (2011). The effects of rural electrification on employment: new evidence from South Africa. *American Economic Review 101*, 3078–3108.

Dollar, D., R. Fisman, and R. Gatti (2001). Are women really the 'fairer' sex? corruption and women in government. *Journal of Economic Behavior and Organization 46*, 423–429.

Donaldson, D. and A. Storeygard (2016). The view from above: Applications of satellite data in economics. *Journal of Economic Perspectives 30*(4), 171–198.

Dubash, N. K. (Ed.) (2018). *Mapping power: The political economy of electricity in India's states*. Oxford University.

Eckel, C. and P. Grossman (2008). Men, women and risk aversion: Experimental evidence. In C. Plott and V. Smith (Eds.), *Handbook of Experimental Economics Results*. Elsevier.

Edlund, L., L. Haider, and P. R. (2005). Unmarried parenthood and redistributive politics. *Journal of the European Economic Association 2-3*, 268–278.

Edlund, L. and R. Pande (2002). Why have women become left wing? The political gender gap and the decline in marriage. *Quarterly Journal of Economcis 117*, 917–961.

Eggers, A. C., A. Fowler, J. Hainmueller, A. B. Hall, and J. M. Snyder Jr. (2015). On the validity of the regression discontinuity design for estimating electoral effects: New evidence from over 40,000 close races. *American Journal of Political Science 59*(1), 259–274.

Ferreira, F. and J. Gyourko (2014). Does gender matter for political leadership? The case of US mayors. *Journal of Public Economics 112*, 24–39.

Fisman, R., F. Schulz, and V. Vig (2014). The private returns to public office. *Journal of Political Economy 122*, 806–862.

Gagliarducci, S. and D. Paserman (2014). The effect of female leadership on establishment and employee outcomes: Evidence from linked employer-employee data. *Research in Labor Economics 41*, 341–372.

Gelman, A. and G. Imbens (2019). Why high-order polynomials should not be used in regression discontinuity designs. *Journal of Business and Economic Statistics 37*(3), 447–456.

George, S. E. (2019). Like father, like son? the effect of political dynasties on economic development. Mimeo.

Golden, M. and B. Min (2013). Distributive politics around the world. *Annual Review of Political Science 16*, 73–99.

Grimmer, J., E. Hirsh, B. Feinstein, and D. Carpenter (2012). Are close elections random? Mimeo (Stanford University).

Gupta, B. and A. Mukhopadhyay (2016). Local funds and political competition: evidence from the National Rural Employment Guarantee Scheme in India. *European Journal of Political Economy 41*, 14–30.

Henderson, J. V., A. Storeygard, and D. N. Weil (2012). Measuring economic growth from outer space. *American Economic Review 102(2)*, 994–1028.

Imbens, G. and K. Kalyanaraman (2012). Optimal bandwidth choice for the regression discontinuity estimator. *Review of Economic Studies 79*(3), 933–959.

Imbens, G. W. and T. Lemieux (2008). Regression discontinuity designs: a guide to practice. *Journal of Econometrics 142*, 615–635.

Iyer, L., A. Mani, P. Mishra, and P. Topalova (2012). The power of political voice: women's political representation and crime in India. *American Economic Journal: Applied Economics 4*, 165–193.

Jacoby, H. G. (2000a). Access to markets and the benefits of rural roads. *Economic Journal 110*, 713–737.

Jacoby, H. G. (2000b). Access to markets and the benefits of rural roads. *Economic Journal 110*(465), 713–737.

Jacoby, H. G. and B. Minten (2009). On measuring the benefits of lower transport costs. *Journal of Developing Economies 89*, 28–38.

Jerven, M. (2013). For richer, for poorer: GDP revisions and Africa's statistical tragedy. *African Affairs 112*, 138–147.

Kale, S. S. (2014). *Electrifying India: Regional political economies of development.* Stanford University Press.

Khemani, S. (2006). The political economy of equalization transfers. In R. Bahl, J. Martinez, and R. Searle (Eds.), *Fiscal Capacity equalization and intergovernmental transfers.* New York: Springer Publications.

Khwaja, A. I. and A. Mian (2005). Do lenders favor politically connected firms? Rent pro vision in an emerging financial market. *Quarterly Journal of Economics 120*, 1371–1411.

Lal, S. (2005). Can good economics ever be good politics? Case study of the power sector in India. *Economic and Political Weekly 40*(7), 649–656.

Lee, D. S. (2008). Randomized experiments from non-random selection in U.S. house elections. *Journal of Econometrics 142*, 675–697.

Lipscomb, M., A. M. Mobarak, and T. Barham (2013). Development effects of electrification: evidence from the topographic placement of hydropower plants in Brazil. *American Economic Journal: Applied Economics 5*, 200–231.

Mahadevan, M. (2019). The price of power: Costs of political corruption in Indian electricity. Department of Economics, University of Michigan.

Mani, A. and S. Mukand (2007). Democracy, visibility and public good provision. *Journal of Development Economics 83*, 506–529.

Mastrobuoni, G. and D. Rivers (2016). Criminal discount factors and deterrence. Mimeo (University of Essex).

Matsa, D. and A. Miller (2013). A female style in corporate leadership? Evidence from quotas. *American Economic Journal: Applied Economics 5*, 136–169.

Mauro, P. (1995). Corruption and growth. *Quarterly Journal of Economics 110*(3), 681–712.

McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: a density test. *Journal of Econometrics 142*, 698–714.

Meyerson, E. (2014). Islamic rule and the empowerment of the poor and the pious. *Econometrica 82*, 229–269.

Miller, G. (2007). Women's suffrage, political responsiveness, and child survival in American history. *Quarterly Journal of Economics 123*, 1287–1327.

Min, B. (2015). *Power and the Vote.* New York: Cambridge University Press.

Min, B., K. M. Gaba, O. F. Sarr, and A. Agalassou (2013). Detection of rural electrification in africa using dmsp-ols night lights imagery. *International Journal of Remote Sensing 34*(22), 8118–8141.

Mitra, A., S. Mitra, and A. Mukherji (2017). Cash for votes: Evidence from India. University of Kent School of Economics Discussion Papers, No. 1711.

Nath, A. (2016). Bureaucrats and politicians: How does electoral competition affect bureaucratic performance? IED Working Paper 269, Boston University.

Osborne, M. J. and A. Slivinski (1996). A model of political competition with citizen-candidates. *Quarterly Journal of Economics 111*, 65–96.

Pande, R. and D. Ford (2012). Gender quotas and female leadership. In *Gender Equality and Development, Background Paper.* World Bank: World Development Report.

Prakash, N., M. Rockmore, and Y. Uppal (2019). Do criminally accused politicians affect economic outcomes? Evidence from India. *Journal of Development Economics (forthcoming).*

Rigon, M. and G. M. Tanzi (2012). Does gender matter for public spending? Empirical evidence from Italian municipalities. Bank of Italy Temi di Discussione (Working Paper) No. 862.

Rud, J. P. (2006). Electricity provision and industrial development: evidence from India. *Journal of Development Economics 97*, 352–267.

Sen, A. and J. Dreze (2005). *India: Economic Development and Social Opportunity*. Oxford University Press.

Shi, K., Y. Chen, B. Yu, C. Xu, C. Li, L. Huang, Z. Chen, and J. Wu (2016). Detecting spatiotemporal dynamics of global electric power consumption using DMSP-OLS nighttime stable light data. *Applied Energy 184*, 450–463.

Shrestha, S. A. (2015). The effect of roads on farmland values: Evidence from the topography-based road network in nepal. Mimeo.

Siddique, Z. (2020). Media reported violence and female labor supply. *Economic Development and Cultural Change (forthcoming)*.

Silverman, I. W. (2003). Gender differences in delay of gratification: A meta-analysis. *Sex Roles 49*, 451–463.

Snyder, J. (2005). Detecting manipulation in U.S. House elections. Mimeo (UCLA).

Spary, C. (2014). Women candidates and party nomination trends in India – evidence from the 2009 general election. *Commonwealth & Comparative Politics 52*, 109–138.

Svaleryd, H. (2009). Women's representation and public spending. *European Journal of Political Economy 25*, 186–198.

Swamy, A., S. Knack, Y. Lee, and O. Azfar (2001). Gender and corruption. *Journal of Development Economics 64*, 25–55.

Thomas, S. (1991). The impact of women on state legislative policies. *Journal of Politics 53*, 958–976.

Tiwari, D. (2014). Electoral competition and candidate wealth in India. Mimeo (University of California, San Diego).

Tuttle, B. T., S. Anderson, C. Elvidge, T. Ghosh, K. Baugh, and P. Sutton (2014). Aladdin's magic lamp: Active target calibration of the dmsp ols. *Remote Sensing 6*(12), 12708–12722.

Uppal, Y. (2009). The disadvantaged incumbents: estimating incumbency effects in Indian state legislatures. *Public Choice 138*, 9–27.

Weidmann, N. B. and S. Schutte (2017). Using night light emissions for the prediction of local wealth. *Journal of Peace Research 54*(2), 125–140.

Xie, Y. and W. Qihao (2016). World energy consumption pattern as revealed by dmsp-ols nighttime light imagery. *GIScience & Remote Sensing 53*, 265–282.

Table 1: Legislator Gender and Luminosity Growth

	(1)	(2)	(3)	(4)
	Growth of $Light_{t+1}$			
	Local Linear			Local Quadratic
	IK (h)	h/2	2h	IK (h)
Female Legislator	15.25**	16.97*	8.52**	17.11*
	[6.12]	[8.96]	[3.79]	[9.42]
R^2	0.03	0.03	0.02	0.03
N	584	316	980	584
Bandwidth	6.68	3.34	13.36	6.68

The dependent variable is the growth of light, $(Log(Light_{t+1}+1) - Log(Light_t+1)) * 100$, per year (averaged over an election term). $FemaleLegislator_t$ is a dummy variable which is 1 for a female legislator and 0 for a male legislator in mixed gender races in which a female either won or was a runner-up against a male. The forcing variable is margin of victory in t ($margin_t$), which is the difference between the vote shares of the female and male candidate in mixed gender races. Column (1) reports estimates from a local linear regression of growth of light on $FemaleLegislator_t$, using a bandwidth determined by Imbens and Kalyanaraman (2012) optimal bandwidth calculator. Columns (2) and (3) halve and double the optimal bandwidth. Column (4) uses a local quadratic smoothing function. The following is true for this and all subsequent tables unless noted otherwise. The kernel used is triangular. The standard errors are clustered at the constituency level. The number of observations with in the given bandwidth is denoted by N. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 2: Robustness Tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Growth of Light_{t+1}						
	With predetermined covariates	Neighbor sample only	Control for party	With alternative margin	No top-coded ACs	No ACs with 0 light	No top-coded or 0 light ACs
Female Legislator	18.07**	15.52**	13.52**	14.78***	15.40**	15.35**	15.51**
	[8.10]	[6.54]	[5.90]	[5.50]	[6.17]	[6.19]	[6.25]
R^2	0.55	0.03	0.04	0.02	0.03	0.03	0.03
N	428	553	584	685	579	579	572
Bandwidth	6.68	7.4	6.68	7.55	6.69	6.67	6.68

Column (1) reports estimates from a local linear regression of growth of light on $FemaleLegislator_t$ after controlling for various constituency-level predetermined covariates. Column (2) uses a sample that only consists of the female-led constituencies and their neighbours. The neighbours are defined as the constituencies that share boundaries with any female-led constituencies and where a male won against a women (i. e. while a constituency has in general five to six neighbors, we only consider those neighboring constituencies where a man won a mixed-gender race). Column (3) controls for the party of the legislator by means of two dummies that are 1 if the legislator belongs to the INC (Indian National Congress) Party or the BJP (Bhartiya Janata Party), respectively. Column (4) uses a forcing variable that is defined as the difference between vote shares of the top-placed female and top-placed male candidates (irrespective if they are the top 2 candidates or not). Columns (5)-(7) reruns regression of growth of light on female legislator to check for observations for which light density is 0 (Column (5)), observations for which light is top-coded (Column (6)), and observations for which light is either 0 or top-coded (Column (7)). All models run a local linear regression using the optimal bandwidth as recommended by Imbens and Kalyanaraman (2012). See also Notes to Table 1.

Table 3: Legislator Gender and Non-Farm Employment

	(1)	(2)	(3)	(4)
	Nonfarm employment / total population$_{t+5}$			
	Local Linear			Local Quadratic
	IK (h)	h/2	2h	IK (h)
Female Legislator	4.19***	4.82***	2.89***	4.28**
	[1.33]	[1.78]	[1.00]	[1.81]
R^2	0.08	0.15	0.04	0.08
N	160	76	263	160
Bandwidth	5.39	2.69	10.78	5.39

The dependent variable is the share of non-farm employment in the constituency population averaged over the election term. $FemaleLegislator_t$ is a dummy variable which is 1 for a female legislator and 0 for a male legislator in mixed gender races. Column (1) reports estimates from a local linear regression of share of non-farm employment on $FemaleLegislator_t$, using Imbens and Kalyanaraman (2012) optimal bandwidth calculator. The forcing variable is margin of victory in t ($margin_t$), which is the difference between vote shares of the female and male candidates in mixed gender races. Columns (2) and (3) halve and double the optimal bandwidth. Column (4) uses a local quadratic smoothing function. See also Notes to Table 1.

Table 4: Spillovers to Neighbouring Constituencies

	(1)	(2)	(3)	(4)
	Neighbor Average Growth of Light$_{t+1}$			
	Local Linear			Local Quadratic
	IK (h)	h/2	2h	IK (h)
	Panel A: All constituencies			
Female Legislator	2.83	0.89	1.6	1.46
	[1.76]	[2.39]	[1.26]	[2.54]
R^2	0.01	0.01	0	0.01
N	576	309	965	576
Bandwidth	6.63	3.31	13.25	6.63
	Panel B: Without top-coded constituencies			
Female Legislator	2.81	1.19	1.53	1.82
	[1.75]	[2.37]	[1.26]	[2.53]
R^2	0.01	0.01	0	0.01
N	585	314	972	585
Bandwidth	6.87	3.43	13.74	6.87

In Panel A the dependent variable is defined as the average growth of light, $(Log(Light_{t+1} + 1) - Log(Light_t + 1)) * 100$, in neighbouring constituencies, averaged over an election term. Panel B excludes any constituency-year observations that have top-coded light values. See also Notes to Table 1.

Table 5: Legislator Gender and Road Completion

	(1)	(2)	(3)	(4)
	Road Projects			
	Local Linear			Local Quadratic
	IK (h)	h/2	2h	IK (h)
	Panel A: Share of Incomplete Road Projects			
Female Legislator	-0.22*	-0.26*	-0.17*	-0.35*
	[0.12]	[0.15]	[0.08]	[0.18]
R^2	0.04	0.11	0.03	0.05
N	122	63	226	122
Bandwidth	3.29	1.64	6.58	3.29
	Panel B: Number of Road Projects Awarded			
Female Legislator	-1.13	-1.38	-0.88	-1.08
	[0.85]	[1.12]	[0.69]	[1.25]
R^2	0.01	0.03	0.01	0.02
N	255	134	435	255
Bandwidth	6.11	3.05	12.21	6.11

In Panel A, the dependent variable is the share of projects that remain incomplete in total projects awarded, averaged over an election term and in Panel B, the dependent variable is the number of projects awarded. $FemaleLegislator_t$ is a dummy variable which is 1 for a female legislator and 0 for a male legislator in mixed gender races in which a female either won or was a runner-up against a male. Column (1) reports estimates from a local linear regression of share of incomplete road projects on $FemaleLegislator_t$, using Imbens and Kalyanaraman (2012) optimal bandwidth calculator. The forcing variable is margin of victory in t ($margin_t$), which is the difference between vote shares of the female and male candidates in mixed gender races. Columns (2) and (3) halve and double the optimal bandwidth. Column (4) uses a local quadratic smoothing function. See also Notes to Table 1.

Table 6: Legislator Gender and Asset Growth

	(1)	(2)	(3)	(4)
	Growth of Assets			
	Local Linear			Local Quadratic
	IK (h)	h/2	2h	IK (h)
Female Legislator	-0.60**	-0.49	-0.31*	-0.46
	[0.26]	[0.27]	[0.16]	[0.43]
R^2	0.14	0.31	0.02	0.22
N	59	27	111	59
Bandwidth	3.64	1.82	7.29	3.64

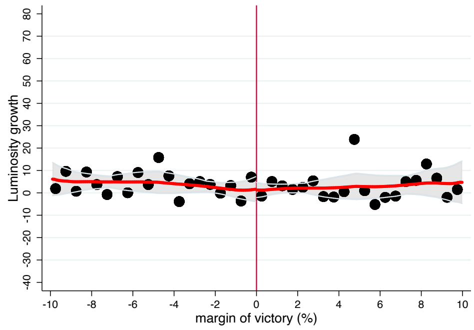
The dependent variable is the growth rate of a legislator's assets over the election term, $(Log(Assets_{t+1} + 1) - Log(Assets_t + 1))$. The sample only considers legislators who re-contest the next election. $FemaleLegislator_t$ is a dummy variable which is 1 for a female legislator and 0 for a male legislator. The standard errors are clustered at the state level. See also Notes to Table 1.

Table 7: Heterogeneity by Party, Legislator and State Characteristics

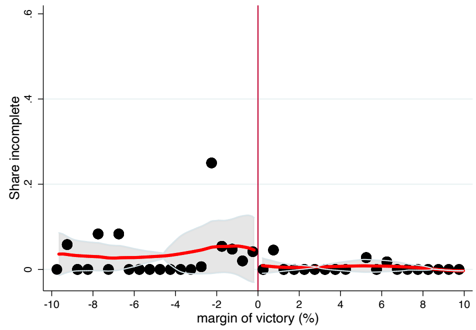
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Aligned	**Non-Aligned**	**Female Party Head**	**Male Party Head**	**Educated**	**Not Educated**	**General**	**SC/ST**	**Incumbent**	**Non-incumbent**	**More Developed**	**Less Developed**
Female Legislator	15.67***	10.66	-3.25	19.72***	33.48**	-0.64	45.39*	-16.32	13.67*	4.48	9.16	20.37*
	[5.07]	[7.71]	[4.04]	[7.25]	[16.16]	[4.97]	[23.37]	[13.57]	[7.53]	[5.27]	[5.75]	[10.56]
R^2	0.04	0.02	0.03	0.04	0.08	0.08	0.13	0.04	0.02	0.02	0.02	0.03
N	337	332	148	487	151	32	88	37	361	214	322	258
Bandwidth	7.92	8.05	8.82	7.01	6.63	8.44	8.54	13.98	7.46	10.58	8.3	5.45

The dependent variable is the growth of light averaged over an election term against female margin of victory in mixed gender races. Aligned constituencies are constituencies that were aligned with the state government for an entire election term and non-aligned constituencies are those that were either not aligned with the state government or were aligned only for a fraction of an election term. Female Party Head is 1 for a constituency which is aligned with a female-headed party and 0 otherwise. Educated is 1 for a legislator who has completed 10th grade or higher and 0 otherwise. Incumbent is a dummy that is 1 if a legislator is also an incumbent and 0 else. More developed states is 1 for states with HDI above the median value in 1999 and 0 otherwise. All models run local linear regressions using a bandwidth determined by Imbens and Kalyanaraman (2012) optimal bandwidth calculator. See also Notes to Table 1.

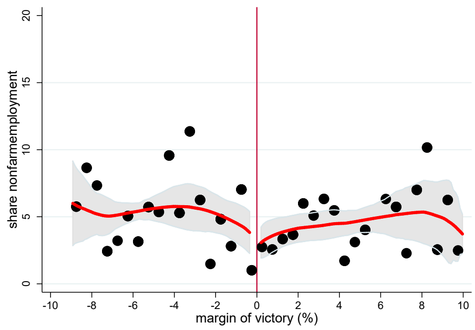
Figure 1: Continuity Checks- RD Tests of Balance on Predetermined Covariates



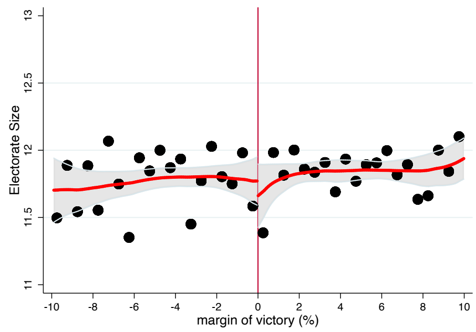
(a) Growth of Light in t-1



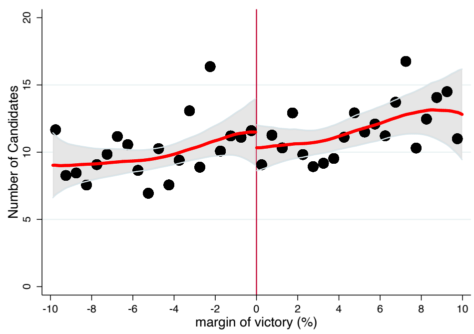
(b) Share Incomplete Roads in t-1



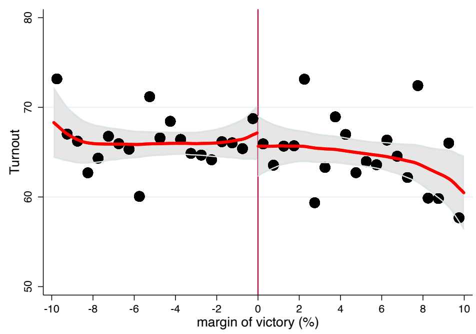
(c) Share of non-farm employment in t-1



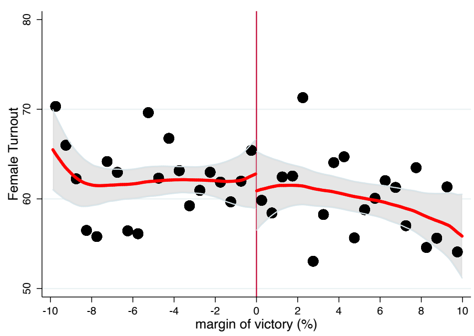
(d) Electorate Size in t-1



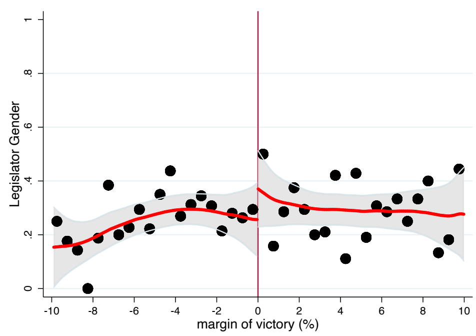
(e) Number of candidates in t-1



(f) Turnout in t-1



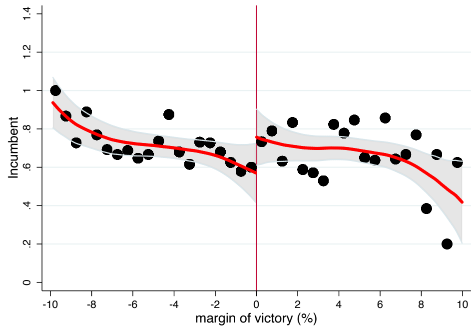
(g) Female Turnout in t-1



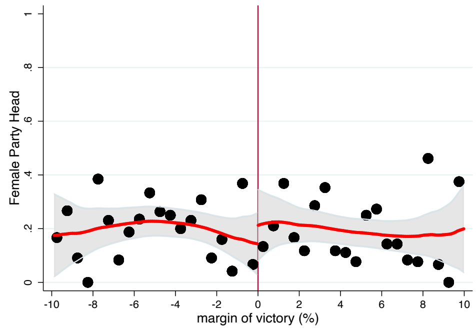
(h) Female legislator in t-1

Each variable is plotted against female margin of victory in mixed gender races, which is the difference between vote shares of a female candidate and male candidate in mixed gender races. Mixed gender races are in which a woman either won or was a runnerup against a man. (Continued on the next page)

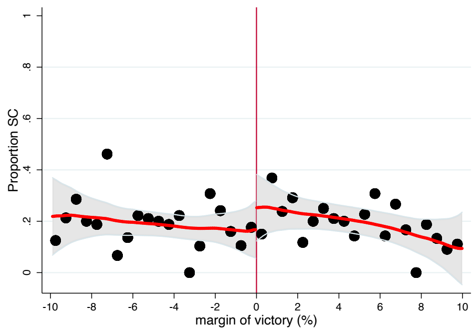
Figure 1: Continuity Checks- RD Tests of Balance on Predetermined Covariates



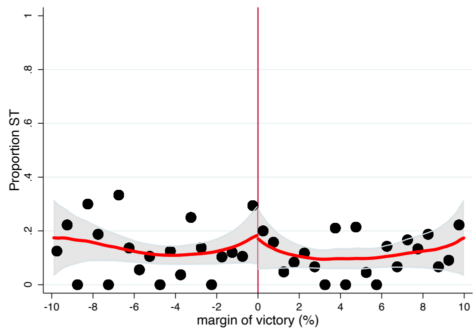
(i) Incumbent in t-1



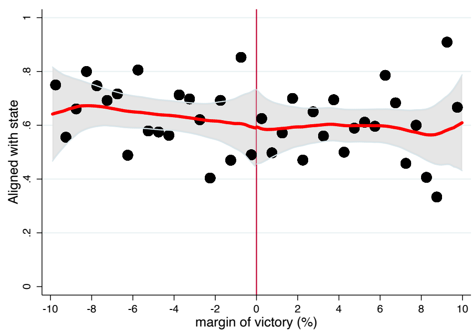
(j) Female party head in t-1



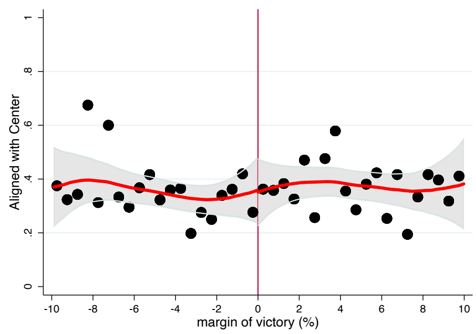
(k) SC-reserved constituency in t-1



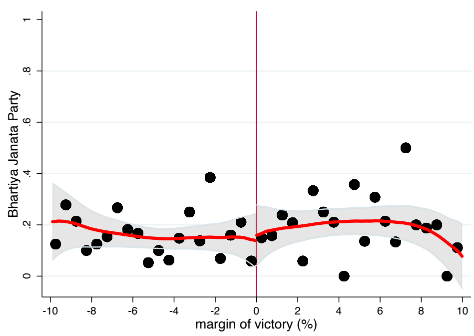
(l) ST-reserved constituency in t-1



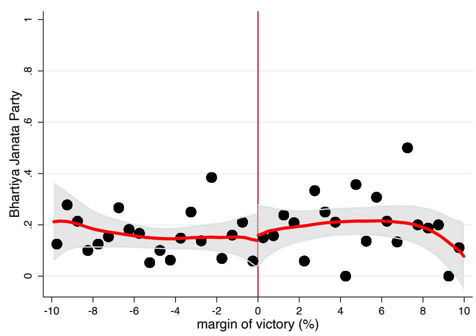
(m) Aligned with state government in t-1



(n) Aligned with central government in t-1



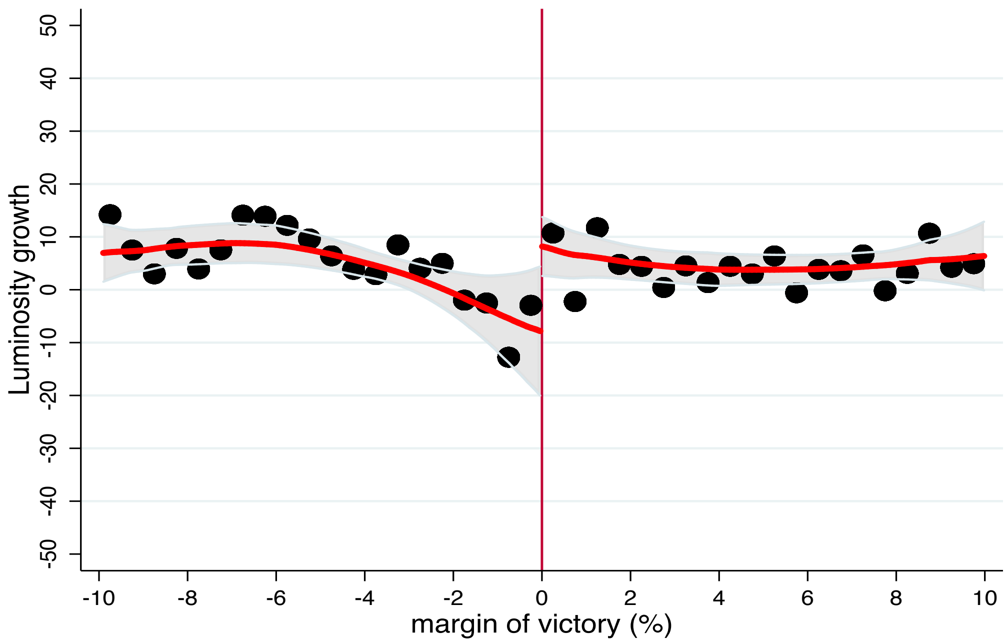
(o) Aligned with state government in t-1



(p) Aligned with central government in t-1

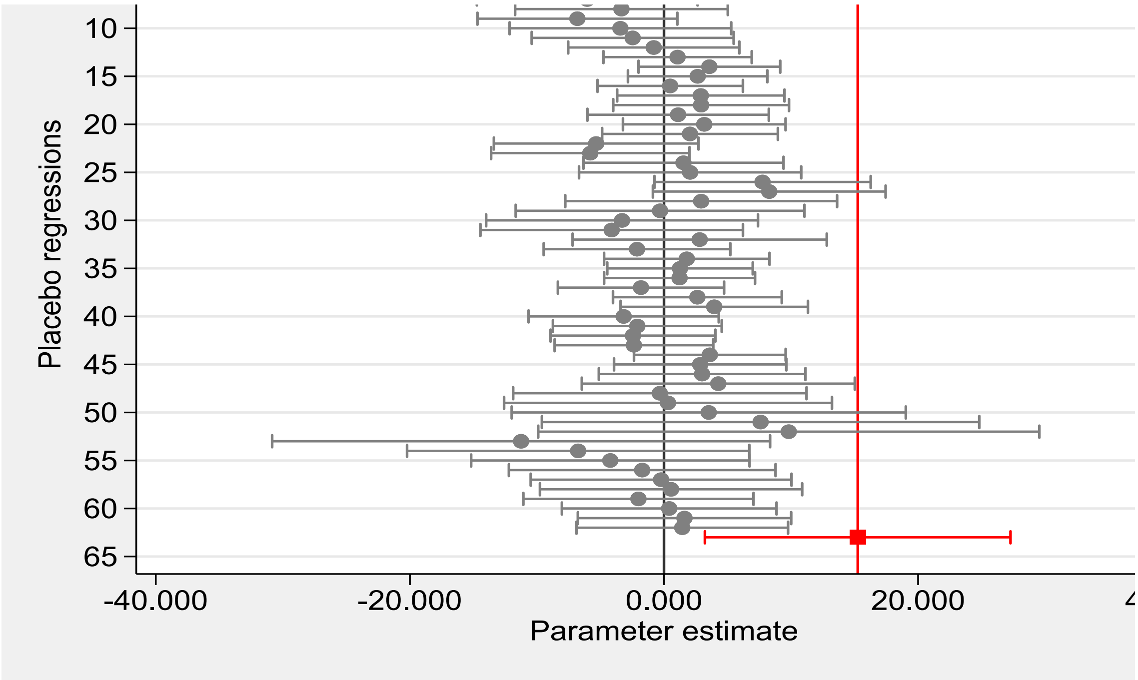
By construction, margin of victory is positive for female legislators and negative for male legislators. Each dot represents a local average in bins of 0.5 percent margin of victory. The solid lines are the smooth curves estimated using a local linear regression of each variable on margin of victory separately on either side of the cutoff of zero, triangular kernel and a 5 percent bandwidth. The figures also depict a 95 percent confidence interval for each variable around the solid curve.

Figure 2: Legislator Gender and Luminosity Growth



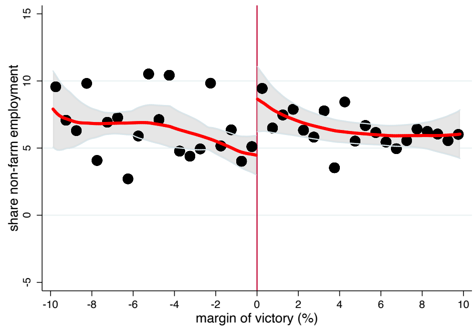
The dependent variable is the growth of light averaged over an election term against female margin of victory in mixed gender races. The victory margin is the difference between the vote shares of the female and male candidate in mixed gender races. These are races in which a man and a woman are the top two vote-winners. By construction, the margin of victory is positive when women win and negative when men win. Each dot represents a local average in bins of 0.5 percent margin of victory. The solid lines are the smooth curves estimated using a local linear regression of each variable on margin of victory separately on either side of the cutoff of zero, using a triangular kernel and a 5 percent bandwidth. The figures also depict a 95 percent confidence interval for each variable around the solid curve.

Figure 3: Legislator Gender and Luminosity Growth: Placebo regressions with fake thresholds

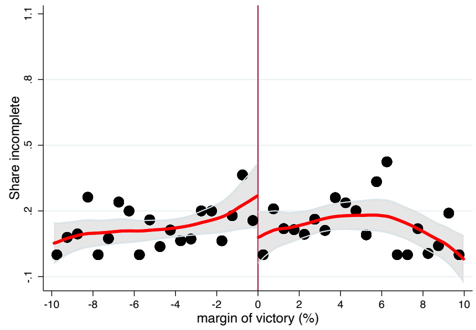


This figure displays 62 placebo coefficient estimates for the gender dummy with confidence intervals. We obtain 31 placebo coefficients by estimating Equation 1 on a subsample of male winners, redefining the margin of victory as *placebo margin of victory = true margin of victory - x* in steps of 0.5 within the interval { -20,-5}, thus effectively defining 31 placebo thresholds. We repeat this exercise on the subsample of female winners. The true coefficient estimate and confidence intervals are highlighted in red. Most placebo coefficients are not significantly different from zero and smaller than the true coefficient.

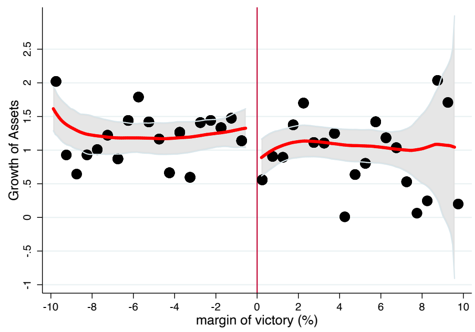
Figure 4: Legislator Gender and Other Economic Outcomes



(a) Share of Non-farm Employment



(b) Share of Incomplete Roads



(c) Asset Growth

The dependent variable is the share of non-farm employment in Panel (a), the share of incomplete roads in Panel (b), and Asset growth in Panel (c). In Panel (c) the sample is restricted to candidates who re-contest the next election. Each variable is plotted against female margin of victory in mixed gender races, which is the difference between vote shares of a female candidate and male candidate in mixed gender races. Mixed gender races are in which a woman either won or was a runnerup against a man. By construction, the margin of victory is positive when women win and negative when men win. Each dot represents a local average in bins of 0.5 percent margin of victory. The solid lines are the smooth curves estimated using a local linear regression of each variable on margin of victory separately on either side of the cutoff of zero, using a triangular kernel and a 5 percent bandwidth. The figures also depict a 95 percent confidence interval for each variable around the solid curve.

Table A.1: Variable Definitions and Data Availability

Variable	Definition (Years of Data Availability)
Growth of Light	Log difference in light density between periods t+1 and t (1992-2012)
Share of Non-farm Employment	Share of Non-farm employment in total population (1990, 1995, 2005, 2013)
Share of Incomplete Projects	Share of incomplete projects in total projects awarded (2004-2012)
Growth of Assets	Log difference in total assets of legislators who recontest the next election (2004-2012)
Log Electors	Natural log of number of registered voters (1992-2008)
Number Candidates	Number of candidates contesting (1992-2008)
Turnout (%)	Percentage of registered voter turned out to vote (1992-2008)
Female Turnout (%)	Percentage of registered women voter turned out to vote (1992-2008)
Female Legislator	is 1 if a woman won and 0 otherwise. (1992-2008)
Incumbent	is 1 if a candidate is incumbent and 0 otherwise (1992-2008)
Female Party Head	is 1 if a party is headed by a woman and 0 otherwise (1992-2008)
SC-reserved Constituency	is 1 if the constituency is reserved for a Scheduled Caste (SC) candidate and 0 otherwise (1992-2008)
ST-reserved Constituency	is 1 if the constituency is reserved for a Scheduled Tribe (ST) candidate and 0 otherwise (1992-2008)
Aligned with State Govt	is 1 if the constituency was aligned with the state ruling party or coalition for the entire election term and 0 otherwise (1992-2008)
Aligned with Central Govt	is 1 if the constituency was aligned with the central ruling party or coalition for the entire election term and 0 otherwise (1992-2008)
INC Legislator	is 1 if a candidate belongs to the Indian National Congress (INC) party and 0 otherwise (1992-2008)
BJP Legislator	is 1 if a candidate belongs to the Bhartiya Janata Party (BJP) party and 0 otherwise (1992-2008)
Educated	is 1 if a candidate has a 10 or more years of education and 0 otherwise (2004-2008)
Legislator's Age	Age of a legislator in years (2004-2008)
Log Total Assets	Log(Total Assets+1) where Total Assets are the self-reported assets in the affidavits (2004-2008)
Log Total Liability	Log(Total Liabilities+1) where Total Liabilities are the self-reported liabilities in the affidavits (2004-2008)
Criminal	is 1 if a candidate has a criminal case pending against him or her and 0 otherwise (2004-2008)

Table A.2: Summary Statistics

	Full Sample					Mixed Gender Sample				
	N	Mean	SD	min	max	N	Mean	SD	min	max
Panel A: Main Outcome Variables										
Growth of Light Density	15520	7.46	39.6	-829.8	916.3	1623	4.40	31.6	-829.8	318.2
Share Nonfarm Employment	4255	5.88	4.94	0	171.9	477	6.53	4.46	0	41.2
Share of Incomplete Projects	4198	0.11	0.26	0	1	561	0.12	0.26	0	1
Growth of Assets	1948	1.06	0.85	-5.08	5.84	258	1.15	0.81	-1.01	3.75
Panel B: Predetermined Constituency Characteristics										
Log Electors t-1	12402	11.7	0.81	7.93	14.2	1377	11.8	0.61	8.76	13.1
Number Candidates t-1	10686	11.5	13.1	1	1033	1252	11.4	29.8	2	1033
Turnout t-1	12402	66.1	12.7	1.07	126.0	1377	65.3	11.7	4.48	96.1
Female Turnout t-1	10686	60.7	13.6	0.82	100.0	1252	61.0	13.2	4.32	95.7
Female MLA t-1	12402	0.050	0.22	0	1	1377	0.27	0.44	0	1
Incumbent t-1	10686	0.72	0.45	0	1	1252	0.69	0.46	0	1
Female Party Head t-1	10686	0.13	0.34	0	1	1252	0.16	0.37	0	1
SC-reserved Constituency t-1	12568	0.14	0.35	0	1	1393	0.20	0.40	0	1
ST-reserved Constituency t-1	12568	0.14	0.35	0	1	1393	0.13	0.33	0	1
Aligned with State Govt t-1	12568	0.61	0.48	0	1	1393	0.64	0.47	0	1
Aligned with Central Govt t-1	12402	0.33	0.41	0	1	1377	0.34	0.40	0	1
INC Legislator t-1	12568	0.29	0.46	0	1	1393	0.28	0.45	0	1
BJP Legislator t-1	12568	0.20	0.40	0	1	1393	0.18	0.38	0	1
Panel C: Candidate Characteristics										
Educated	2927	0.87	0.34	0	1	408	0.84	0.36	0	1
MLA's Age	3056	49.3	9.96	25	84	423	48.1	10.1	25	80
Total Assets ('000 Rs.)	3106	10771.2	31028.5	0	714083.8	430	9904.5	27855.4	0	330990.9
Total Liability ('000 Rs.)	2759	1102.6	6213.9	0	192653.3	375	686.8	3232.3	0	54852.6
Criminal	3615	0.29	0.45	0	1	515	0.22	0.41	0	1

Notes: Full Sample is the sample of the all races during the period 1992-2008. Mixed Gender sample is the sample of races where a female candidate placed either first or second against a male candidate. The unit of observation is an Assembly constituency. Each data point is a constituency-election year observation. For annual data, we compute election term averages.

Table A.3: Luminosity Elasticity of GDP

	(1)	(2)	(3)
	Log(State GDP Per Capita)		
Log Light Per Capita	0.38***	0.34***	0.15***
	[0.11]	[0.09]	[0.04]
Method	OLS	FE	FE with Year Dummies
R^2	0.28	0.82	0.98
N	474	474	474

The above is a panel of 29 Indian states over the period 1992-2009. The standard errors are clustered at the state level and are in the parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A.4: Balance in Constituency Characteristics- Female vs. Male legislators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All Mixed Gender races			Mixed Gender Races within 5% margin			RD estimate
	Female Legislators	Male Legislators	Difference	Female Legislators	Male Legislators	Difference	
Growth of Light Density t-1	3.505	6.761	-3.256	3.048	3.511	-0.464	-0.0496
	(29.052)	(42.261)	(2.042)	(30.402)	(30.140)	(3.200)	(2.443)
Share Incompete Projects t-1	0.032	0.032	-0.000	0.003	0.047	-0.044	0.00934
	(0.150)	(0.127)	(0.016)	(0.021)	(0.175)	(0.027)	(0.0452)
Share Nonfarm Employment t-1	1.461	1.497	-0.036	1.296	1.579	-0.283	-0.934
	(0.582)	(0.626)	(0.093)	(0.547)	(0.657)	(0.181)	(1.123)
Log Electors t-1	11.825	11.777	0.047	11.815	11.818	-0.003	-0.230
	(0.567)	(0.644)	(0.033)	(0.630)	(0.577)	(0.061)	(0.236)
Number Candidates t-1	10.761	11.903	-1.142	10.573	10.560	0.014	-1.618
	(7.300)	(40.533)	(1.689)	(6.975)	(7.274)	(0.758)	(1.292)
Turnout t-1	64.993	65.580	-0.588	65.588	66.104	-0.516	-0.635
	(12.104)	(11.326)	(0.632)	(11.542)	(10.427)	(1.119)	(1.812)
Female Turnout t-1	60.763	61.258	-0.494	61.192	62.262	-1.070	-0.844
	(13.816)	(12.668)	(0.749)	(13.662)	(12.285)	(1.374)	(2.246)
Female MLA t-1	0.305	0.238	0.066***	0.311	0.301	0.009	0.120
	(0.461)	(0.426)	(0.024)	(0.464)	(0.460)	(0.047)	(0.129)
Incumbent t-1	0.666	0.707	-0.041	0.713	0.684	0.029	0.222
	(0.472)	(0.455)	(0.026)	(0.454)	(0.466)	(0.049)	(0.142)
Female Party Head t-1	0.152	0.176	-0.024	0.201	0.202	-0.001	0.0400
	(0.359)	(0.381)	(0.021)	(0.402)	(0.403)	(0.043)	(0.109)
SC-reserved Constituency t-1	0.216	0.190	0.026	0.223	0.171	0.053	0.0908
	(0.412)	(0.392)	(0.022)	(0.418)	(0.377)	(0.040)	(0.118)
ST-reserved Constituency t-1	0.113	0.137	-0.024	0.112	0.114	-0.002	-0.0424
	(0.317)	(0.344)	(0.018)	(0.316)	(0.318)	(0.032)	(0.131)
Aligned with State Govt t-1	0.627	0.656	-0.030	0.593	0.619	-0.026	0.00720
	(0.476)	(0.468)	(0.025)	(0.482)	(0.474)	(0.049)	(0.127)
Aligned with Central Govt t-1	0.335	0.346	-0.012	0.390	0.322	0.068	0.001
	(0.395)	(0.411)	(0.022)	(0.408)	(0.410)	(0.042)	(0.116)
INC Legislator t-1	0.261	0.291	-0.030	0.240	0.275	-0.035	0.0882
	(0.440)	(0.454)	(0.024)	(0.428)	(0.448)	(0.045)	(0.117)
BJP Legislator t-1	0.192	0.169	0.023	0.201	0.147	0.054	0.0239
	(0.394)	(0.375)	(0.021)	(0.402)	(0.355)	(0.038)	(0.0962)

Columns (1)-(3) compare unconditional means of predetermined constituency variables between female-led constituencies with male-led constituencies in our mixed gender races sample. Columns (4)-(6) additionally condition the sample to close races that are decided by margin of 5% or less. Column (7) reports the RD estimates of the difference in the constituency characteristics. Standard deviations in parentheses except in columns (3), (6) and (7) which have standard errors in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels from tests of no differences, respectively.

Table A.5: Legislator Gender- Impacts over the Legislative Term

	(1)	(2)	(3)
	Local Linear		
	IK (h)	h/2	2h
	Panel A: First Two Years		
Female Legislator	8.55	12.49	3.1
	[6.66]	[10.32]	[5.43]
R^2	0	0.01	0
N	811	475	1,208
Bandwidth	11.86	5.93	23.72
	Panel B: Last Two Years		
Female Legislator	20.41	30.47	7.03
	[15.38]	[25.09]	[10.33]
R^2	0.01	0.01	0
N	617	345	1,007
Bandwidth	8.82	4.41	17.63

In Panel A the dependent variable is the average growth rate for first two years of an election term. In Panel B the dependent variable is the average growth rate for the last two years of an election term. Column (1) runs a local linear regression using the optimal bandwidth calculator. Columns (2) and (3) halve and double the optimal bandwidth. See also Notes to Table 1.

Table A.6: RD Check for Road Completion- Constituency Population Thresholds

	(1)	(2)	(3)
	Average Village Population	Proportion of Villages with Population>=500	Proportion of Villages with Population>=1000
Female Legislator	155.15	-0.08	0.01
	[500.07]	[0.10]	[0.12]
R^2	0	0.05	0.01
N	281	72	104
Bandwidth	10.07	2.28	3.23

The village population data is from 2001 census. $FemaleLegislator_t$ is a dummy variable which is 1 for a female legislator and 0 for a male legislator in mixed gender races. The forcing variable is margin of victory ($margin_t$), which is the difference between vote shares of the winning and runnerup candidates in mixed gender races. Column (1) reports estimates from a local linear regression of average village population on $FemaleLegislator_t$ using a bandwidth determined by Imbens and Kalyanaraman (2012) optimal bandwidth calculator. The dependent variables are proportion of villages with population of 500 or more in Column (2) and proportion of villages with population of 1000 or more in Column (3). See also Notes to Table 1.

Table A.7: Associations of Alternative Outcomes with Luminosity Growth

	(1)	(2)
	Growth of Light	
	Panel A: Roads	
Share of Incomplete Projects	-11.15*	-23.86**
	[6.74]	[11.41]
R^2	0.03	0.32
N	561	561
Method	OLS	FE
	Panel B: Assets	
Growth of Assets	-3.09**	-1.64
	[1.45]	[1.19]
R^2	0.01	0.26
N	258	258
Method	OLS	OLS
	Panel C: Non-farm Employment	
Share Non-farm Employment	1.12***	2.07*
	[0.41]	[1.17]
R^2	0.02	0.5
N	426	426
Method	OLS	FE

FE refers to fixed effects, which are constituency and election term fixed effects. In the regressions for road completion, both columns control for the number of road projects awarded, the regressions for asset growth control for the baseline level of assets. Standard errors are in parentheses and are clustered at the constituency level in Panels A and C, and at the state level in Panel B. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A.8: Legislator Gender and Luminosity Growth in Subsamples

	(1)	(2)	(3)	(4)
	Growth of $Light_{t+1}$			
	Local Linear			Local Quadratic
	IK (h)	h/2	2h	IK (h)
	Panel A: Incomplete Road Projects Subsample			
Female Legislator	21.75	4.7	18.97	3.91
	[17.20]	[17.08]	[11.67]	[20.44]
R^2	0.04	0.05	0.04	0.05
N	122	63	226	122
Bandwidth	3.29	1.64	6.58	3.29
	Panel B: Growth of Assets Subsample			
Female Legislator	55.61*	58.74	32.62*	62.84
	[32.49]	[65.20]	[18.28]	[68.70]
R^2	0.12	0.14	0.09	0.13
N	59	27	111	59
Bandwidth	3.64	1.82	7.29	3.64

This table replicates the results in Table 1 for the subsamples used for the results in Panel A of Table 5 (legislator gender and road completion) and Table 6 (legislator gender and asset growth). See also Notes to Tables 1, 5, Table 6.

Table A.9: Balance in Candidate Characteristics- Female vs. Male Legislators

	(1)	(2)	(3)	(4)	(5)	(6)
	All Mixed Gender races			**Mixed Gender Races within 5% margin**		
	Female Legislators	**Male Legislators**	**Difference**	**Female Legislators**	**Male Legislators**	**Difference**
Educated	0.800	0.883	-0.083**	0.762	0.870	-0.108
	(0.401)	(0.323)	(0.036)	(0.429)	(0.339)	(0.067)
MLA's Age	46.500	49.680	-3.180***	45.646	48.671	-3.025*
	(10.344)	(9.676)	(0.973)	(11.341)	(9.939)	(1.811)
Total Assets ('000 Rs.)	12588.207	7504.576	5083.631*	7859.415	6061.714	1797.701
	(37190.682)	(14978.659)	(2682.717)	(13907.696)	(9860.372)	(2026.900)
Total Liability ('000 Rs.)	777.249	605.144	172.105	741.619	724.553	17.066
	(4362.568)	(1653.743)	(334.589)	(2509.085)	(2337.882)	(443.373)
Criminal	0.135	0.284	-0.149***	0.103	0.321	-0.218***
	(0.342)	(0.452)	(0.036)	(0.306)	(0.470)	(0.066)

These candidate characteristics are available for elections held between 2004-2008 from the self-reported candidate affidavits. There is only one election per state during the time period considered. Columns (1)-(3) compare unconditional means of candidate characteristics between female-led constituencies with male-led constituencies in our mixed gender races sample. Columns (4)-(6) additionally condition the sample to close races that are decided by margin of 5% or less. Standard deviations in parentheses except in columns (3) and (6) which have standard errors in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels from tests of no differences, respectively.

Table A.10: Do Candidate Criminal Records Impact Winning?

	(1)	(2)
	Probability of Winning	
	Panel A: Full Sample	
	OLS	IK(h)
Criminal	0.0356**	-0.00833
	(0.0164)	(0.0283)
N	4828	1637
	Panel B: Mixed Gender Sample	
Criminal	0.0714	0.0531
	(0.0503)	(0.0936)
N	722	238

This table estimates how having pending criminal accusations at the time of contesting an election affects the probability of winning. In Panel A, the sample is races in which a candidate with criminal accusations either won or was the runnerup against a candidate with no accusations. In Panel B, we consider close close races with a victory margin of 5% or less in which a candidate with criminal accusations either won or was the runner-up against a candidate with no accusations. The dependent variables is a dummy variable which is 1 if a candidate wins and 0 otherwise. Criminal is a dummy variable which is 1 if a candidate has any criminal charges against him or her and 0 otherwise.

Table A.11: Heterogeneity: Impacts of Legislator Gender on Non-Farm Employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Aligned	**Non-Aligned**	**Female Party Head**	**Male Party Head**	**Educated**	**Not Educated**	**Incumbent**	**Non-incumbent**	**More Developed**	**Less Developed**
Female Legislator	5.55***	2.97*	1.38	4.44***	3.74**	-0.71	4.87***	4.31*	1.64	4.35***
	[2.03]	[1.56]	[1.29]	[1.34]	[1.66]	[2.81]	[1.52]	[2.47]	[1.51]	[1.65]
R^2	0.16	0.04	0.42	0.08	0.1	0.08	0.09	0.09	0.02	0.08
N	83	96	20	148	94	29	110	56	70	121
Bandwidth	5.57	7.26	4.8	5.98	7.71	10.13	6.3	8.3	8.09	6.29

The dependent variable is the share of non-farm employment in total constituency population averaged over the election term against female margin of victory in mixed gender races. Aligned constituencies are constituencies that were aligned with the state government for an entire election term and non-aligned constituencies are those that were either not aligned with the state government or were aligned only for a fraction of an election term. Female Party Head is 1 for a constituency which is aligned with a female-headed party and 0 otherwise. Educated is 1 for a legislator who has completed 10th grade or higher and 0 otherwise. Incumbent is a dummy that is 1 if a legislator is also an incumbent and 0 else. More developed states is 1 for states with HDI above the median value in 1999 and 0 otherwise. All models run local linear regressions using a bandwidth determined by Imbens and Kalyanaraman (2012) optimal bandwidth calculator. See also Notes to Table 1.

Table A.12: Balance in Constituency and Candidate Characteristics: Close vs. non-close and mixed gender vs. non-mixed gender constituencies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All			**Men**			**Women**		
	Close	**Non-Close**	**Difference**	**Close**	**Non-Close**	**Difference**	**Close**	**Non-Close**	**Difference**
Panel A: Predetermined Constituency Characteristics									
Growth of Light Density t-1	3.293	5.974	-2.681	3.511	8.008	-4.497	3.048	3.681	-0.633
	(30.222)	(38.854)	(2.277)	(30.140)	(46.041)	(3.605)	(30.402)	(28.549)	(2.632)
Share Incompete Projects t-1	0.026	0.034	-0.008	0.047	0.025	0.022	0.003	0.043	-0.040
	(0.129)	(0.143)	(0.017)	(0.175)	(0.097)	(0.022)	(0.021)	(0.174)	(0.026)
Lag Share Nonfarm Employmen	1.459	1.488	-0.029	1.579	1.462	0.117	1.296	1.517	-0.221
	(0.623)	(0.600)	(0.104)	(0.657)	(0.615)	(0.144)	(0.547)	(0.588)	(0.150)
Log Electors t-1	11.817	11.793	0.024	11.818	11.761	0.058	11.815	11.828	-0.013
	(0.601)	(0.613)	(0.037)	(0.577)	(0.669)	(0.053)	(0.630)	(0.542)	(0.050)
Number Candidates t-1	10.566	11.679	-1.114	10.560	12.459	-1.900	10.573	10.832	-0.259
	(7.128)	(34.992)	(1.868)	(7.274)	(47.979)	(3.471)	(6.975)	(7.428)	(0.671)
Turnout t-1	65.868	65.087	0.781	66.104	65.372	0.732	65.588	64.766	0.822
	(10.941)	(11.975)	(0.702)	(10.427)	(11.668)	(0.927)	(11.542)	(12.316)	(1.069)
Female Turnout t-1	61.770	60.726	1.045	62.262	60.842	1.420	61.192	60.599	0.593
	(12.929)	(13.332)	(0.827)	(12.285)	(12.813)	(1.084)	(13.662)	(13.887)	(1.269)
Female MLA t-1	0.306	0.255	0.050*	0.301	0.213	0.088**	0.311	0.303	0.008
	(0.461)	(0.436)	(0.027)	(0.460)	(0.410)	(0.035)	(0.464)	(0.460)	(0.041)
Incumbent t-1	0.697	0.684	0.014	0.684	0.717	-0.033	0.713	0.648	0.065
	(0.460)	(0.465)	(0.029)	(0.466)	(0.451)	(0.039)	(0.454)	(0.478)	(0.043)
Female Party Head t-1	0.202	0.150	0.052**	0.202	0.165	0.037	0.201	0.133	0.068**
	(0.402)	(0.357)	(0.023)	(0.403)	(0.372)	(0.033)	(0.402)	(0.340)	(0.033)
SC-reserved Constituency t-1	0.195	0.205	-0.010	0.171	0.198	-0.027	0.223	0.214	0.010
	(0.397)	(0.404)	(0.024)	(0.377)	(0.398)	(0.032)	(0.418)	(0.410)	(0.036)
ST-reserved Constituency t-1	0.113	0.131	-0.018	0.114	0.146	-0.032	0.112	0.113	-0.002
	(0.317)	(0.337)	(0.020)	(0.318)	(0.353)	(0.028)	(0.316)	(0.317)	(0.028)
Aligned with State Govt t-1	0.607	0.656	-0.049*	0.619	0.671	-0.053	0.593	0.639	-0.046
	(0.477)	(0.469)	(0.028)	(0.474)	(0.464)	(0.038)	(0.482)	(0.474)	(0.042)
Aligned with Central Govt t-1	0.353	0.336	0.017	0.322	0.356	-0.034	0.390	0.314	0.076**
	(0.410)	(0.402)	(0.024)	(0.410)	(0.412)	(0.034)	(0.408)	(0.389)	(0.035)
INC Legislator t-1	0.259	0.284	-0.025	0.275	0.297	-0.022	0.240	0.269	-0.029
	(0.439)	(0.451)	(0.027)	(0.448)	(0.457)	(0.037)	(0.428)	(0.444)	(0.039)
BJP Legislator t-1	0.172	0.182	-0.011	0.147	0.178	-0.031	0.201	0.188	0.013
	(0.378)	(0.386)	(0.023)	(0.355)	(0.383)	(0.030)	(0.402)	(0.391)	(0.035)
Panel B: Candidate Characteristics									
Educated	0.818	0.855	-0.037	0.870	0.889	-0.019	0.762	0.818	-0.056
	(0.387)	(0.353)	(0.039)	(0.339)	(0.315)	(0.047)	(0.429)	(0.387)	(0.061)
MLA's Age	47.246	48.582	-1.336	48.671	50.185	-1.514	45.646	46.899	-1.253
	(10.691)	(9.818)	(1.048)	(9.939)	(9.537)	(1.386)	(11.341)	(9.861)	(1.556)
Total Assets ('000 Rs.)	6902.366	11338.543	-4436.177	6061.714	8202.431	-2140.717	7859.415	14815.537	-6956.121
	(11914.105)	(32770.404)	(2867.379)	(9860.372)	(16893.489)	(2120.832)	(13907.696)	43970.661)	(5587.216)
Total Liability ('000 Rs.)	732.233	665.473	66.760	724.553	544.983	179.570	741.619	792.765	-51.146
	(2406.121)	(3559.485)	(358.284)	(2337.882)	(1174.566)	(249.937)	(2509.085)	(4967.294)	(713.294)
Criminal	0.224	0.212	0.012	0.321	0.268	0.053	0.103	0.148	-0.045
	(0.418)	(0.409)	(0.040)	(0.470)	(0.444)	(0.059)	(0.306)	(0.356)	(0.049)

Columns (1)-(3) compare mixed gender races in which victory margin was within 5% (close races) with mixed gender races with a larger victory margin (non-close races). Columns (4)-(6) further break down close races by the gender of the legislator. Columns (7)-(9) compare non-close races by the gender of the legislator. Standard deviations in parentheses except in columns (3) and (6) which have standard errors in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels from tests of no differences , respectively.

Table A.13: External validity: candidates with positive and negative party swings

	(1)	(2)
	Growth of $Light_{t+1}$	
	Positive party swing	Negative party swing
Female Legislator	14.84**	15.41*
	[7.32]	[8.33]
R^2	0.03	0.04
N	405	255
Bandwidth	7.2	9.37

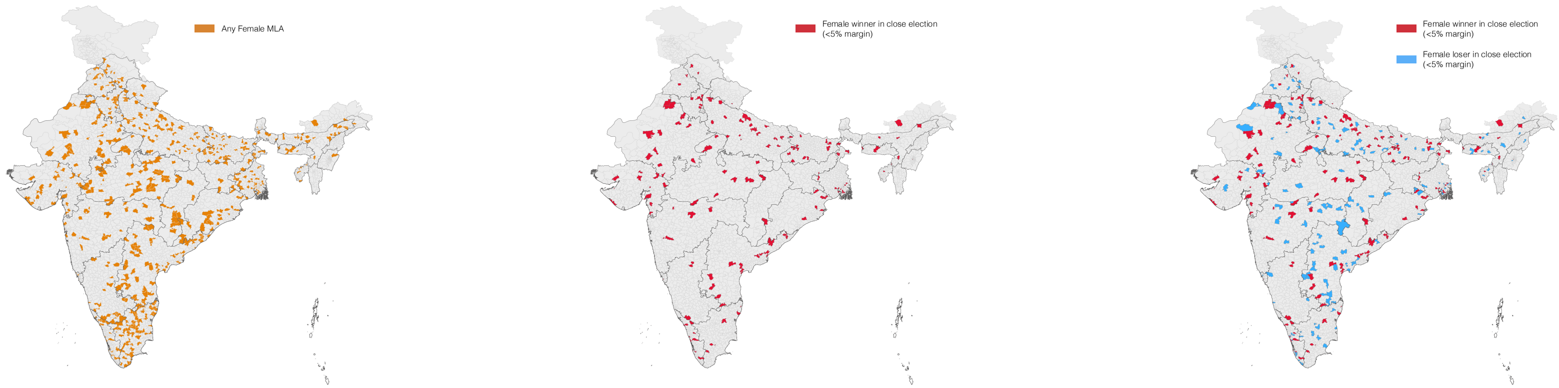
This table replicates the results in column (1) of Table 1 for subsamples of candidates with postive (model 1) and and negative party swings (model 2). Negative and positive party swings are defined based on Equation 4. See also Notes to Table 1.

Table A.14: Re-contest and Re-election Rates by Legislator Gender and Whether Close Election

	(1)	(2)	(3)	(4)	(5)	(6)
	Close			**Non-close**		
	Female	**Male**	**Difference**	**Female**	**Male**	**Difference**
Prob(Winning)	0.180	0.267	-0.087*	0.316	0.356	-0.040
	(0.385)	(0.444)	(0.047)	(0.465)	(0.479)	(0.027)
Prob(Winning|Rerunning)	0.290	0.435	-0.145**	0.524	0.558	-0.033
	(0.456)	(0.498)	(0.069)	(0.500)	(0.497)	(0.037)
Rerunning	0.621	0.613	0.008	0.602	0.637	-0.036
	(0.487)	(0.489)	(0.055)	(0.490)	(0.481)	(0.028)

Columns (1)-(3) compare the likelihood that an incumbent legislator reruns and gets reelected after mixed-gender races in which victory margin was within 5% (Close races). Column (4)-(6) compare the likelihood of re-running and re-election after mixed-gender races with a larger victory margin (Nonclose races). The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels from tests of no differences, respectively.

Figure A.1: The Geography of Women Legislators: 1992-2008.



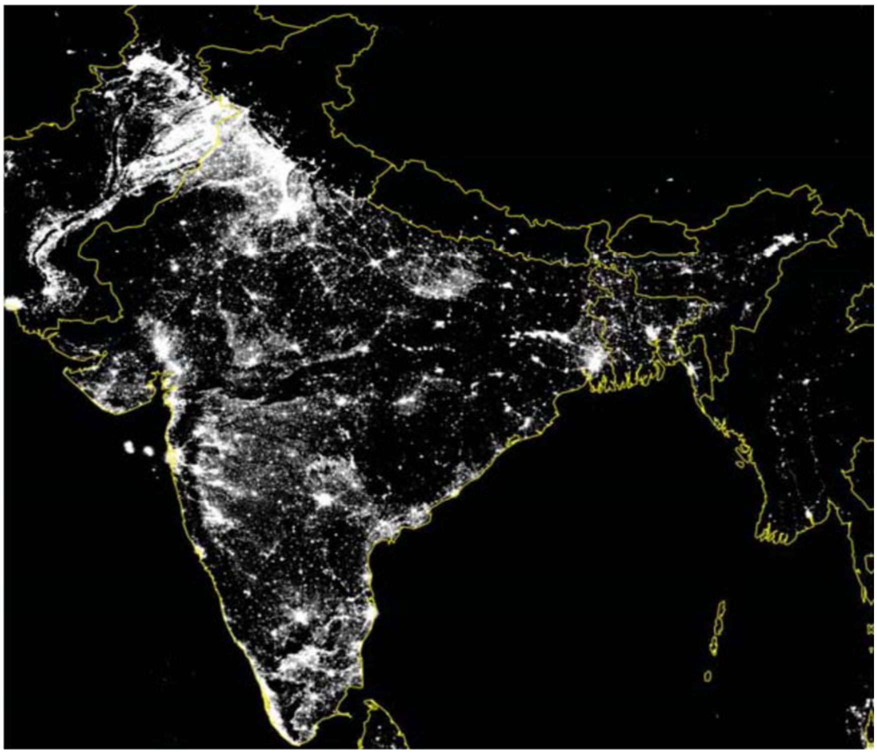
(a) Women legislators / all races

(b) Women legislators / close races

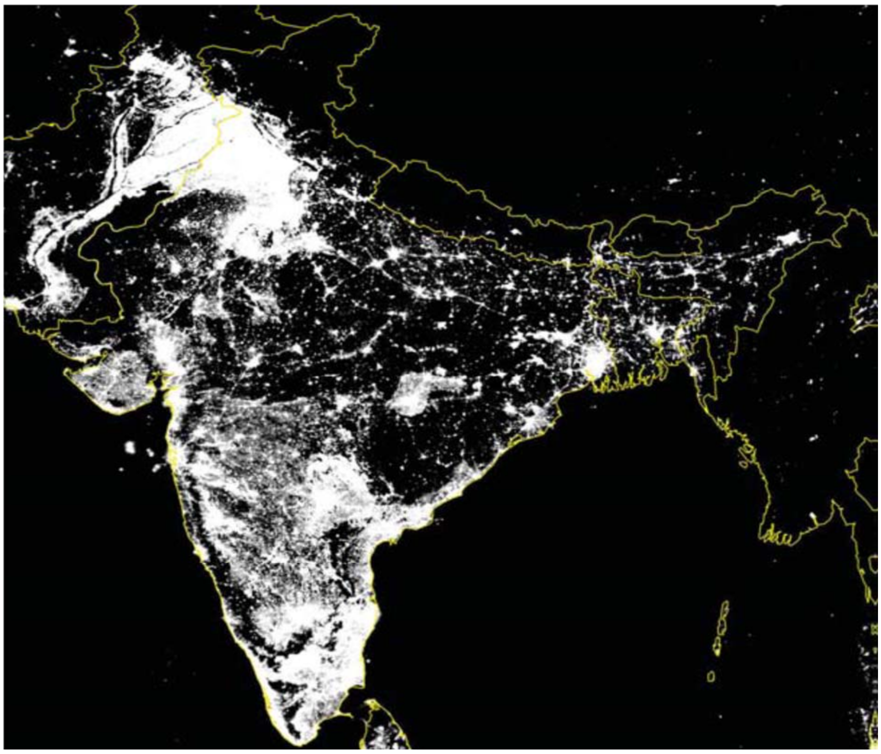
(c) Women and male legislators / close races

Note: Subfigure (a) indicates constituencies in which a female candidate won an assembly constituency seat in state elections between 1992 and 2008. Subfigure (b) indicates constituencies in which the female candidate won in a close mixed-gender election. Subfigure (c) additionally shows constituencies where the female candidate lost in a close mixed-gender election.

Figure A.2: Luminosity in India.



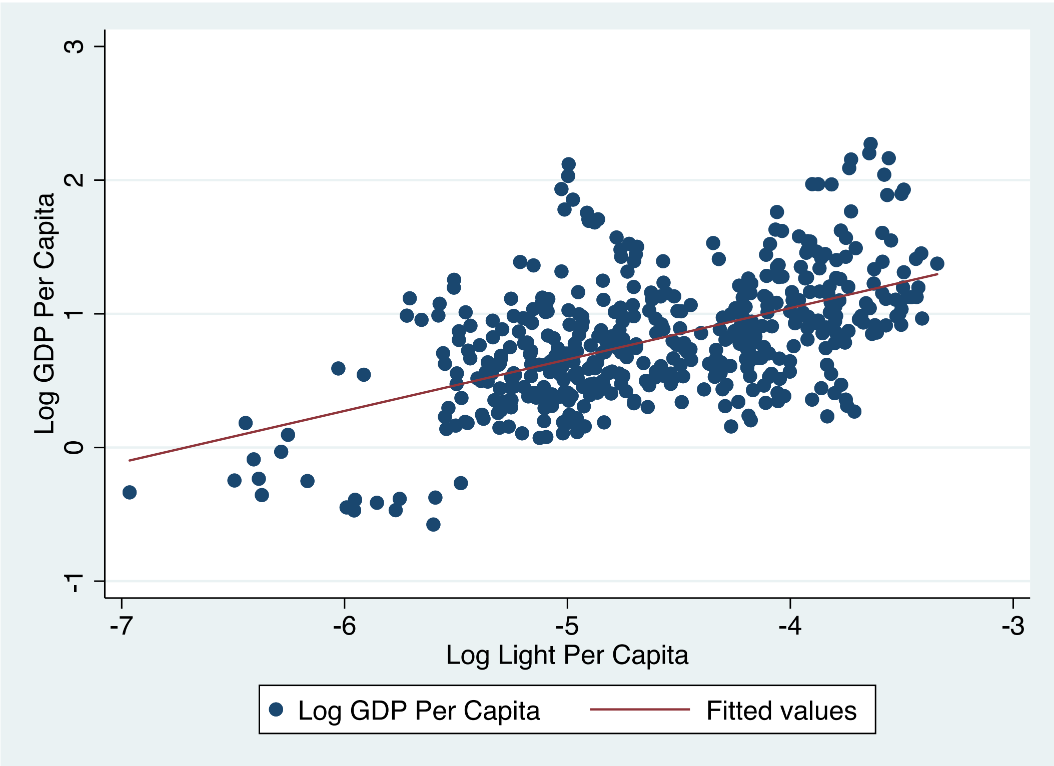
(a) Luminosity in 1992



(b) Luminosity in 2009

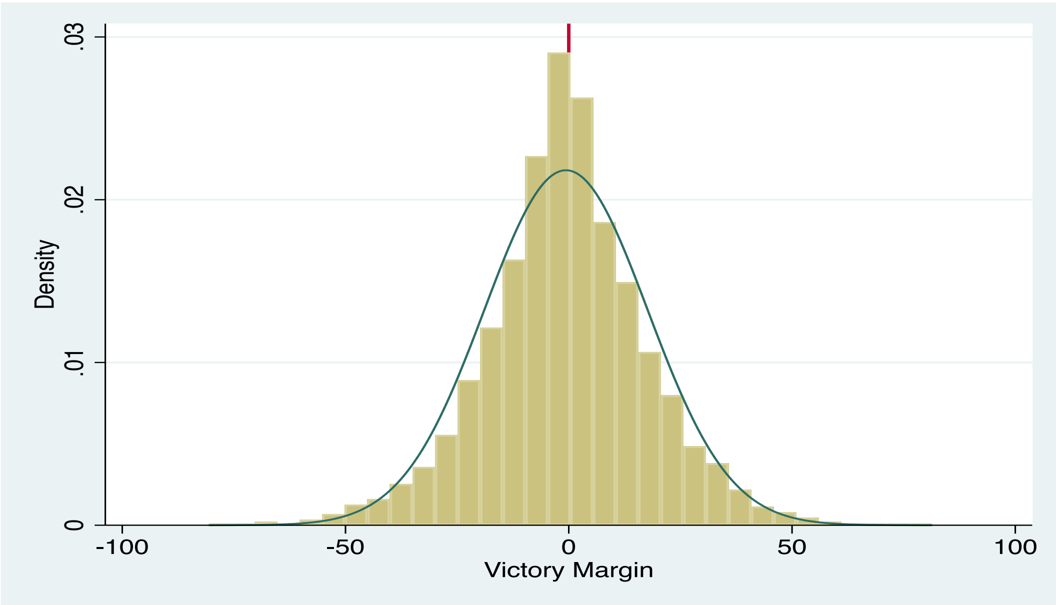
Note: Subfigures (a) and (b) show the level of average luminosity in India in 1992 and 2009, respectively. The average growth rate of GDP in India during this period was about 120%. Source for all figures: DMSP-OLS v4 Time Stable Annual Composites from NOAA National Geophysical Data Center.

Figure A.3: GDP Against Luminosity- State Data

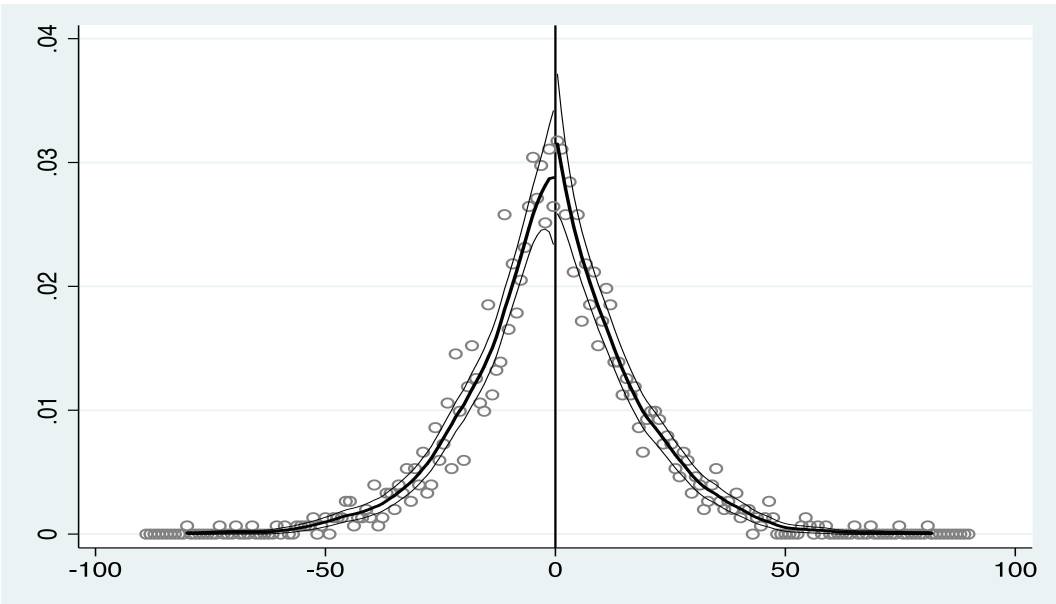


Note: Scatter of log of night lights per capita and log of GDP per capita, both using the state population in the denominator. The time period is 1992-2009.

Figure A.4: Density of the Forcing Variable



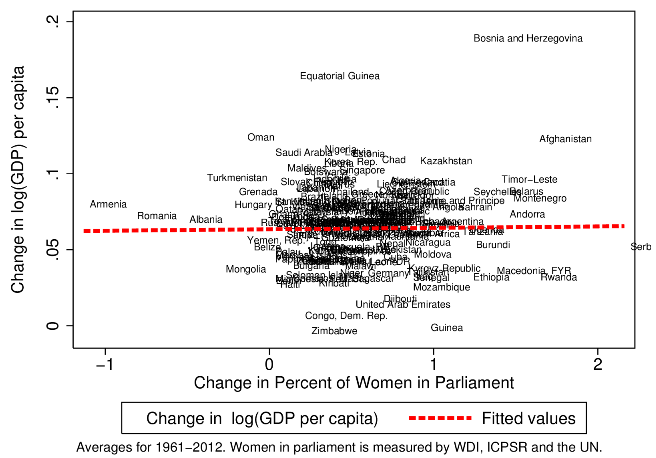
(a) Density of Victory Margin



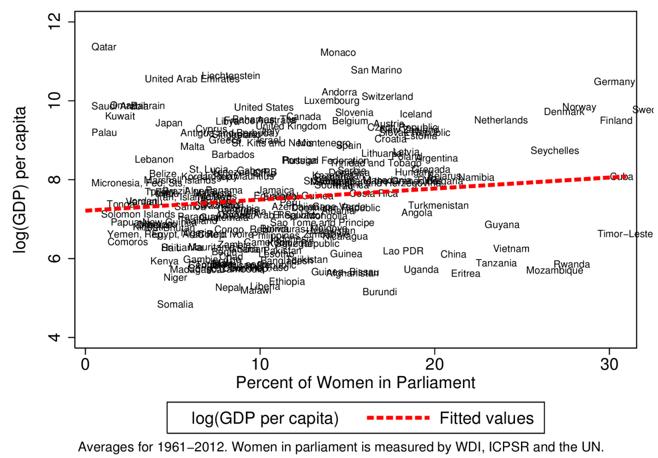
(b) McCrary's Density Test

The figures plot the density of the margin of victory, which is the difference between vote shares of the female and male candidates in mixed gender races. Mixed gender races are defined as those in which a man and a woman rank in the top two. By construction, margin of victory is positive for female legislators and negative for male legislators. The magnitude of the discontinuity (log difference in height) is 0.13 (with a standard error of 0.15).

Figure A.5: Cross-Country Scatter- Women in Parliament and Economic Growth

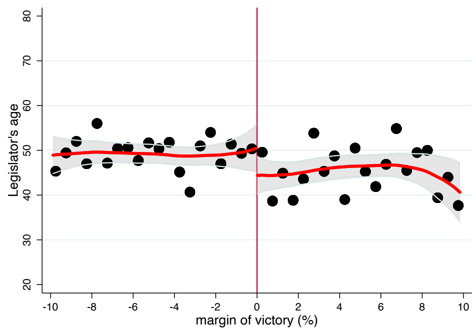


(a)

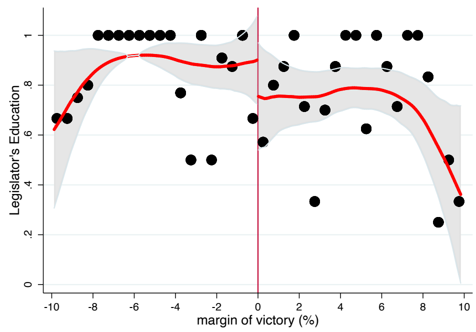


(b)

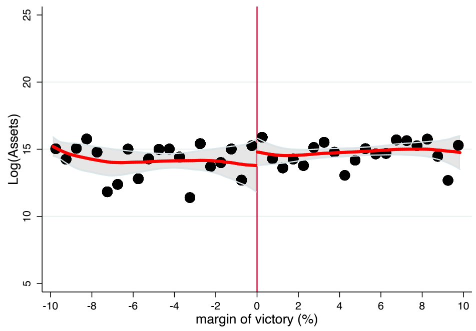
Figure A.6: Differences in legislator characteristics



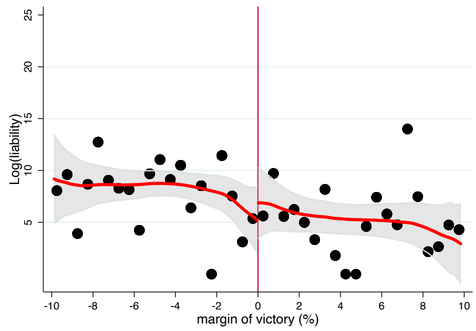
(a) Winner's age



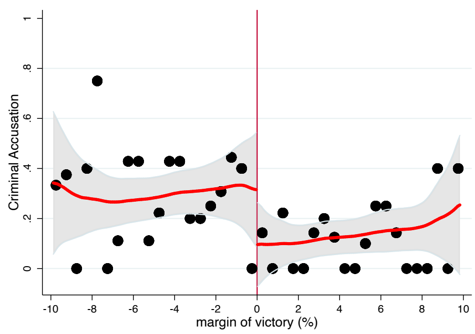
(b) Education



(c) Total Assets



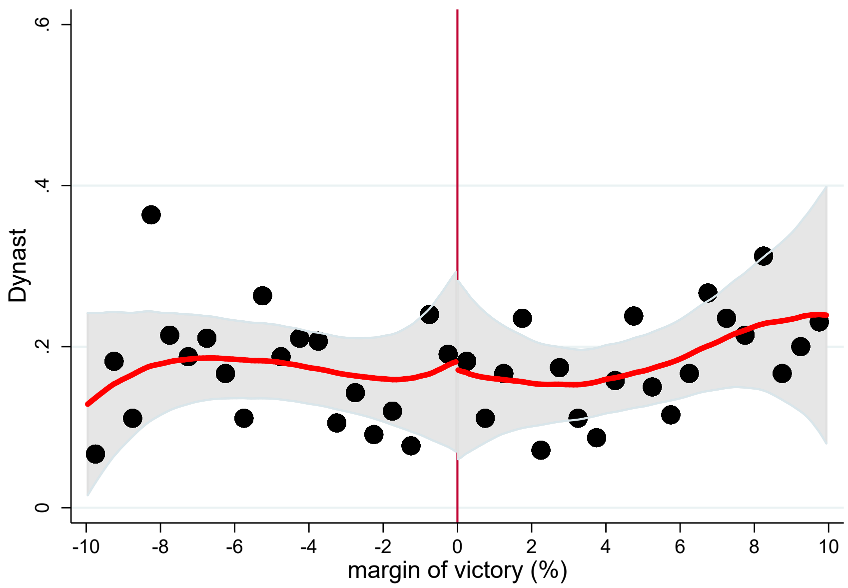
(d) Total Liabilities



(e) Criminal

Each variable is plotted against female margin of victory in mixed gender races, which is the difference between vote shares of a female candidate and male candidate in mixed gender races. Mixed gender races are in which a woman either won or was a runnerup against a man. By construction, margin of victory is positive for female legislators and negative for male legislators. Each dot represents a local average in bins of 0.5 percent margin of victory. The solid lines are the smooth curves estimated using a local linear regression of each variable on margin of victory separately on either side of the cutoff of zero, triangular kernel and a 5 percent bandwidth. The figures also depict a 95 percent confidence interval for each variable around the solid curve.

Figure A.7: Propensity to be dynasts among men and women in close elections



This figure plots a dummy indicating whether a MLA is a dynast against female margin of victory in mixed gender races, which is the difference between vote shares of a female candidate and male candidate in mixed gender races. Mixed gender races are in which a woman either won or was a runnerup against a man. By construction, margin of victory is positive for female legislators and negative for male legislators. Each dot represents a local average in bins of 0.5 percent margin of victory. The solid lines are the smooth curves estimated using a local linear regression of each variable on margin of victory separately on either side of the cutoff of zero, triangular kernel and a 5 percent bandwidth. The figure also depicts a 95 percent confidence interval for each variable around the solid curve.