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Keywords: Political Competition; Relevant Third, Collusion, Development, Vote Shares

JEL Classification: D72, D73, O12

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The Relevant Third: Threat of Coalition and Economic Development*

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AUGUST 2024

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> You win by working hard, making tough decisions and building coalitions.
>
> *John Engler*
> *46^{th} Governor of Michigan*

1 Introduction

This paper examines the effect of political competition on economic development in a multi-party setting. We use a novel measure of political competition: the presence of a *relevant third* and the consequent threat of potential collusion that the incumbent faces. Increased electoral/political competition results in favourable outcomes for the voters and citizens.[1] For example, Wittman (1989, page 1396) writes: *competition for political office reduces the potential for opportunism by politicians.* The underlying premise is that a substantial electoral advantage—or a lack of political competitors—diminishes the extent to which politicians are held accountable, allowing them to prioritize narrow self-interests without jeopardizing their re-election prospects. A growing body of literature supports the notion that increased electoral competition correlates with improved economic and political outcomes (Dash and Mukherjee, 2015, Solé-Ollé and Viladecans-Marsal, 2012, Ashworth et al., 2014, Padovano and Ricciuti, 2009). Politicians elected within a competitive setting are less likely to renege on their policy promises (Walkowitz and Weiss, 2017), engage in rent-seeking behaviour (Polo, 1998, Svaleryd and Vlachos, 2009), or prioritise special-interest policies during their term in office (Besley et al., 2010).

How to measure political competition, however, remains an open question. The empirical literature on political competition has employed various measures to define electoral competitiveness (see Dash et al., 2019). These include the effective number of candidates or parties (ENOC or ENOP), computed as the inverse of the Hirschman-Herfindahl concentration index (HHI) constructed using candidate or party vote or seat shares at a constituency

[1] An election is defined as competitive or contestable if there exists an opposition party (or coalition formed prior to the election) that has chance of winning and credibly offers equivalent or superior performance to that offered by the incumbent (party).

(Arvate, 2013, Gottlieb and Kosec, 2019), vote share difference between the top-two candidates (Besley et al., 2010, Dash and Mukherjee, 2015, Solé-Ollé and Viladecans-Marsal, 2012), winning vote share (Sørensen, 2014), and seat share of opposing ideological blocs (Curto-Grau et al., 2018).

We use a new definition of political competition: the presence of a *Relevant Third* and the threat of collusion between non-incumbents. In our framework, the third placed candidate is relevant if the number of votes received by the third placed candidate exceeds the winning margin. In such a situation, if the second and third placed candidate could arrive at some form of an agreement, together they can beat the incumbent (in the next election). Using a regression discontinuity framework comparing situations where the third-ranked candidate is barely relevant to those where they are barely not, we exogenously identify a potential *threat of collusion* between the non-incumbents. We are thus able to causally isolate the impacts of competition on *ex-post* outcomes, through a potential shock to re-election probabilities. We rule out channels other than the threat of collusion as potential incentive compatible responses to political agency relationships: there are no effects when our analysis is restricted to cases where the threat of collusion is not credible.

Our definition of competition has several advantages in the context of India with its multi-party/multi-candidate nature of elections. *First*, while the commonly used difference in vote share margin between the first and the second placed candidate (winner vs runner up), might be satisfactory in a two-party system as in the US, it is less than satisfactory in a multi-party system as in India.[2] *Second*, interpreting the implications of an increase in the effective number of parties (ENOP) is problematic. An increase in the number of parties above 2, which is the long run equilibrium in a majoritarian system (the *Duverger Hypothesis*) is actually indicative of a decline in the competitiveness of the electoral system. *Third*, a different problem arises in the context of establishing a causal link between electoral competitiveness and economic development. The measures that have typically been used are potentially endogenous. For example, the existence of a close election (where the winning margin is small) is arguably non-random, and could potentially be correlated with unobserved constituency and candidate level characteristics that could directly affect development outcomes. A similar concern arises from other measures as well. The HHI index and ENOC are potentially outcomes of electoral competitiveness in the previous term and prior development trends. Even with the commonly-used instrumental variables strategy

[2]For example, Dash et al. (2019) argue that use of vote share difference between the top two candidates needs to be normalised by a measure of the volatility of the electorate.

— employing IVs such as historical levels of competition, or legislative changes — it is difficult to rule out the effect of confounds such as collective preferences of the region or time-varying unobservables that could simultaneously affect both competition and development outcomes. *Finally*, apart from identification problems, these metrics are usually weaker indicators of political competition. Measures such as the ENOC, the HHI, and seat-differences across ideological blocs might capture the level of political fragmentation, instead of being direct measures of competition faced by a candidate (Dash and Mukherjee, 2015). It is also unclear whether these measures are able to isolate any one aspect or channel of political competition through which the effects on development outcomes could manifest. Therefore, for our purpose, a majority of these metrics are inadequate in fully understanding political competition.

Our measure of political competition is particularly meaningful in settings with multiple parties or candidates, which differs significantly from the commonly studied two-party contests. Duverger (1954) argued that voters do not want to waste their vote and will thus, in most cases, exclusively vote for two front-runners. Several follow-up papers have shown that under plurality rule, when voters are instrumentally rational, an election with multiple candidates usually boils down to a two-candidate race, and of these two, the candidate who is preferred by the majority wins the election. The American election landscape with the two major parties (Republicans and Democrats) is a popular illustration of the Duverger Hypothesis. However, there are instances from many other countries that third- and lower-ranked candidates often receive a large share of the total votes and play an important role.[3] For example, Pons and Tricaud (2018), using data from French local and parliamentary elections show that the presence of a third candidate (decided by a specific electoral law) has important implications for electoral outcomes.

Multi-party/multi-candidate contests are prevalent worldwide, with an average of nine active political parties participating in elections across a sample of 235 countries (Seror and Verdier, 2018). In the context of Indian Legislative Assembly Elections, which is the focus of our paper, an electoral district (known as 'constituency' in India) had, on average, 11 candidates contesting an election during the period 2014–2018. Our approach, therefore, allows us to look beyond only the top-two candidates. Additionally, there are no term limits for contesting candidates and as a result, the potential incentives for re-election always exist. This makes the agency argument more nuanced and politicians are, therefore,

[3]Third ranked candidates can play an important role even if they receive a small fraction of votes. The Ralph Nader example from the 2000 US Presidential election is a case in point.

always likely to respond to any incentives that may enhance or reduce the probability of their re-election.[4]

The existence of a *Relevant Third* in a constituency might not be random. In particular, constituencies with a *Relevant Third* might differ systematically from constituencies without a *Relevant Third*. To overcome this empirical challenge, we exploit a regression discontinuity (RD) design that credibly identifies the effect of having a *Relevant Third*, by comparing development outcomes in constituencies with a *barely Relevant Third* with outcomes in constituencies *barely* without a *Relevant Third*. Our running variable here is the difference between the vote share of the third-placed candidate and the winning margin (i.e., difference in the vote share of the winner and the runner-up). A positive value of this variable indicates the presence of a *Relevant Third*, while a negative value indicates a non-relevant third.[5]

Our primary measure of the level of economic development or prosperity is nighttime lights or nightlight. Nighttime lights have been used extensively in the literature as proxies for levels of economic development at granular levels (see, for example Chanda and Kabiraj, 2020, Asher et al., 2021), particularly at levels of aggregation below the district level (in the Indian context). We find that having a *Relevant Third* results in a large an statistically significant growth in nighttime lights, which corresponds to a 1.8—5.5% growth premium during our sample period. The results are driven by the higher growth of nightlights in the second half of the electoral term. This is not surprising given that constituency development is likely to take some time and therefore effects on luminosity should ideally show up with a lag.

[4]One important characteristic of a "political market" is that there are no legal restrictions to competitors forging explicit and implicit alliances (engage in collusion) to consolidate of vote shares. This is quite common in Indian elections. For instance, leading up to the 2024 national elections, the major opposition parties have formed an explicit alliance and entered into a seat-sharing agreement. This is expected to result in consolidation of the vote shares of the parties in the alliance in every constituency where such an agreement has been reached, against the challenger in that constituency. See for example: `https://theprint.in/india/seat-sharing-agreement-among-india-bloc-partners-almost-finalised-sachin-pilot/2004008/`.

[5]Lee (2008) was possibly the first to exploit a regression discontinuity design using electoral data. Studies using a similar design in the context of India and elsewhere include Uppal (2009), Clots-Figueras (2011, 2012), Broockman (2014), Bhalotra and Clots-Figueras (2014), Fisman et al. (2014), Anagol and Fujiwara (2016), Asher and Novosad (2017), Bhalotra et al. (2017), Baskaran and Hessami (2018), Prakash et al. (2019), Lee (2020), Lahoti and Sahoo (2020), Prakash et al. (2022), Mahadevan and Shenoy (2023), Faravelli et al. (2023), Baskaran et al. (2023), Khalil et al. (2024).

We show that our results are indeed driven by the threat of collusion. When the second and third placed candidates are from ideologically opposed major parties and it is unlikely that these two parties will ever collude (i.e., the threat of collusion is not credible) we find that the *Relevant Third* does not have a statistically significant effect on economic growth.

As potential mediating channels for increased luminosity, we estimate impacts of having a *Relevant Third* on a large set of public goods. We find that having a *Relevant Third* results in provision of better health care goods measured by the proportion of villages in the constituency having access to a particular health facility, better education infrastructure as measured by the proportion of villages in the constituency having different types of schools, improved drainage and market infrastructure and higher electricity supply to marginal, small and medium enterprises (MSMEs). We also find that a higher fraction of *Relevant Thirds* in a district results in reduction in district-level crimes. Finally, turning to the impacts on electoral outcomes, we find that the existence of a *Relevant Third* does not affect the likelihood of the incumbent re-contesting, but conditional on re-contesting it reduces the probability of re-election of the incumbent.

The paper makes several important contributions. *First*, it contributes to the literature on the effect of political competition on economic development. In contrast to most other studies, which, typically, estimate an association between the two, we provide credible causal estimates of the economic impact of electoral competition. *Second*, we propose a new measure of political competition for multi-candidate settings. *Third*, we contribute to the literature on the role of political competition in shaping politician performance (Kosec et al., 2018, Acemoglu et al., 2014, Besley et al., 2010). *Fourth*, we contribute to the link between re-election incentives and economic outcomes (Van Weelden, 2013, Pailler, 2018, Finan and Mazzocco, 2021). *Finally*, we show that in multiparty elections, it is important to look beyond the winner (and even the runner-up). Anagol and Fujiwara (2016) examine the political implications coming second: they compare the effects of barely coming second vs barely coming third and find the the runner-up effect is considerable. Pons and Tricaud (2018), using data from French local and parliamentary elections show that the presence of a third candidate has important implications for electoral outcomes. Our focus is very different. In our case it is not about the presence of a third placed candidate; rather it is about the *relevance* of the third placed candidate.

The rest of the paper is organised as follows. Section 2 presents details on the setting and the datasets used in our analysis. Section 3 presents a brief conceptual framework to set up the empirical analysis that follows. The empirical strategy is discussed in Section

4. Section 5 discusses the validity of the RD design that we use in this paper. Section 6 presents the key results on growth of nightlights. Section 7 examines the credibility of the threat of coalition as a measure of political competition. In Section 8, we discuss the two key mechanisms that potentially explains how political competition can affect economic outcomes. Section 9 examines heterogeneity in the treatment effects on nighttime lights along a number of different dimensions. Finally, (in Section 10), we analyse the impact of this coalitional threat on electoral outcomes in the subsequent election. Section 11 concludes.

2 Background and Data

2.1 Legislative Assembly Elections in India

India follows a parliamentary form of government, distributing power between the Centre and the States. State elections, known officially as *Vidhan Sabha* or Legislative Assembly elections, are conducted in single-member Assembly Constituencies (ACs) to elect Members of the Legislative Assembly (MLAs) that constitute a state-level Legislative Assembly. As per the latest delimitation exercise, which came into force in 2008, there are 4,123 Assembly Constituencies across 640 districts in the 28 states and three union territories of the country.

The Election Commission of India (ECI) is the apex body responsible for conducting elections for all echelons of the government. The ECI fixes electoral calendars that are not necessarily synchronised across states or within the same state for different tiers of the government. Elections are conducted under a first-past-the-post system, and an electoral term lasts for five years, unless the assembly is dissolved and the state goes to early elections.

2.2 Elections Data

The election data comes from the official statistical reports on Assembly elections provided by the Election Commission of India (ECI).[6] Since our preferred satellite data for night-

[6] We make use of the compiled elections dataset from Trivedi Centre for Political Data (TCPD), Ashoka University as well as the Socioeconomic High-Resolution Rural-Urban Geographic (SHRUG) data repository.

time lights is from NASA's Visible Infrared Imaging Radiometer Suite Day/Night Band (explained in detail in Section 2.3), we are constrained in our choice of the sample period for elections. To accommodate the timeline of the VIIRS-DNB data which is available from 2012 to 2021, our sample period for elections is 2013–2017- i.e., we observe exactly one Assembly election per state in this period. We collect information on a number of electoral variables, including vote shares and party affiliation of the candidates, voter turnout rates, reservation status of the constituency, and the total number of contestants. We also collect information on candidate characteristics, including their assets, liabilities, education level, criminal record, age, and gender. Data for this comes from candidate affidavits submitted by contestants to the ECI.[7] This data then allows us to compute the key variables that we use in our analysis: the winning margin and the vote share of the third placed candidate.

Figure 1 presents the distribution and the means of some of the key variables that we use in our analysis. On average the winning margin is 12.5%, the vote share of the third placed candidate is 11.75% and there is significant overlap in the distribution of the winning margin and the vote share of the third placed candidate. The vote share of the top-3 candidates is on average 91.15%; the lower ranked candidates are, therefore, quantitatively considerably less important than the top-3 candidates.

Panel A of Table 1 present summary statistics for the electoral data that we use in our analysis. The average constituency has around 206,000 voters and the average turn-out rate is 73% (voting in India is not compulsory). The average number of contestants in a constituency is 11 with 1 female candidate on average. The average vote share of the winners is 46% compared to the average vote share of 33.5% for the runner-up. There is considerable incumbency disadvantage with 36.7% of incumbents being re-elected in any particular election. On average winners have 2 terms of experience. 91% of winners are male; 56% of winners are from a national party and 38% are from state based parties.

It is also important to situate the distribution of the third-ranked candidates within the broader electoral setting considered in our analysis. In our sample, 2,028 (49.8%) constituencies had a *Relevant Third*, while 2,044 (50.1%) did not. Of the 2,028 constituencies that had a *Relevant Third*, 647 (31.9%) constituencies had a barely *Relevant Third* (i.e., $0 < v_3 - (v_1 - v_2) \leq 5$); while among the 2,044 constituencies without a *Relevant Third*,

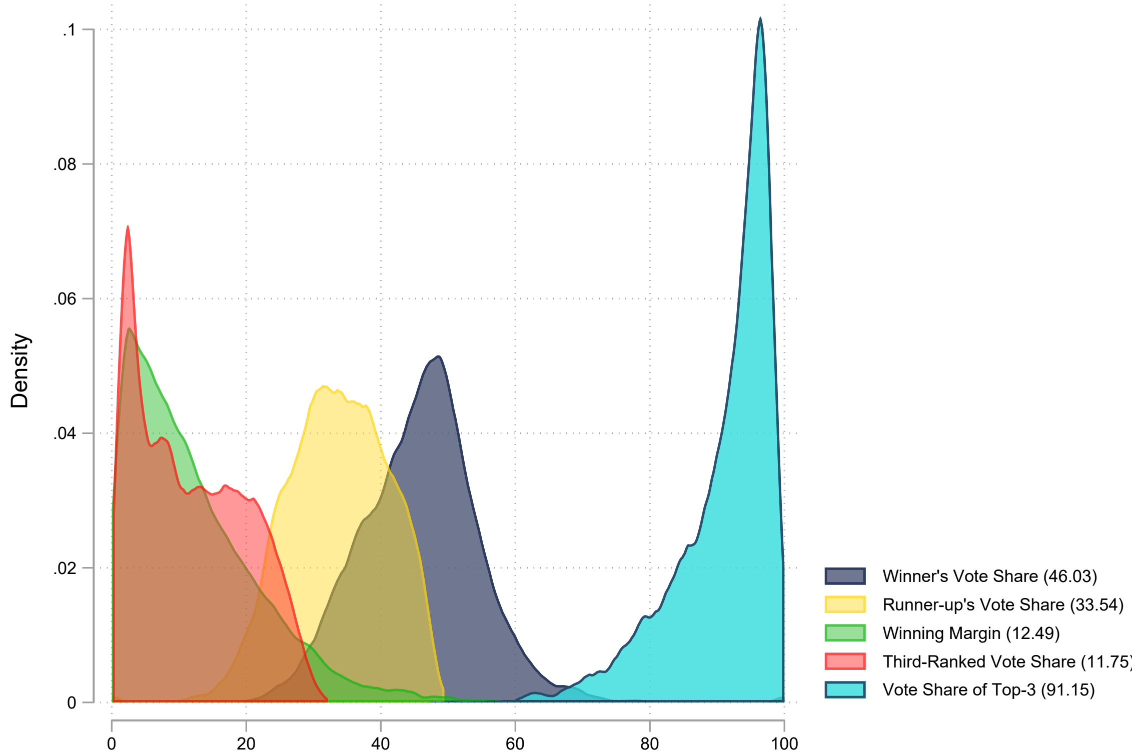
[7] The data on affidavits is compiled by the Association for Democratic Reforms (ADR) and the Socioeconomic High-Resolution Rural-Urban Geographic (SHRUG) data repository.

Table 1: Summary Statistics

	N	Mean	SD	Min	Max
	(1)	(2)	(3)	(4)	(5)
Panel A: Electoral Characteristics					
Electors ('000)	4,107	206.589	93.166	2.904	865.650
Voter Turnout (%)	4,107	72.879	11.837	0.01	98.250
Number of Contestants	4,107	10.775	5.119	1	45
Number of Female Contestants	4,107	1.047	1.185	0	9
Number of Re-Contesting Candidates	4,107	1.946	1.204	0	8
Number of Candidates losing Security Deposits	4,107	10.876	5.666	0	43
Number of Turncoat Candidates	4,107	0.438	0.656	0	4
Winner's Vote Share	4,107	46.033	9.126	19.450	100
Runner-up's Vote Share	4,107	33.541	7.602	0	49.46
Third-Ranked Candidate's Vote Share	4,072	11.752	8.146	0.130	32.14
Winning Margin ($v_1 - v_2$)	4,107	12.492	11.152	0.010	100
Re-Elected Winner (Incumbent)	4,107	0.367	0.482	0	1
Turncoat Winner	4,107	0.101	0.301	0	1
Winner's Experience (No. of Terms)	4,107	2.042	1.453	1	13
Re-Contesting Winner	4,107	0.586	0.492	0	1
Male Winner	4,107	0.912	0.282	0	1
National Party Winner	4,102	0.562	0.496	0	1
State-based Party Winner	4,102	0.379	0.485	0	1
Panel B: Nighttime Lights (2013-21)					
Total Nighttime Lights	20,535	2715.403	2698.944	0	43626.43
Luminosity Density	18,205	21.292	71.063	0	981.8018
Annual Growth in Luminosity Density (%) (excluding election year)	14,564	4.361	14.429	-76.925	257.742
Panel C: Proportion of Villages in the Constituency with Access to Public Facilities (2019)					
Community Health Centre	1,873	16.496	13.094	0	100
Primary Health Centre	1,873	6.618	7.127	0	77.181
Maternity Health Centre	1,873	44.872	22.443	0	100
Closed Drainage	1,873	9.109	16.573	0	100
Uncovered Drainage	1,873	36.980	24.237	0	100
Solar Energy	1,873	14.969	19.202	0	100
MSMEs Having Electricity	1,873	29.880	20.211	0	100
Kuchha Drainage	1,873	24.535	16.782	0	100
Mandi	1,873	3.757	8.315	0	100
Regular Market	1,873	13.058	16.104	0	100
Weekly *Haat*	1,873	21.165	18.256	0	97.138
Primary School	1,873	91.312	11.404	0	100
Middle School	1,873	63.048	19.001	0	100
High School	1,873	39.799	19.981	0	100
Senior-Secondary School	1,873	25.106	16.997	0	100
Panel D: District-level Crimes during the Electoral Term (2014-21)					
Total IPC Crimes	2,480	5263.469	7533.158	8	89611
Crimes (per 1000 population)	2,480	2.543	2.556	0.097	33.549

Notes: Data on public goods comes from the village-level survey of Mission Antyodaya. Each variable from this data measures the proportion of villages within the constituency having access to that particular public good. The number of observations (1,873) corresponds to the number of constituencies which consist of villages, and for which information on public facilities is available. Data on IPC crimes comes from the annual statistical reports of the National Crimes Record Bureau (NCRB). Crime count is measured at the district-level for the duration of the district's respective electoral term in our analysis. In the crime panel, the number of observations (2,480) represents the number of districts (620) times four (4 years of the electoral term, excluding the election-year) in our sample.

Figure 1: Vote Share. Densities and Means



Notes: Data from all assembly elections in the period 2013–2017 included. Vote share of the top-3 is given by $v_1 + v_2 + v_3$ where v_i is the vote share of the candidate ranked $i : i = 1, 2, 3$. *Winning margin* is the vote share difference between the winner and the runner-up ($v_1 - v_2$). We present the sample mean for each variable in the parentheses.

668 (32.6%) were barely without a *Relevant Third* (i.e., $-5 < v_3 - (v_1 - v_2) \leq 0$).[8]

[8]Candidates can either stand as *independents* (those that contest the election without a political party affiliation) or be *party nominated*. In this case they can be nominated by a state based party (political party contesting elections in several states but being principally associated with one state), other state based party (a state based party that is contesting outside its principal state) a local party (a party that is limited to a particular state or a sub-region of a single state) or a national party (a party with a significant presence in different Legislative Assemblies (States) as well in the National Assembly). Finally voters have the option to vote for NOTA or none of the above. We use the party-type categorisation of the Trivedi Centre for Political Data (TCPD), Ashoka University. What *types* of candidates rank third in these elections and, in turn, become relevant (or non-relevant)? Figure A1 presents a descriptive picture of the third-ranked candidates (and their relevance) by their *type*. Candidates from national parties constitute the largest proportion of third placed candidates/parties: 34% of the non-relevant thirds are from national parties while 35% are relevant. Candidates from state-based parties constitute 34.3% of the *Relevant Thirds* compared to 18% of the non-*Relevant Thirds*. On the other hand, the NOTA constitute 16.5% of the non-*Relevant Thirds* but only 2% of the *Relevant Thirds*.

2.3 Nighttime Lights Data

Our measure of economic development at the assembly constituency level is growth in nighttime lights (nightlights). Nightlights are increasingly being used as a proxy for economic development when more standard data that capture economic conditions are unavailable. In our context, our unit of observation is the state assembly constituency and there is little data available at that level of disaggregation. We use data from NASA's Visible Infrared Imaging Radiometer Suite Day/Night Band (VIIRS-DNB), which has been reporting nighttime lights data from 2012 onwards.[9] We utilise the VIIRS-DNB data compiled under the SHRUG Data Project, which provides data disaggregated at the Assembly Constituency level for India for the period 2012–2021. Thus, for our sample period of elections, we observe nighttime lights for each constituency for the full electoral term of five years.[10]

Our primary variable of interest is *luminosity density*, defined as the sum of nighttime lights (pixel values) detected in a constituency in a year divided by the total area of the constituency. Panel B of Table 1 presents the descriptive statistics for the key outcome variable that we use. Excluding the election year, *luminosity density* grows by 4.4% in each year across the sample of constituencies. There is, however, considerable variation in the growth rate of luminosity density across constituencies.

2.4 Public Goods and Infrastructure Data

We also use the village-level data on a set of public goods and infrastructure from the Mission Antyodaya (henceforth MA) Facilities portal. MA is an initiative of the Government of India that surveyed nearly 650,000 villages across India to conduct gap analyses and provide inputs to participatory plans of village councils (Gram Panchayats or GPs),

[9] Much of the previous work in economics using nighttime lights has utilized data from an older U.S. Department of Defense's satellite, the Defense Meteorological Satellite Program (DMSP), that collected nighttime light emissions with the Operational Linescan System (OLS). The DMSP-OLS nighttime lights, while providing a much longer time-series for India (1992–2012), had several flaws which become important in its use as a viable proxy for economic activity. We utilize VIIRS-DNB (rather than DMSP-OLS) because of its ability to better detect low luminosity regions (better measurement of spatial variation) (Nordhaus and Chen, 2015), low sensitivity to blooming effects or spillovers (Gibson et al., 2021), and its ability to consistently produce NL data that maintains a positive NL-to-GDP elasticity (Baskaran et al., 2023).

[10] Table A1 provides a description of the state-wise timing of Assembly elections and the corresponding time period of nighttime lights considered in our main analysis.

the lowest level of government in the country.[11] All information as part of MA surveys is available at the village-level and we use the SHRUG repository to aggregate village-level data on facilities to the assembly constituency level. We use data on school availability, health facilities, market infrastructure, drainage/sanitation infrastructure, and electricity availability. We compute the proportion of villages in each assembly constituency that have the relevant public good. Panel C of Table 1 presents the average proportion of villages in each assembly constituency with each public good. While almost 45% of constituencies have a maternity centre, 91.3% have a primary school, 63% have a middle school and 39.8% have a high school, only 9.1% have closed drainage and 3.75% have a *mandi* (wholesale market).

2.5 Crimes Data

We are additionally interested in examining whether the presence of a *Relevant Third* generates a response from the winning candidate to uphold law and order in their constituency.

The Indian Constitution makes law and order, including crime prevention a state subject. This means that the state government is responsible for crimes within its jurisdiction. State governments are punished for poor performance in this sphere. While on the administrative side the responsibility for maintaining law and order is the responsibility of civil servants and bureaucrats, who are politically non-aligned, elected politicians can influence the administrative machinery.

We use data made available by National Crime Records Bureau (NCRB), as a part of their "Crime in India" reports. These reports provide data on the *First Information Reports* (or FIRs) filed with a particular police station in a given year under different Indian Penal Code (IPC) violations. For our analysis, we consider any recorded crime under IPC in a given year and aggregate the annual number of IPC offences to the district-level.[12] Thus, we have an annual district-level panel on total IPC crimes during the period 2014—2021, which is merged with our primary election data, which covers the period 2013—2017.

[11] See: https://missionantyodaya.nic.in/

[12] The NCRB publications are at the police jurisdiction level which, typically, subsume the whole district. We manually match each of these jurisdictions to their respective administrative districts as listed under the 2011 round of the Census. Additionally, from 2014 onwards, a number of Census-2011 districts have been broken down into several new districts. To maintain parity with other analysis, we match these new district names to their original counterparts that are listed in the Census.

Panel D of Table 1 presents the summary statistics for district-level IPC crimes over the electoral term. On average, during the period 2014–2021, the average number of crimes reported is 5263 and the average number of crimes (per 1000 population) is 2.54. There are large variations across districts.

3 Conceptual Framework

Consider a set-up where there are three parties A (winner), B (runner-up) and C (third-placed) that are competing for vote. The set of voters is given by a fixed population that has preferences over the parties. Each party chooses a policy position to maximise its vote share. Let V_A, V_B and V_C denote the vote shares of the three parties A, B and C respectively. By definition $V_A > V_B > V_C$.

Parties B and C can collude by coordinating their policy positions that will attract more voters collectively. Collusion could involve joint policy platforms, strategic endorsements or coordinated campaigning. Assume that voters have preferences over the policy space $[0, 1]$. Each party chooses a policy position x_A, x_B and x_C within this space. Voters vote for the party whose policy position is closest to their preferences. Let d_{ij} denote the distance between voter i's preferences and the policy position of party $j; j = A, B, C$. Vote shares depend on the distances between voter preferences and party positions. We assume that the election process is repeated over multiple periods, parties are long-lived and therefore each party considers the future implications of its current actions.

If there is no collusion, each party independently chooses its policy position. Collusion in this case implies parties B and C coordinating their positions to maximise their combined vote share. Vote shares depend on the distances between voter preferences and party positions. Parties B and C collude, if by doing so, their combined vote share exceeds their individual vote shares. This can happen for example if by colluding they are able to attract swing voters (or neutrals) or voters who might otherwise have chosen to abstain. Collusion is worthwhile if the combined vote shares of parties B and C surpasses that of party A.

Party A recognising the threat of collusion can adjust its strategy to maintain its leading position. To counter the threat of collusion, party A can enhance its efficiency (offer improved policies and policy proposals, improve campaign effectiveness, increase voter outreach and work towards improving the welfare of voters). By investing in better policies, party A can reduce the policy distance d_{iA} for a larger number of voters. Alternatively, party A can increase efforts in campaigning, voter engagement and communication to enhance its appeal, making its policies more attractive and reducing voters from switching to parties B and C. Finally, Party A can target undecided or swing voters through targeted outreach programs and increasing its vote share by attracting voters who might otherwise have supported parties B or C.

So in a *non-collusive equilibrium* each party competes independently and party A wins. In an equilibrium with *collusion threat* the threat of collusion between parties B and C forces party A to improve its efficiency. By improving policies, campaign effectiveness, and voter outreach, party A can maintain its leading position and counter the coordinated efforts of parties B and C.

4 Empirical Strategy

We examine the impact of having a *Relevant Third* (candidate) on the level of economic development, proxied by growth in nighttime lights, in an electoral constituency. Essentially, we are interested in estimating the following equation:

$$GROWTH_{c,s,t+1} = \alpha + \beta Relevant\ Third_{c,s,t} + \varepsilon_{c,s,t+1} \tag{1}$$

where $GROWTH_{c,s,t+1} = \log(NL_{c,s,t+1}) - \log(NL_{c,s,t})$ is the annual growth rate in luminosity density measured as the difference in the natural log of nighttime luminosity density between the years t and $t+1$, in constituency c in state s. $Relevant\ Third_{c,s,t}$ is a binary variable indicating whether constituency c in state s in the election-year t had a *Relevant Third* (candidate). Specifically:

$$Relevant\ Third_{c,s,t} = \begin{cases} 1 & \text{if } Third\ Margin > 0 \\ 0 & \text{if } Third\ Margin \leq 0 \end{cases} \tag{2}$$

Third Margin is defined as follows. Let v_{icst} be the vote share of the candidate ranked $i; i = 1, 2, 3$ in constituency c in state s in year t. Then

$$Third\ Margin = (v_{3cst}) - (v_{1cst} - v_{2cst})$$

i.e., *Third Margin* is the difference between the vote share of the third placed candidate (v_{3cst}) and the winning margin ($v_{1cst} - v_{2cst}$). A positive value implies that the vote share of the winner is lower than the combined vote share of the second- and third-ranked candidates ($v_{2cst} + v_{3cst} \geq v_{1cst}$). A negative value, on the other hand, implies that the vote share of the winner is greater than the combined vote share of the second- and third-ranked candidates ($v_{2cst} + v_{3cst} < v_{1cst}$) and corresponds to the winner not facing a *threat of coalition from* the runner-up and the third-placed candidates.

Table 2: Political Competition and Nightlights Growth. Using Alternative Measures of Political Competition

	(1)	(2)	(3)	(4)	(5)	(6)
Relevant Third	0.2944*	0.268*				
	(0.1537)	(0.1554)				
Winning Margin			-0.0061	0.0025		
			(0.0057)	(0.0065)		
ENOP					0.0960	0.1478
					(0.1076)	(0.1169)
State Fixed Effects	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Controls	✗	✓	✗	✓	✗	✓
Observations	14,564	14,184	14,564	14,184	14,436	14,068
R-Squared	0.42	0.43	0.42	0.43	0.42	0.43

Notes: Standard errors clustered at the Assembly constituency level presented in parentheses. All columns correspond to an OLS estimation with growth in luminosity density as the outcome (see Section 4). *Relevant Third* is a dummy variable = 1 if $v_3 - (v_1 - v_2) > 0$ and 0 otherwise, where $v_i, i = 1, 2, 3$ is the vote share of the i^{th} ranked candidate in constituency c in state s in year t. *Winning Margin* is the difference in the vote share of the top-two candidates ($v_1 - v_2$), and *ENOP* (effective number of parties) is calculated as $\frac{1}{\sum_j v_j^2}$ where v_j is the vote share of the j-th candidate. The specifications in all columns control for state and year fixed effects. Columns 2, 4, and 6 additionally control for a set of candidate and constituency characteristics (the number of contestants, number of electors, reservation status of the constituency, gender of the winner, age of the winner, mean assets of the contestants, mean number of criminal cases against the contestants, and voter turnout). Significance: $^{***}p < 0.01$;$^{**}p < 0.05$;$^{*}p < 0.1$.

Columns 1 and 2 of Table 2 present the OLS regression results corresponding to equation (1). Having a *Relevant Third* has significant implications for nightlight growth. The regression results in column 2 imply that having a *Relevant Third* is associated with a 0.27 percentage point higher growth in nightlights over the electoral term.

As a robustness exercise we also examine how our results compare to those that use other measures of political competition: *winning margin*, defined as the difference in vote shares between the winner and the runner up ($v_1 - v_2$) and the effective number of parties (*ENOP*, which is calculated as $\frac{1}{\sum_j v_j^2}$ where v_j is the vote share of the j-th party). Both of these have been used extensively in any analysis of political competition. The higher is the *winning margin* and the lower is the *ENOP* the less competitive is the constituency.[13]

Irrespective of whether or not we control for other characteristics of the candidate and the constituency (number of contestants, number of electors, reservation status of the constituency, gender of the winner, mean asset of the contestants, mean number of criminal cases against the contestants and voter turnout), we see that neither of these more widely used measures of political competition is associated with an increase in the growth in luminosity density. See columns 3–6 of Table 2.

The basic story of increased political competition being associated with positive economic outcomes then holds for our new measure of political competition: the presence of a *Relevant Third*. The problem with estimating equation (1) arises from the fact that the presence of a *Relevant Third* in a constituency might not be random. Constituencies with a *Relevant Third* might differ systematically from constituencies without a *Relevant Third*. For instance, constituencies where the vote choice is ex-post concentrated toward a single candidate (i.e., when *Relevant Third* = 0) could reflect the collective preferences of the electorate, which could, in turn, be directly correlated with the level of local economic development. Similarly, constituencies where the winning candidate does not have a clear majority (i.e., when *Relevant Third* = 1) could possess anti-incumbency preferences, which could itself be an outcome of the level of economic development in the constituency.

To alleviate these concerns and estimate the causal impact of having a *Relevant Third* in the constituency on growth in nighttime lights, we employ a regression discontinuity (RD) design (Imbens and Lemieux, 2008). By definition, the probability that a constituency has a relevant third-placed candidate is a function of the difference between the third-placed candidate's vote share and the winning margin (i.e., the vote share difference between the winner and the runner-up). This probability has a discontinuous jump at the point where this difference is zero. That is, treatment assignment, whether a constituency has a relevant third-position candidate, (henceforth *Relevant Third*) is determined by the cut-off value, $d = 0$, of the forcing variable, *Third Margin*. Therefore, the rule for treatment

[13] *ENOP* gives the number of options or substitutes available to the voter. Political parties have to "work harder" to convince voters to vote for them. As a rule, competition is thus expected to increase in the number of parties.

assignment is completely described by equation (2). The crucial identifying assumption for this design is that no other variable faces a discontinuous jump at this cut-off. Thus, in a small neighbourhood of the cut-off, it is a reasonable assumption that the existence of a *Relevant Third* in a constituency is essentially random. In our setting, the RD design, therefore, compares constituencies that *barely* had a *Relevant Third* with constituencies that *barely* did not have a *Relevant Third*.

The regression specification (to estimate the causal impact of having a *Relevant Third* on prosperity) is given by:

$$GROWTH_{c,s,t+1} = \alpha + \beta Relevant\ Third_{c,s,t} + f(Third\ Margin_{c,s,t}) + \mu_{c,s,t+1} \quad (3)$$
$$\forall\, Third\ Margin_{c,s,t} \in (d-h, d+h)$$

where $GROWTH_{c,s,t+1}$ is the annual growth in luminosity density in the constituency, as defined earlier. $Relevant\ Third_{c,s,t}$ is the treatment variable, $Third\ Margin_{c,s,t}$ is the forcing variable, and h is the bandwidth defined around the cut-off $d = 0$. The control function, $f(Third\ Margin_{c,s,t})$, is a polynomial of order n in the forcing variable on each side of d. We estimate equation (3) employing a local linear regression method (Imbens and Lemieux, 2008, Hahn et al., 2001). The optimal bandwidth (h) is computed using the Imbens and Kalyanaraman (2012) (IK) algorithm. We additionally report results using other bandwidths such as the CCT bandwidth (Calonico et al., 2014), half the IK-bandwidth ($h/2$), and double the IK-bandwidth ($2h$). We consider polynomials of degree 1 ($p = 1$) and degree 2 ($p = 2$).

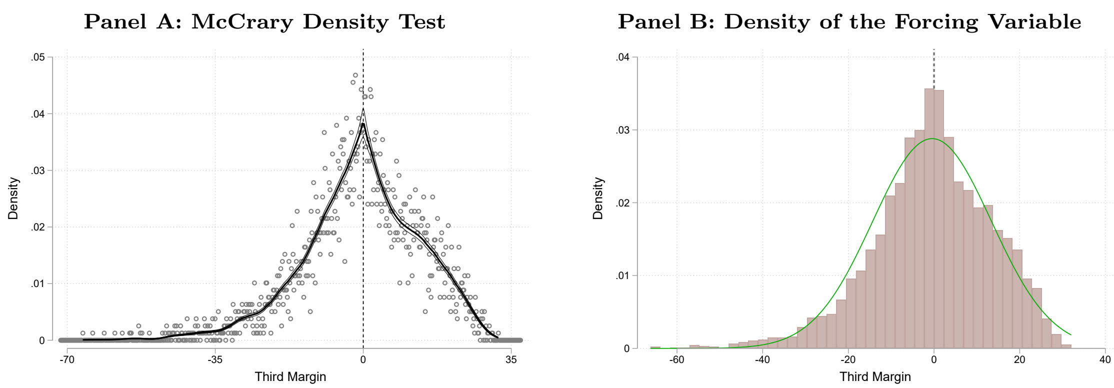
5 Validity of the RD Design

In this section we conduct a series of tests to examine the validity of the RD design.

5.1 Continuity of the Forcing Variable

First, we conduct the McCrary (2008) density test for a discontinuity at the cut-off in the density of the forcing variable. In our context, this tests whether third-placed candidates whose vote shares are close to the winning margin become disproportionately 'relevant'- i.e., a disproportionate proportion of these candidates' vote share is barely above the cut-off. If this were the case, we would find a larger frequency of *Relevant Third* winners, compared to *Relevant Third* losers, in the neighbourhood of the cut-off. This would imply that the density of the margin of victory, the forcing variable, is discontinuous at the cut-off. Figure 2 shows that the density of the *Third Margin* (the forcing variable) below and above the cut-off is not statistically significantly different and the estimated size of the discontinuity in our running variable (log difference in height) is -0.004978 (SE = 0.11276), providing evidence against any manipulation at the threshold.

Figure 2: Continuity of the Forcing Variable



Notes: The figure shows the continuity of the forcing variable, which is defined as the difference between the vote share of the third placed candidate and the winning margin. A positive value of *Third Margin* indicates that the vote share of the third-position candidate is higher than the winning margin (i.e., *Relevant Third* = 1). On the other hand, a negative value implies that the third-position candidate has a vote share lower than the winning margin. The estimated size of the discontinuity in our running variable, *Third Margin*, (log difference in height) is -0.004978 (SE = 0.11276).

While immensely popular, the McCrary (2008) density test requires pre-binning of the data, which has been shown to be problematic in different circumstances (see for example Cattaneo and Titiunik, 2022). To address this potential issue, we conduct two alternative density (based) tests (Cattaneo et al., 2020, Bugni and Canay, 2021), which are presented in Panel A of Table 3.[14] Using both tests, we find that the discontinuity estimate of our running variable at the threshold is statistically not significant, providing stronger evidence against any manipulation at the cut-off.

[14] A graphical analogue of the Cattaneo et al. (2020) density test is presented in Figure A2 in the Appendix.

Table 3: RD Validity Tests

Panel A: Alternative Continuity Tests

Method	N_h	p**-value**
Bugni and Canay (2021)	138	0.799
Cattaneo et al. (2020)	1689	0.778

Panel B: Approximate Permutation Test (Canay and Kamat, 2018)

Measures in $t-1$	N_q	p**-value**
Relevant Third $(t-1)$	89	0.556
Third Margin $(t-1)$	85	0.446
NL Growth (previous year)	93	0.314
Log(Electorate Size) $(t-1)$	91	0.907
Voter Turnout $(t-1)$	91	0.246
SC/ST Reserved	93	0.343
BJP Winner $(t-1)$	90	0.482
INC Winner $(t-1)$	91	0.241
BJP Runner-up $(t-1)$	91	1.000
INC Runner-up $(t-1)$	91	0.275
Male Winner $(t-1)$	91	1.000
Criminally Accused Winner $(t-1)$	89	0.616
Number of contestants $(t-1)$	93	0.883

Notes: Panel A presents the results from the density tests developed by Bugni and Canay (2021) and Cattaneo et al. (2020), where N_h represents the effective number of observations within the optimally selected bandwidth. A graphicalanalog of the Cattaneo et al. (2020) density test is presented in Figure A2. In Panel B, we employ the approximate permutation test à la Canay and Kamat (2018), where N_q is the effective number of observations in the optimally selected window, q, around the cut-off (zero).

5.2 Balance on Pre-Determined Characteristics

Next, we examine whether pre-determined constituency-level characteristics exhibit a discontinuity at the cut-off. A key identifying assumption of our RD design is that no other pre-determined variable, apart from the treatment, should exhibit a discontinuous jump at the cut-off of our running variable. To verify the validity of this assumption, we estimate equation (3) using a set of pre-determined constituency- and candidate-level characteristics from the previous election ($t-1$) as outcome variables. Of particular interest are the following variables: the previous election's third margin (running variable at $t-1$), whether the constituency had a *Relevant Third* in the previous election, and the growth in nighttime lights in the year leading up to the current election. The first two variables allow us to investigate potential contamination of our RD design from the fact that some constituencies may systematically have (close) *Relevant Thirds* in every election. We should ideally not observe any discontinuous jump in the previous year's nightlight growth at the current running variable's threshold. A discontinuity in prior growth would imply that any effects we observe on post-election nighttime lights growth are driven by a pre-treatment divergence in nighttime light trends between constituencies with and without a *Relevant Third*. We also consider the previous election's electorate size, turnout rate, reservation status, number of contestants, winner's party affiliation, winner's, winner's net assets, and winner's criminal record. The RD estimates are presented in Table 4.[15] We do not find a significant jump at the cut-off for the probability that a constituency had a *Relevant Third* in the previous election, as well as the *Third Margin* in the previous election. There is no evidence of a statistically significant difference in the growth in nighttime lights in the year leading up to the election-year around the cut-off. The RD estimate is never statistically significant, i.e., there is no discontinuous jump in any of the other pre-determined constituency and candidate level characteristics.

The recent literature (see Canay and Kamat, 2018) suggests employing a permutation-based test, which compares the empirical cumulative density function of pre-determined covariates on both sides of the cut-off. This method has the advantage of being asymptotically valid for small n in the optimally selected neighbourhood, and is additionally able to detect a

[15]Figure A3 in the Appendix presents a graphical analogue of this Table. In none of the panels, do we find a discontinuous jump in any of the pre-determined constituency- or candidate-level characteristics. A balance test for these characteristics based on a simple mean-comparison test is presented in Table A2 in the Appendix. While the mean differences are statistically significant in several cases in the full sample (see columns 1–3), none of the differences are statistically significant in the bandwidth of 5% (i.e., the vote share of the third placed candidate is within 5% of the winning margin).

Table 4: Balance Test: RD Estimates

Variable	RD Estimate	IK(h)	N_h	p-value
Relevant Third ($t-1$)	-0.091 (0.073)	2.83	783	0.225
Third Margin ($t-1$)	-1.519 (1.319)	5.59	1,395	0.250
NL Growth ($t-1$)	2.841 (1.879)	5.11	1,340	0.131
Log(Electorate Size) ($t-1$)	-0.034 (0.091)	2.98	831	0.703
Turnout ($t-1$)	0.663 (1.271)	5.78	1,437	0.602
SC/ST Reserved	-0.069 (0.077)	1.96	589	0.358
BJP Winner ($t-1$)	-0.051 (0.064)	2.75	764	0.417
INC Winner ($t-1$)	0.068 (0.065)	2.70	750	0.300
BJP Runner-up ($t-1$)	-0.001 (0.053)	2.62	733	0.984
INC Runner-up ($t-1$)	-0.104 (0.076)	2.46	696	0.167
Male Winner ($t-1$)	-0.015 (0.045)	2.50	703	0.722
Criminal Winner ($t-1$)	-0.065 (0.076)	2.39	654	0.395
Number of Contestants ($t-1$)	-0.360 (0.553)	5.43	1,374	0.515

Notes: The table presents the RD estimates for pre-determined constituency-level characteristics estimated for the optimal bandwidth (h) employing the bandwidth selection procedure of Imbens and Kalyanaraman (2012), and a triangular kernel.

discontinuity in situations where features of a covariate's distribution other than the mean are discontinuous at the threshold. The results from this method, using the same set of covariates considered in Table 4, are presented in Panel B of Table 3. We continue to find no evidence of a discontinuity in any of the candidate and constituency-level baseline characteristics. This provides us with further confidence in the validity of our empirical strategy.

5.3 External Validity

We next address two related concerns with respect to the external validity of our empirical framework. In particular, we examine (1) whether the close third-ranked candidates are geographically concentrated; and (2) whether the observations lying in a small neighbourhood around the cut-off of our running variable are concentrated within a narrow range of political circumstances (vote share of the third ranked candidate and the winning margin).

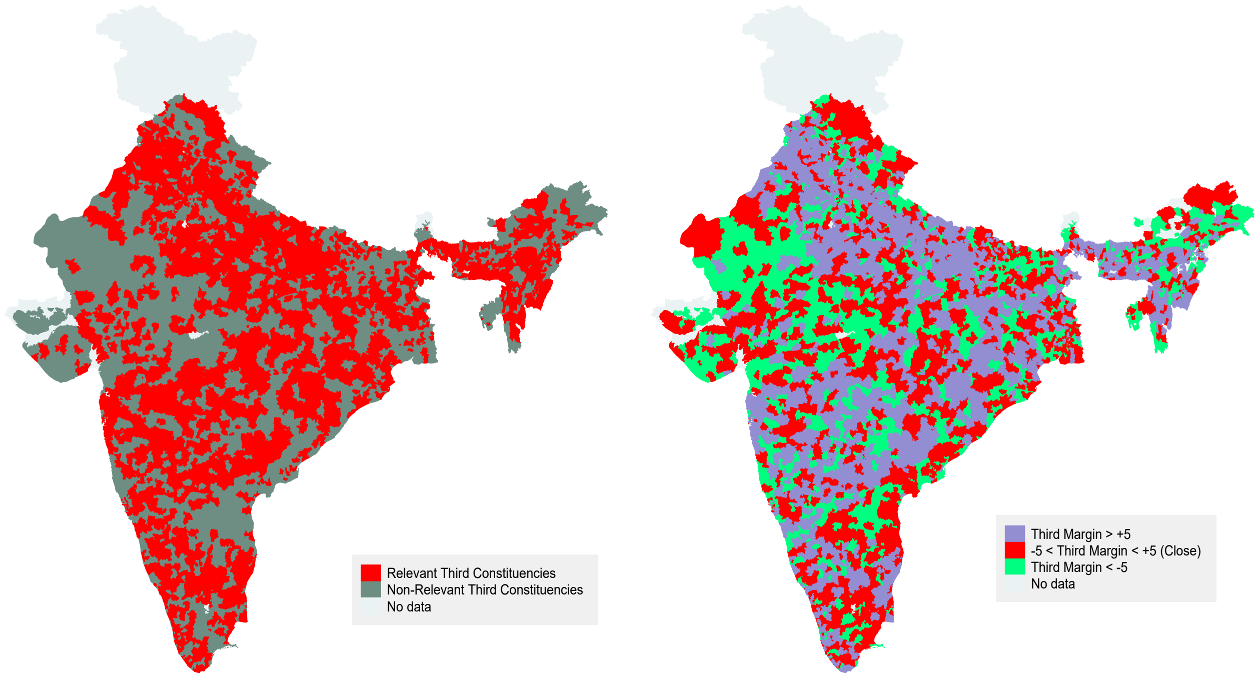
Panels A and B of Figure 3 present the geographic spread of constituencies with a *Relevant Third* and the geographical spread of constituencies with and without a barely *Relevant Third*. There is no evidence of geographic clustering and constituencies with a *Relevant Third* and with and without a barely *Relevant Third*, are spread out across the country.

For our empirical strategy to be valid, the closely relevant (and non-relevant) third-ranked candidates should be representative of a broad range of political circumstances. Panel A of Figure 4 presents a scatter plot of the third-placed candidate's vote share against the Third margin. It shows that the barely relevant and the barely not relevant thirds are observed across a wide-range of vote shares of the third-ranked candidate. In particular, in the constituencies where the third-ranked candidate was within 5% of the winning margin (i.e., close), the vote share of the third-ranked candidate varies considerably, from 0.33% to 25.22%. Thus, the occurrence of a third-ranked candidate with vote share close to the winning margin is representative of a wide range of voter preferences towards the third-ranked candidates.

In Panel B of Figure 4, we present a scatter plot of the third margin on the winning margin. Again 'close' third-ranked candidates are observed across a range of winning margins, ranging from 0.009% to 27.14%.

Figure 3: External Validity

Panel A: Geographic Concentration of Relevant Thirds | **Panel B: Geographic Concentration of Third Margin**



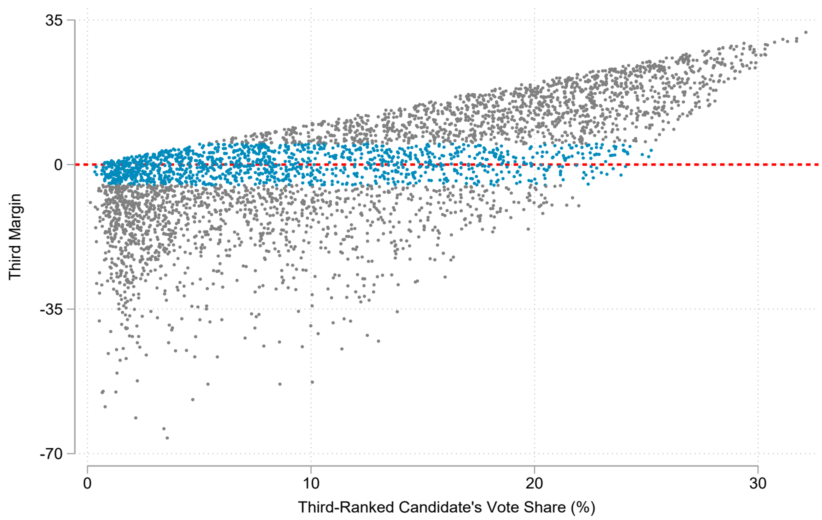
Notes: In Panel A, we present a map of constituencies colored-coded by a binary variable indicating whether there is a relevant third-ranked candidate. In particular, 49.8% of the constituencies have a relevant third-ranked candidate, while 50.2% are without one. In Panel B, we plot 3 intervals of the running variable, *Third Margin*, which is defined as the third-ranked candidate's vote share minus the winning margin. The red-coloured areas in Panel B represent constituencies where the third-ranked candidate was barely relevant or barely not relevant (i.e., within 5 percentage of the winning margin) — those that essentially comprise our RD sample.

6 Effect of *Relevant Third* on Economic Growth

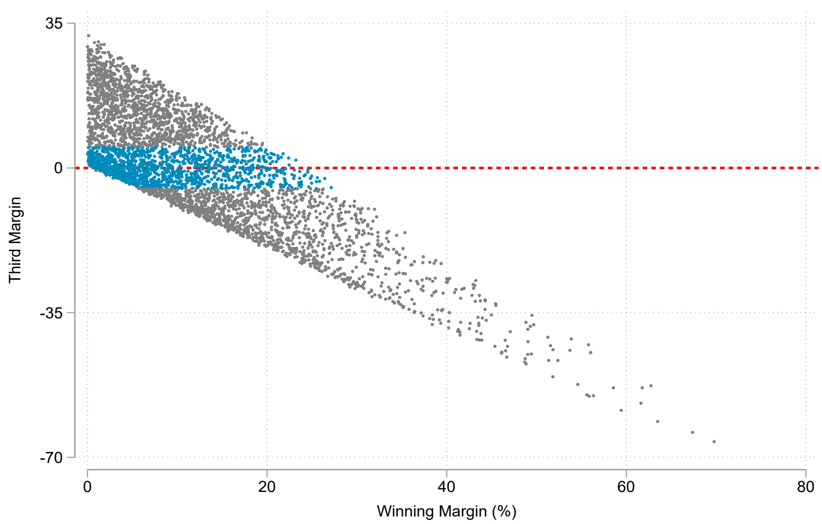
In this section, we present results from estimating equation (3) using a local linear regression technique with different bandwidths. Our primary outcome variable is *luminosity density* (defined as the total sum of nighttime lights detected within the boundaries of a constituency in a year, divided by the total area of the constituency). The growth rate of luminosity density is defined as the difference in the natural logarithm of luminosity density between the current and the previous year. For our main specification, we take the year-on-year (annual) growth rate over the election term, exclusing the election year. We exclude the election year as the effects in the year of the election could be potentially driven by the elected candidate from the previous term. We, thus, have four observations per constituency in the main specification. This also helps us examine within term hetero-

Figure 4: Third Margin and Vote Share of Third-Ranked Candidate

Panel A: Third Margin and Vote Share of the Third-Ranked Candidate



Panel B: Third Margin and Winning Margin



Notes: In Panel A, we present a scatter plot of the third-ranked candidate's vote share against *Third Margin*, which is defined as the third-ranked candidate's vote share minus the winning margin; Panel B presents a scatter plot of the winning margin against *Third Margin*. The highlighted regions in both panels represent constituencies where the third-ranked candidate's vote share was within 5 percentage points of the winning margin, in either direction. The unit of analysis is an Assembly constituency.

geneity of effects. In addition to the full electoral term, we break the electoral term into two sub-samples: (*i*) first half of the electoral term (years $t+1$ and $t+2$), and (*ii*) second half of the electoral term (years $t+3$ and $t+4$), where t is the election year. Owing to the asynchronous electoral calendars across states, and by extension, varying time periods of nighttime lights by state, we control for year fixed effects in all specifications.

6.1 Main Results

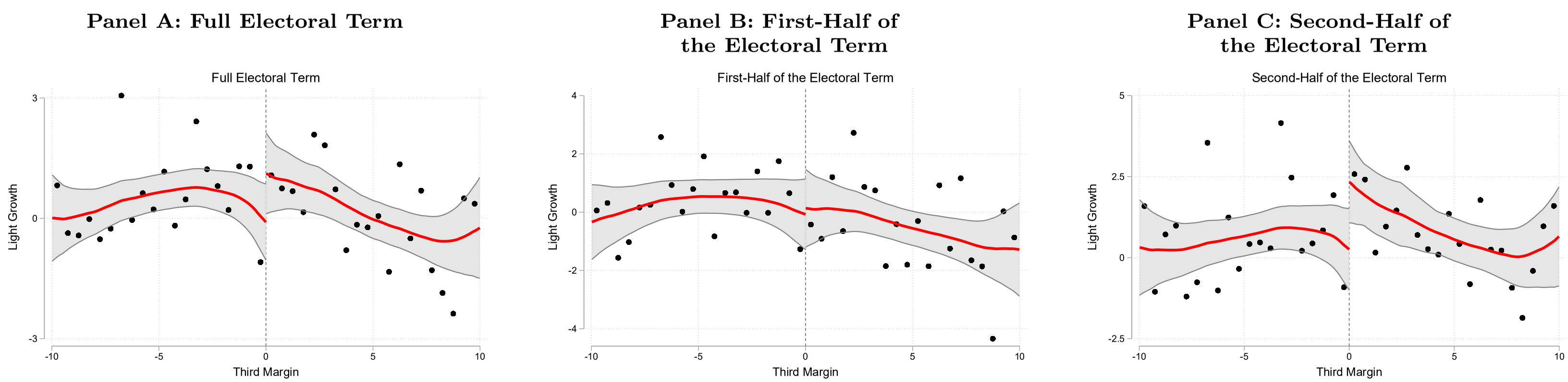
Table 5 presents our main results. These are presented in Column 1. In columns 2–4, we examine the robustness of the results to alternative bandwidths and bandwidth selection procedures employing a local linear regression ($p = 1$). Finally, in column 5, we present estimates using a second order local polynomial smoothing function ($p = 2$) to examine the sensitivity of our main estimates to the choice of functional form. Panel A presents the results for the full election term (years $t+1 \longrightarrow t+4$); Panel B presents the corresponding results for the first half of the election term (years $t+1$ and $t+2$) while Panel C presents the results for the second half of the election term (years $t+3$ and $t+4$).

Across the full electoral term (Panel A), we find a weak positive effect of a *Relevant Third* on nighttime lights. A comparison of the results presented in Panels B and C imply that the (overall) positive effects are driven by the significantly higher growth in luminosity in the second half of the electoral term. In the second half of the term, constituencies with a barely*Relevant Third* experience 1.2–3.5 percentage points higher growth rate in nighttime lights compared to constituencies where the third placed candidate is *barely* not relevant.

Figure 5 presents a graphical analogue of the results reported in Table 5. Consistent with the regression results, the figures show a discontinuous jump in the growth of nighttime lights at the cut-off (i.e., $Third\ Margin = 0$) and the effects are particularly strong in the second half of the electoral term (Panel C).

There are no statistically significant effects of having a *Relevant Third* on nightlights in years $t+1$ and $t+2$, i.e., the first half of the electoral term. This is not surprising given that affecting economic outcomes (prosperity) takes time and hence any effects of actions undertaken to increase economic outcomes would possibly show up with a delay. Additionally, this shows that the improvements in nightlights are driven by the actions of the incumbent, and are not a product of the previously elected representative.

Figure 5: Impact of a *Relevant Third* on Growth of Nightlights



Notes: The figure plots the annual growth in luminosity density (net of year fixed effects) against the running variable, *Third Margin*. A positive value of the running variable implies that the vote share of the third-ranked candidate is higher than the winning margin; a negative value implies the winning margin is higher than the vote share of the third-position candidate. Each dot in the figure depicts the averages over successive bins of 0.5% of the running variable. The curves are local linear regression (with 95% confidence intervals) fit separately for the positive and negative parts of the cut-off.

Table 5: Effect of a *Relevant Third* on Growth of Nightlights

	$p=1$				$p=2$
	(1)	(2)	(3)	(4)	(5)
Panel A: Full Electoral Term					
Relevant Third	1.209*	1.029	2.294**	0.748	2.002**
	(0.719)	(0.639)	(0.945)	(0.551)	(1.013)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	4.97	6.59	2.49	9.94	4.97
Observations	4620	5840	2592	8004	4620
Panel B: First-Half of the Electoral Term					
Relevant Third	0.208	0.190	0.081	-0.202	0.015
	(1.000)	(0.892)	(1.354)	(0.758)	(1.416)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	6.41	8.56	3.21	12.82	6.41
Observations	2860	3564	1610	4778	2860
Panel C: Second-Half of the Electoral Term					
Relevant Third	2.081**	1.718**	3.257***	1.182*	3.543***
	(0.872)	(0.796)	(1.177)	(0.690)	(1.248)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.73	7.34	2.87	11.47	5.73
Observations	2604	3160	1468	4406	2604

Notes: Local linear RD regression ($p = 1$) results presented in Columns 1–4. Column 5 presents results for a local quadratic RD regression ($p = 2$) using a triangular kernel using the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parentheses. In each column, the outcome variable is the annual growth in luminosity density (net of year fixed-effects) as defined in Section 4. Panel A: sample of annual growth rate in the full electoral term ($t+1$ to $t+4$); Panel B: annual growth rate in the first half of the term ($t+1$ and $t+2$); Panel C: annual growth rate in the second half of the term ($t+3$ and $t+4$). Significance: $^{***}p < 0.01$;$^{**}p < 0.05$;$^{*}p < 0.1$.

Using estimates of elasticity of GDP to nighttime lights we can compute the effect in terms of actual GDP growth (see Bickenbach et al., 2016, Baskaran et al., 2023). Based on a nighttime lights-to-GDP elasticity of 0.10, and using luminosity density as our primary outcome, we find that having a relevant third-placed candidate increases the regional GDP growth by 0.1 to 0.3 percentage points. The growth rate of India in the sample period, 2012–2021, averaged around 5.5% per year. The results presented in Table 5 indicate that the growth premium from having a *Relevant Third* was between 1.8 and 5.5%.[16]

6.1.1 Robustness Exercises

In this section, we conduct a set of robustness exercises to address important concerns related to the estimates presented in the preceding section.

***Placebo Discontinuity*:** In our main analysis, the treatment assignment rule is described by *Third Margin*, i.e., the difference between the vote share of the third-ranked candidate, and the winning margin. While our RD specification is based on a cut-off of zero (i.e., $v_3 = v_1 - v_2$), the salience of this specific cut-off for an incumbent might not be as sharp. For instance, an incumbent, elected by a winning margin of, say, 10%, may regard a third-ranked candidate with a vote share of 9% to be as relevant as a third-ranked candidate with a vote share of 11%; i.e., the incumbent might view both cases as a credible threat of coalition. In our empirical framework, the former would be defined as a *non-Relevant Third*, while the latter would be considered *relevant*. We address this concern by re-estimating our main specification (equation (3)) using placebo (alternative) thresholds. In our case, a placebo threshold of, say, 5 would imply that third-ranked candidates are relevant only when their vote share exceeds the winning margin by more than 5 percentage points, and vote shares falling short of the winning margin by 5 percentage points or more correspond to 'non-relevant' thirds. We estimate the treatment effect at placebo cut-offs in increments of 5 percentage points either side of zero. The results for this exercise are presented graphically in Figure A4. We find that for all placebo thresholds, the results are not statistically significant, and it is only the cut-off of zero that matters for any effects on economic growth to materialise. Reassuringly, the placebo cut-offs do not yield a statistically significant results separately for the first- and the second-half of the electoral terms.

***Alternative Bandwidths*:** In Table 5, we presented RD estimates for the optimal bandwidth (h) computed using the Imbens and Kalyanaraman (2012) procedure, as well as results from using two variants of h: (i) half the optimal bandwidth ($h/2$), and (ii) double the

[16] This is calculated as follows. We calculate the proportion of average annual GDP growth rate explained by our estimates, i.e., estimated GDP growth as a result of a relevant third-ranked candidate (0.11–0.32%) divided by the average annual GDP growth rate in the country (5.5%).

optimal bandwidth ($2h$). While we do not expect coefficient stability as we move farther away from the cut-off, it is useful to examine how the estimates evolve with incremental changes in the optimal bandwidth. In Figure A5, we present different point estimates (and the 90% confidence intervals) by varying the bandwidth between 0.1 and 2 of the optimal bandwidth in increments of 0.1. The patterns are fairly stable showing a steady decline in the estimated effect, as h increases, particularly in Panels A and C. Consistent with the results presented in Table 5, irrespective of h, the effects are never statistically significant for the first half of the electoral term (Panel B).

***Incumbent's Failure to Secure a Majority*:** In a first-past-the-post multi-party electoral system, it is entirely possible for a candidate to win the election without securing a majority vote share. For example, in our sample, only 31% of the winning candidates secured a vote share greater than 50%. One could argue that what we are estimating is the effect of a winner not being able to secure a majority vote share compared to a winner who wins by a majority, instead of actually capturing the impact of having a *Relevant Third* vis-à-vis not having one in the constituency. To address this concern, we estimate the following regression:

$$GROWTH_{c,s,t+1} = \alpha + \beta Majority\ Winner_{c,s,t} + f(Majority\ Margin_{c,s,t}) + \mu_{c,s,t+1} \quad (4)$$
$$\forall\ Majority\ Margin_{c,s,t} \in (d - h, d + h)$$

where $Majority\ Margin_{c,s,t} = v_1 - 50$ (how far the winner is to securing majority) is our new running variable; $Majority\ Winner = 1$ if $v_1 > 50$, and 0 otherwise. Observing a jump in nightlights growth identical to the one presented in Table 5 at this placebo cutoff (i.e., at $Majority\ Margin_{c,s,t} = 0$ or $v_1 = 50$) would be problematic for two reasons. *First*, this would imply that the presence of a *Relevant Third* is potentially not a credible measure of electoral competition; instead, it is simply an indirect indicator of the electoral strength of the incumbent. *Second*, this would also imply that our estimates are not purely a product of an incumbent's response to a coalitional threat; instead, it could imply that the incumbent is simply responding to not acquiring a majority vote share. The corresponding regression results are presented in Table A3 in the Appendix. Reassuringly, we do not observe a significant difference in nighttime lights growth between constituencies where the winner *barely* secured a majority vote share relative to constituencies where the winner *barely* missed out on a majority. In fact, the estimates are not statistically significant for any bandwidth choice, and for any phase of the electoral term.[17] This provides us with some confidence in our estimates in that we are not erroneously capturing the impact of a seemingly related feature of the election.

***Beyond the Third*:** Do candidates ranked lower than the third position matter? It is natural to ask whether the effects observed in the preceding section extend to, say, the fourth- or the fifth-ranked candidates who become 'relevant' according to our definition (i.e., when their vote share exceeds the winning margin). If this indeed were the case, then it would imply that the estimates presented in Table 5 are, in fact, capturing the impact of 'fragmentation' instead of a threat of coalition. Drawing on the Duverger-Demsetz hypothesis (see Ferris et al., 2016), our contention is that a 'relevant' candidate ranked lower than the third position cannot serve as (or represent a credible measure of) a viable threat of collusion. This is primarily because, theoretically, as fragmentation increases, the possibility of coalition formation among the non-incumbents decreases. To empirically validate our argument, we estimate (3) using two alternative running variables: (i) $Fourth\ Margin = v_4 - (v_1 - v_2)$, and (ii) $Fifth\ Margin = v_5 - (v_1 - v_2)$; where v_i is the vote share of the i-th ranked candidate.[18] The same definition of a 'relevant' candidate using the margin variable, as described in equation (2), applies here. Table A4 presents the results from this estimation exercise. We find that there is no statistically impact of a 'relevant' fourth-ranked or fifth-ranked candidate across the electoral term.[19] This provides further evidence that it is indeed the effect of a coalitional threat, induced by the presence of a *Relevant Third*, that drives our main results. We discuss the coalition formation problem more in Section 9.4 wherein we examine what kinds of non-incumbent vote share compositions constitute a credible coalitional threat.

7 Credibility of the Threat of Coalition

The premise of our paper relies on the hypothesis that the presence of a *Relevant Third* poses a coalitional threat to the winner. Since this threat negatively affects the probability

[17] Figure B1 in the Appendix presents a graphical analogue of the results presented in Table A3

[18] We do not go beyond the fifth-ranked candidate since we do not have a sufficient number of observations where the vote shares of candidates ranked, say, sixth or seventh exceed the winning margin.

[19] Figure B2 in the Appendix presents a graphical analogue of the results presented in Table A4.

of re-election, it forces the incumbent to deliver. However, this argument stands on the credibility of the threat of a potential coalition (between the runner-up and the third-ranked candidate). Given the complex political landscape of India, where political parties and actors have, in the past, formed electoral coalitions even with ideologically opposed blocks, it is difficult to directly estimate the probability of coalition formation. We, therefore, examine the credibility of potential coalitional threat using two alternative approaches.

7.1 Falsification Analysis: Third-placed candidate NOTA

First, we take advantage of the ballot option 'None of the Above' or NOTA, and we divide our sample into the following two sub-samples: (i) when the ballot option 'None of the Above' (NOTA) receives the third-highest vote share, i.e., NOTA is ranked third in the constituency, and (ii) when a contesting candidate – either party affiliated or independent – is ranked third in the election. Ever since its introduction in 2013, NOTA has been widely recognised as a pure protest vote option in the Indian electoral space, though with no (actual) impact on the final electoral outcomes (see Ujhelyi et al., 2021). In our setting, NOTA being ranked third in an election could not possibly correspond to a credible threat (of coalition formation) to the incumbent. Thus, a sub-sample analysis with NOTA as the third-placed candidate serves as a falsification exercise to ascertain whether the effects that we have observed are indeed driven by a *plausible* threat of collusion between the runner-up and third-placed candidate. Table 6 presents the results from this estimation exercise. The dependent variable is again the growth of luminosity density over the full electoral term (Panel A) or separately in the first and second halves of the electoral term (Panels B and C respectively). In Columns 1–5 we find that the results for the sub-sample of non-NOTA third-ranked candidates are almost identical to the full sample estimates presented in Table 5. On the other hand, for the sub-sample of constituencies where NOTA is ranked third in the election (columns 6–10), the results are statistically never statistically significant, i.e., there is no effect of having a *Relevant Third*. This lends confidence to our hypothesis that the observed effects are indeed a result of a (credible) possible coalitional threat.

7.2 Ideological Credibility of the Coalitional Threat

Second, we create two sub-samples from our sample constituencies based on the ideological compatibility of the second- and third-placed candidates. While historically, small parties

Table 6: Impact of a *Relevant Third* on Growth of Nightlights: Falsification

	Non-NOTA Third Candidate					NOTA Third Candidate				
	$p=1$				$p=2$	$p=1$				$p=2$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Full Electoral Term										
Relevant Third	1.509**	1.159*	2.676***	0.890	2.544**	-3.578	-4.691	-2.727	-2.848	-4.454
	(0.765)	(0.668)	(1.020)	(0.578)	(1.083)	(2.933)	(3.054)	(3.040)	(2.754)	(3.357)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	4.64	6.35	2.32	9.27	4.64	4.40	3.21	2.20	8.79	4.40
Observations	3916	5112	2156	6884	3916	404	336	248	668	404
p–value (NOTA − Non-NOTA)						*0.094*	*0.062*	*0.094*	*0.187*	*0.047*
Panel B: First-Half of the Electoral Term										
Relevant Third	0.138	0.087	0.273	-0.281	0.204	-1.131	-4.431	-4.515	-1.409	-4.251
	(1.045)	(0.915)	(1.427)	(0.792)	(1.489)	(3.472)	(3.738)	(3.714)	(3.224)	(3.979)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	6.53	9.12	3.26	13.06	6.53	5.71	2.94	2.85	11.42	5.71
Observations	2622	3384	1458	4400	2622	258	152	150	404	258
p–value (NOTA − Non-NOTA)						*0.727*	*0.241*	*0.231*	*0.736*	*0.294*
Panel C: Second-Half of the Electoral Term										
Relevant Third	2.439***	2.070**	3.872***	1.415**	4.205***	-5.310	-5.518	-1.202	-4.248	-2.705
	(0.930)	(0.864)	(1.243)	(0.713)	(1.309)	(4.183)	(4.261)	(3.850)	(3.854)	(4.461)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.56	6.64	2.78	11.13	5.56	3.70	3.24	1.85	7.41	3.70
Observations	2306	2640	1280	3924	2306	184	170	108	302	184
p–value (NOTA − Non-NOTA)						*0.071*	*0.081*	*0.212*	*0.151*	*0.176*

Notes: Local linear RD regression ($p = 1$) results presented in Columns 1–4 and 6–9. Columns 5 and 10 present results for a local quadratic RD regression ($p = 2$) using a triangular kernel using the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parentheses. Across all panels, columns 1–5 correspond to the sub-sample where NOTA does not rank third, while columns 6–10 report results for constituencies where NOTA was ranked third at the polls. In each column, the outcome variable is the annual growth in luminosity density (net of year fixed-effects) as defined in Section 4. Panel A: sample of annual growth rate in the full electoral term ($t+1$ to $t+4$); Panel B: annual growth rate in the first half of the term ($t+1$ and $t+2$); Panel B: annual growth rate in the second half of the term ($t+3$ and $t+4$). The p-values for equality of coefficients across the two sub-samples (NOTA vs Non-NOTA Thirds) using a Wald χ^2 test presented in italics. Significance: $^{***}p < 0.01;^{**}p < 0.05;^{*}p < 0.1$.

have often formed electoral coalitions with large parties irrespective of their ideological position, these coalitions have almost exclusively centred around two major national parties, the Bharatiya Janata Party (BJP) and the Indian National Congress (INC). The BJP and the INC have been major political opponents for decades, and have, since the idependence of the country, formed central governments either as leaders of a major coalition bloc or on their own at different points of time. Our second approach to examining the credibility of coalitional threats relies on the hypothesis that it is unlikely that the BJP and the INC would ever form a coalition. We run our main specification for two sub-samples: (*i*) *Ideologically Non-Credible Coalitions*, which are defined as constituencies where the runner-up and the third-placed candidate are affiliated to the BJP and INC (irrespective of the order); and (*ii*) *Ideologically Credible Coalitions*, defined as constituencies where the runner-up and the third position is secured by any other combination of parties barring the BJP–INC pair. The regression results are presented in Table 7.[20] Columns 1–5 present the results for credible coalitions while columns 6–10 present the results for non-credible coalitions. For the sub-sample of constituencies with an ideologically credible coalitional threat, the effects are largely similar to the full sample results, though the estimates a more imprecise (see Panel A). The effects are largely positive and statistically significant for the second half of the electoral term (Panel C). On the other hand, for the sub-sample of constituencies where coalition threat is non-credible, we find that the effects are muted across the full electoral term, compared to the sub-sample of credible coalitions (Panel A). However, we find that, in the first-half of the electoral term, there is a weak negative effect on the growth of nighttime lights (Panel B).

8 Mechanisms

Before proceeding further, let us briefly summarise the key results thus far. Our RD estimates show that having a *Relevant Third* in a constituency, indicative of greater political competition because the incumbent faces a threat of collusion, results in higher growth in nighttime lights. Additionally, we find that investments in constituency development are significantly higher only when the coalitional threat posed by the *Relevant Third* is indeed a credible one (see Section 7). In this section we examine whether there is any truth to the argument that there is greater investment in constituencies with a *Relevant Third*.

[20] Figure B8 present these results graphically and these figures corroborate the results presented in Table 7.

Table 7: Impact of a *Relevant Third* on Growth of Nightligts: Ideological Credibility of the Coalitional Threat

	Credible Coalitions					Non-Credible Coalitions				
	$p = 1$				$p = 2$	$p = 1$				$p = 2$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Full Electoral Term										
Relevant Third	1.173	0.986	2.126**	0.859	1.752*	-0.433	0.420	2.131	-1.449	2.353
	(0.738)	(0.611)	(0.967)	(0.573)	(1.037)	(1.740)	(1.996)	(2.418)	(1.303)	(2.601)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.20	8.64	2.60	10.40	5.20	7.57	5.95	3.79	15.15	7.57
Observations	4388	6496	2468	7448	4388	588	472	320	1036	588
p–value (Credible − Non-Credible)						*0.396*	*0.786*	*0.998*	*0.105*	*0.829*
Panel B: First-Half of the Electoral Term										
Relevant Third	0.463	0.451	0.133	0.137	-0.088	-4.245*	-4.300*	-1.129	-3.357*	-0.804
	(1.065)	(0.897)	(1.431)	(0.811)	(1.501)	(2.288)	(2.261)	(2.906)	(1.798)	(3.184)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	6.30	9.79	3.15	12.60	6.30	8.60	8.94	4.30	17.19	8.60
Observations	2574	3576	1462	4254	2574	330	340	176	574	330
p–value (Credible − Non-Credible)						*0.064*	*0.051*	*0.698*	*0.076*	*0.838*
Panel C: Second-Half of the Electoral Term										
Relevant Third	1.885**	1.437*	2.998**	1.137	3.236**	3.929	3.863	5.343	1.178	6.341*
	(0.901)	(0.784)	(1.217)	(0.720)	(1.292)	(2.702)	(2.681)	(3.627)	(2.083)	(3.762)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.92	8.93	2.96	11.84	5.92	5.88	5.97	2.94	11.75	5.88
Observations	2456	3310	1402	4076	2456	230	238	120	440	230
p–value (Credible − Non-Credible)						*0.473*	*0.386*	*0.541*	*0.985*	*0.436*

Notes: Local linear RD regression ($p = 1$) results presented in Columns 1–4 and 6–9. Columns 5 and 10 present results for a local quadratic RD regression ($p = 2$) using a triangular kernel using the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parantheses. Across all panels, Columns 1–5 correspond to a sub-sample of constituencies where the BJP and the INC were *not* ranked second and third together, while columns 6–10 report results for constituencies where the BJP and the INC ranked second and third together (in whichever order). In each column, the outcome variable is the annual growth in luminosity density (net of year fixed-effects) as defined in Section 4. Panel A: sample of annual growth rate in the full electoral term ($t + 1$ to $t + 4$); Panel B: annual growth rate in the first half of the term ($t + 1$ and $t + 2$); Panel B: annual growth rate in the second half of the term ($t + 3$ and $t + 4$). The p-values for equality of coefficients across the two sub-samples (Credible vs Non-Credible Coalitions) using a Wald χ^2 test presented in italics. Significance: $^{***}p < 0.01$;$^{**}\,p < 0.05$;$^{*}\,p < 0.1$.

We consider investment along two dimensions: investment in public goods and (possible) investment in law and order and security that results in a reduction in crime. These two pathways also serve as mediating channels (mechanisms) to explain our key results.

8.1 Provision of Public Goods

Our primary data source for the estimation with respect to public goods is the Mission Antyodaya (MA) 2020 data on village-level facilities (see Section 2.4). For this analysis, we construct a cross-sectional data of constituencies where the outcome variables are measured in 2020. Thus we consider the electoral cycle 2015–2019, i.e., the elected representative holds office in 2019 for each constituency.[21] Each variable corresponding to a particular village-level public good is measured as the proportion of villages in a constituency having access to that good.[22] The set of public goods that we consider are (*a*) drainage infrastructure (closed drains, uncovered drains and open *kuchha* drains); (*b*) market infrastructure (*mandi* or wholesale market, regular market, weekly *haat* or local/informal market); (*c*) electricity supply (to micro, small and medium enterprises or MSMEs and solar/wind electricity for households); (*d*) public health infrastructure (Primary health centres, community health centres and maternity health centres); (*e*) school availability (primary school, middle school, high school and senior secondary school). We also construct an index using a principle component analysis for the set of variables corresponding to the different public goods. The regression results are presented in Table 8. We present the results corresponding to the optimal bandwidth using the Imbens and Kalyanaraman (2012) approach.[23]

The RD estimates show that having a *Relevant Third* in a constituency results in a significantly higher proportion of villages within the constituency having access to public goods. The proportion of villages with closed drainage is 12 percentage points higher, while the proportion of villages with uncovered drainage is 9.2 percentage points lower in constituencies with a *Relevant Third* (columns 1 and 2 respectively). The proportion of villages with

[21]Due to the asynchronous nature of the Legislative Assembly elections, in some states, the leaders would have had the full electoral term to affect the availability of facilities, while in some states, the leaders would have had just one year for the provision of these facilities. Therefore, we also control for election-year fixed effects in our regressions and find that our results vis-à-vis MA public facilities continue to hold.

[22]Each variable is multiplied by 100 for ease of interpretation.

[23]Results for alternative bandwidths and alternative ways of computing the bandwidth are available on request.

Table 8: Effect of a *Relevant Third* on Provision of Public Goods in the Constituency

	Drainage Infrastructure			Market Infrastructure			Electricity Supply	
	Closed Drains	Uncovered Drains	Open *Kuchha* Drains	Mandi	Regular Market	Weekly *Haat*	Supply to MSMEs	Solar/Wind Electricity for Households
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Relevant Third	12.289***	-9.211***	-0.655	2.227*	6.118**	1.470	10.206***	11.425***
	(3.492)	(3.357)	(2.222)	(1.311)	(2.708)	(2.315)	(3.483)	(3.812)
Bandwidth Size (h)	4.95	6.29	8.29	6.40	6.66	8.61	5.78	4.47
Observations	626	753	922	767	780	954	706	561

	Public Health Infrastructure			Availability of Schools				Index of
	Primary Health Centres	Community Health Centres	Maternity Centres	Primary School	Middle School	High School	Senior Secondary School	**Public Goods**
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Relevant Third	1.446	4.947**	5.075	2.535	5.685**	4.022	3.096	0.785***
	(1.256)	(2.233)	(3.355)	(1.724)	(2.685)	(2.803)	(2.531)	(0.283)
Bandwidth Size (h)	6.77	5.65	7.79	7.26	6.90	7.28	8.39	2.52
Observations	789	695	888	837	801	837	933	351

Notes: Local linear RD regression ($p = 1$) results presented. Standard errors clustered at the Assembly constituency level presented in parenthesis. Significance: $^{***}p < 0.01$;$^{**}p < 0.05$;$^{*}p < 0.1$. Optimal bandwidth computed using the Imbens and Kalyanaraman (2012) technique. Results for alternative bandwidths and alternative ways of computing the bandwidth are available on request.
Outcome variables: proportion of villages in the constituency with closed drainage system (column 1); uncovered drainage system (column 2); open *kuchha* drainage system (column 3); at least one *mandi* or wholesale market (column 4); at least one regular market (column 5); at least one weekly *haat* (column 6); proportion of MSMEs in the villages within a constituency having access to electricity (column 7); proportion of villages in the constituency having access to solar/wind electricity (column 8); having at least one primary (column 9), community (column 10) and maternity (column 11) health centre; having at least one primary (column 12), middle (column 13), high (column 14) and senior secondary school (column 15). In column 16 the outcome variable is an index of public goods.

a community health centre is higher by a statistically significant 5 percentage points (column 5). While the proportion of villages that have a primary health centre or a maternity health centre are higher by 1.45 percentage points and 5 percentage points respectively, these effects are not statistically significant (columns 4 and 6 respectively).

Constituencies with a *Relevant Third* have better market infrastructure: the proportion of villages with a wholesale market (or *mandi*) is higher by 2.2 percentage points (column 7) and the proportion of villages with a regular market is higher by 6.1 percentage points (column 8). While the proportion of villages with a local/informal market (weekly *haat*) this effect is not statistically significant (column 9). Constituencies with a *Relevant Third* have more schools. The proportion of villages with a primary school, a middle school, a high school and a senior secondary school are all higher in constituencies with a *Relevant Third*; the effect is however only statistically significant for availability of middle schools (5.7 percentage points higher in constituencies with a *Relevant Third*).

Constituencies with a *Relevant Third* have more villages with electricity available for MSMEs and wind and solar electricity for households. Finally the presence of a *Relevant*

Third candidate is associated with a 0.8 standard deviations higher overall availability of public goods. These results therefore support the argument that elected representatives from constituencies with a *Relevant Third* are able to improve the broad economic conditions in their constituencies.

8.2 Effects on Crime

Our second channel we consider is the effect of political competition on crime. The crime data made available by the NCRB is, however, only available at the district level, which is higher than the constituency level — constituencies are nested within districts. Therefore, we aggregate up our constituency level treatment variables to the district level to determine the causal impact of *Relevant Third*. So the main treatment variable becomes the district level fraction of constituencies with a *Relevant Third*.[24]

We expect the characteristics of the elected politician (in this case if he/she is elected from a constituency that has a *Relevant Third*) in period t would affect crime in the district in period $(t+1)$. We specify the relationship between the characteristics of the elected politician and crime as follows:

$$C_{ds(t+1)} = \alpha_s + \eta_{st} + \beta A_{dst} + \varepsilon_{ds(t+1)} \tag{5}$$

where $C_{ds(t+1)}$ refers to the total crime count in district d in state s in period $t+1$; A_{dst} denotes the fraction of seats in district d in state s in period t with a *Relevant Third*. We include state fixed effects (α_s), which capture time-invariant state-specific unobserved factors and state-specific year fixed effects η_{st}, which control for time-varying unobserved factors at the state level and also absorbs the overall year fixed effects capturing any year-specific macroeconomic shocks.[25] Standard errors are clustered at the district level to allow for any possible correlation between observations from the same district.

[24]See Clots-Figueras (2012), Bhalotra and Clots-Figueras (2014), Bhalotra et al. (2014), Lahoti and Sahoo (2020), Prakash et al. (2022), Bhalotra et al. (2021), Anukriti et al. (2022), Jain et al. (2023), Baskaran et al. (2023) for more on this approach to examine the effect of different characteristics of politicians on a range of different outcomes in the context of India.

[25]Since we observe only one time-period post the election, we have one data point for each district corresponding to the fraction of seats in district d with a *Relevant Third*. Therefore, we are unable to include district-specific fixed effects. We, nonetheless, have four observations on each district corresponding to the total crimes recorded within the electoral term.

While we include fixed effects to control for unobservables, we still cannot rule out the possibility of time-varying district specific unobserved characteristics being correlated with both $C_{ds(t+1)}$ and A_{dst}. For example, some unforeseen event might make the district more competitive and also reduce reported crime. If such district level factors change over time that can make the treatment variable (A_{dst}) endogenous.

We use an IV approach to address the problem of endogeneity. We use the fraction of seats in the district where the votes received by the third-placed candidate barely exceeds the winning margin as an instrument for the number of seats where with a *Relevant Third*. Since, the outcome of the close election is random for each constituency, and the average at the district level can be considered random too. Specifically the 2SLS regression specification is given by:

$$A_{dst} = \delta_s + \phi_{st} + \tau AC_{dst} + \sum_{j=1}^{J} \nu_j I_{jdst} + \sum_{j=1}^{J} \pi_j I_{jdst} \times F(M_{jdst}) + \epsilon_{ds(t+1)} \tag{6}$$

$$C_{ds(t+1)} = \alpha_s + \eta_{st} + \beta A_{dst} + \xi TC_{dst} + \sum_{j=1}^{J} \mu_j I_{jdst} + \sum_{j=1}^{J} \psi_j I_{jdst} \times F(M_{jdst}) + \varepsilon_{ds(t+1)} \tag{7}$$

Equations (6) and (7) are respectively the first and second stage of the 2SLS specification. A_{dst} is the fraction of constituencies in the district with a *Relevant Third* and is potentially endogenous. In the first stage regression (equation (6)) A_{dst} is predicted by AC_{dst}, which denotes the fraction of constituencies where the third placed candidate is *barely* relevant. However, while the outcome of a close election is random, the possibility of the presence of a close election itself might not be random. To account for this possibility, we include as an additional control in the second stage (equation (7)) the fraction of constituencies with a close third party (TC_{dst}). The inclusion of TC_{dst} as an additional control also ensures that the exclusion criterion is met, as after controlling for a fraction of close elections in the district, the instrument (AC_{dst}) can affect the outcome only through the overall fraction of relevant thirds in the district (A_{dst}). Our regressions also control for I_{jdst}, which is a dummy variable indicating the existence of a third-ranked candidate in the j^{th} constituency of district d in state s. $F(M_{jdst})$ is a polynomial function of the difference between the margin of victory and the vote share of the third placed candidate (the *Third Margin*). We also include the interaction between I_{jdst} and $F(M_{jdst})$.

Figure A6 plots the district level fraction of constituencies with a *Relevant Third* against the *Third Margin* in each constituency in the district. We create this figure as follows. The constituency-level data on *Third Margin* are aggregated into one percentage point bins, as suggested by Imbens and Lemieux (2008), and a lowess smoothing line is plotted on each side of the discontinuity. The figure then plots the fraction of constituencies in the district with a *Relevant Third* against the *Third Margin*. We see a significant and discontinuous jump in the fraction of constituencies when $Third\ Margin > 0$.

Table 9 presents the OLS and the 2SLS regression results. Across the OLS and 2SLS estimations, we find a significant negative impact of *Relevant Thirds* in a district on the total number of crimes reported during the electoral term. The results remain robust to the addition of state-specific year fixed effects and state fixed effects, and to using different bandwidths to define a close relevant third-ranked candidate. In Panel B, we alternatively use the total number of crimes weighted by the population of the district as the outcome. We continue to find statistically significant negative results across different specifications. In particular, we find that a 10 percentage points increase in the fraction of *Relevant Thirds* in the district leads to a 3.2–6.2% reduction in the average incidence of crimes (per 10,000 population) during the district's electoral term.

9 Heterogeneity Analysis

The impact of a *Relevant Third* on economic development may vary by the characteristics of the winner (party affiliation and alignment), the political/institutional environment of the state where the constituency is located the gender of the winner and the margins (of the winner and the runner-up). In this Section, we conduct heterogeneity analyses along a number of different dimensions.

9.1 Political Alignment of the Winner

We first examine whether the effects observed in Section 6.1 exhibit any heterogeneity based on political alignment of the winning candidate vis-à-vis the party in power at the state level i.e., aligned vs non-aligned winner. For coalition-based state governments that are constituted of multiple political parties, we consider winning candidates in constituencies to be aligned if they belong to any one of the parties that constitute the coalition. Table A5 presents the results from estimating equation (3) for two sub-samples: (*a*) politically aligned winner (columns 1–5) and (*b*) politically non-aligned winner (columns 6–10). Once

Table 9: Impact of a *Relevant Third* on Crimes

	OLS				2SLS						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A: Total IPC Crimes											
Fraction of Constiuencies with a Relevant Third in the District	-32.437***	-22.634***	-34.335***	-22.633***	-97.499***	-78.219***	-99.035***	-78.219***	-71.785***	-46.389***	-34.318***
	(8.983)	(6.530)	(9.021)	(6.539)	(17.055)	(14.633)	(16.896)	(14.633)	(18.165)	(10.686)	(9.895)
KP F-Stat (First-Stage)	.	.	.	.	320.014	332.322	321.887	331.360	170.735	390.420	423.747
Bandwidth	.	.	.	.	5	5	5	5	2.5	7	10
Mean of Dep. Variable	5263.469	5263.469	5263.469	5263.469	5263.469	5263.469	5263.469	5263.469	5263.469	5263.469	5263.469
Number of Observations	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480
Panel B: Crimes per 10,000 Population											
Fraction of Constiuencies with a Relevant Third in the District	-0.122***	-0.057***	-0.125***	-0.057***	-0.151**	-0.094**	-0.152***	-0.094**	-0.158**	-0.083**	-0.085**
	(0.035)	(0.021)	(0.035)	(0.021)	(0.058)	(0.041)	(0.058)	(0.041)	(0.064)	(0.033)	(0.034)
KP F-Stat (First-Stage)	.	.	.	.	320.01	332.32	321.89	331.36	170.735	390.420	423.747
Bandwidth	.	.	.	.	5	5	5	5	2.5	7	10
Mean of Dep. Variable	25.434	25.434	25.434	25.434	25.434	25.434	25.434	25.434			
Number of Observations	2468	2468	2468	2468	2468	2468	2468	2468	2468	2468	2468
State Fixed Effects	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓
Year Fixed Effects	✗	✗	✓	✓	✗	✗	✓	✓	✓	✓	✓

Notes: OLS and 2SLS estimates presented. Standard errors clustered at the district level presented in parantheses. For the 2SLS estimation, we use a linear function of *Third Margin.*

again we present separate estimates for the full electoral term (years $t+1-t+4$) and for the first and second halves of the electoral term (years $t+1$ and $t+2$ and $t+3$ and $t+4$ respectively). We find that the effect is more pronounced and statistically significant for the set of constituencies that elect an aligned candidate, as compared to non-aligned winners.[26] This effect is strong both for the full electoral term (Panel A) and also separately for the second half of the electoral term (Panel C). There is no corresponding effect in the first half of the electoral term (Panel B). There is no effect of having a *Relevant Third* in constituencies where the winner is not politically aligned with the party in power in the state legislature.[27]

One possible explanation for these results is as follows: political parties as a unit also care about maximising their re-election probability in future electoral cycles. Candidates elected in competitive elections, from seats with a *barely* relevant third-placed candidate might be considered electorally 'weak' by the party. This is in addition to the incumbency disadvantage that is a common feature of Indian elections. The ruling party, might aggressively support such (weak) winners during their term, and, thereby, resulting in improved economic outcomes for such constituencies.

9.2 Political and Economic Environment

Second, we consider heterogeneous treatment effects based on the local political and economic environment. For this, we divide our sample into BIMAROU and non-BIMAROU states, and estimate equation (3) separately for the two sub-samples.[28] While analysing this potential heterogeneity, we note that there are competing theoretical possibilities. On

[26]Figure B3 presents a graphical analogue of the results reported in Table A5. Consistent with the results presented in Table A5, we see a discontinuous jump in the growth of nighttime lights at the cut-off ($Third\ Margin = 0$) in the second half of the electoral term when the winner is politically aligned (with the party in power at the state level).

[27]Using a Wald χ^2 test we test for the equality of the coefficients across the two sub-samples. In Panels A and C, the differences are generally statistically significant, i.e., the effect of a *Relevant Third* is significantly higher in Aligned relative to Non-Aligned constituencies. That is not so for Panel B.

[28]BIMAROU is an acronym used to denote the group of states of Bihar, Madhya Pradesh, Rajasthan, Odisha and Uttar Pradesh. Bihar, Madhya Pradesh and Uttar Pradesh were sub-divided into Bihar and Jharkhand, Madhya Pradesh and Chhattisgarh and Uttar Pradesh and Uttarakhand. We include Jharkhand, Chhattisgarh and Uttarakhand as part of the BIMAROU states. These are considered to traditionally have weaker institutions. Heterogeneity of political economy outcomes by BIMAROU states have been commonly studied in the Indian context. See Prakash et al. (2019), Drèze and Sen (2013).

the one hand, voters in economically laggard (or institutionally weak) states may assign a higher weight to the level of economic development in deciding who to vote for. Therefore, the cost of reneging on, or under-providing on economic development might be higher in these states. On the other hand, voters in relatively more developed and prosperous states might be sensitive to any deviations from the pre-existing high-development trajectory, which could, in turn, push the competitively elected candidate to foster economic growth during their term. Which effect dominates is, therefore, an empirical question.

Table A6 reports the results separately for the BIMAROU (columns 1–5) and non-BIMAROU states (columns 6–10).[29] We find that the effects are significantly larger in BIMAROU states compared to non-BIMAROU states and statistically significant only in the former. This is true for the full electoral term (Panel A) and the second half of the electoral term (Panel C). The effect of a *Relevant Third* is never statistically significant in the non-BIMAROU states.[30]

9.3 Gender of the Incumbent

Does the gender of the incumbent matter? It is argued that the increase in political participation of women has benefited the wider community. For example, Baskaran et al. (2023), using an RD approach, show that constituencies in India that elect women experience significantly higher growth in economic activity and they do not find any negative spillovers in neighbouring constituencies that elect men. In our context we ask whether male and female incumbents perform differently when they face a threat of collusion, i.e., when they are elected from a constituency with a *Relevant Third*. Table A7 presents the RD estimates of a *Relevant Third* on the growth of nightlights in male vs female incumbent constituencies. We find that the positive effects on prosperity that we observed in Table 5 are driven by constituencies with a male incumbent. A *Relevant Third*, or a threat of collusion does not have a statistically significant effect on growth in nightlights in constituencies with a female incumbent (irrespective of whether we consider the full electoral term or the sec-

[29] A graphical analogue of Table A6 is presented in Figure B4 in the Appendix.

[30] Again, using a Wald χ^2 test we also test the equality of the coefficients across the two sub-samples. In Panels A and C, the differences are generally statistically significant, i.e., the effect is a *Relevant Third* is significantly higher in BIMAROU relative to Non-BIMAROU states. In Panel B, when we use a local quadratic RD regression ($p = 2$) — compare the results in columns 5 and 10 — we see that the effects are significantly higher in the BIMAROU states even in the first half of the electoral term.

ond half of the electoral term).[31] It is possible that more resources are targeted towards constituencies where the male incumbent is facing a threat of coalition, but women are not provided that kind of support.

9.4 Electoral Margins

What does a *Relevant Third* mean in the context of overall electoral outcomes and how does that affect the decisions of the incumbent? For example, consider the case where there are exactly three candidates with vote shares v_1, v_2 and v_3. Suppose the third placed candidate is relevant i.e., $v_2 + v_3 > v_1$. But the combination of vote shares is potentially important. Consider three alternative possibilities: (a) $v_1 = 0.49, v_2 = 0.48, v_3 = 0.03$; (b) $v_1 = 0.49, v_2 = 0.27, v_3 = 0.24$; and (c) $v_1 = 0.35, v_2 = 0.31, v_2 = 0.29$. In case (a), while there is a potential threat of collusion, it is clear that the third placed candidate is not substantive. That is not so in cases (b) and (c) where the third placed candidate receives a high vote share. However, in case (b), the winner is without doubt the preferred candidate. It is possible that the incumbent will act differently in the three cases.

To investigate how the different margins affect post-electoral outcomes we consider heterogeneity with respect to the winning margin $(v_1 - v_2)$, the runner-up margin $(v_2 - v_3)$ and the ratio of winning/runner-up margin $((v_1 - v_2)/(v_2 - v_3))$. The estimating regression is given by equation (3). Once again we present separate regressions for the full electoral term, the first half of the electoral term and the second half of the electoral term. The RD estimates are presented in Table A8. In Panel A, we present the RD estimates for three different categories of the winning margin: $v_1 - v_2 \leq 0.025; v_1 - v_2 \in (0.025, 0.10); v_1 - v_2 \geq 0.10$. The first interval, $v_1 - v_2 \in (0, 0.025]$, corresponds to the conventionally close election case.[32] The other two sub-samples, $(0.025, 0.10)$ and $(0.10, 1)$, are constructed to ensure a sufficient sample size and a similar distribution of relevant vis-à-vis non-relevant Thirds within each interval.

For the full electoral term and in the second half of the electoral term (but not for the first

[31] Figure B5 in the Appendix presents a graphical analogue of these results and corroborate them.

[32] In our sample, 588 (14.3%) constituencies have a winning margin of less than 2.5%. On average, 145,819 valid votes are cast in these constituencies, which implies that a winning margin of 2.5% corresponds to the average difference in the votes polled by the winner and the runner-up being approximately 3,645 votes.

half of the electoral term) the presence of a *Relevant Third* has a statistically significant effect on the growth of nightlights if winning margin is in the intermediate rate i.e., $v_1-v_2 \in (0.025, 0.10)$. That the effects are not statistically significant when the winning margin is large is not surprising. In this case even though the election is competitive as defined (consider case (b), above), there is no doubt as to who the preferred candidate is and possibly the threat of coalition is not particularly credible in practical terms.

In Panel B we present the heterogeneous effects by the runner-up margin ($v_2 - v_3$). In this case we consider two categories of the runner-up margin: $v_2 - v_3 \leq 0.2$ and $v_2 - v_3 > 0.2$. The effects are statistically significant in the second half of the electoral term: we find that the RD estimates are statistically significant when the runner-up margin is large enough ($v_2 - v_3 \geq 0.2$).

Finally, in Panel C we present the heterogeneous effects by the ratio of the winning/runner-up margin. In this case for the full term and also for the second half of the electoral term the RD estimates are statistically significant when the ratio of the margins is small ($(v_1 - v_2)/(v_2 - v_3) \leq 0.3$).

10 Electoral Outcomes

Improvement in economic outcomes, induced by the presence of a *Relevant Third*, is implicitly mediated by a shock to the re-election probability of the incumbent. In essence, our claim draws from the literature that suggests voters utilise elections as an accountability mechanism to re-elect (weed out) incumbents who deliver better (worse) development outcomes (Barro, 1973, Ferejohn, 1986, Arvate, 2013, Gottlieb and Kosec, 2019) i.e., voters engage in *retrospective voting*. Additionally, the implicit link between political competition and the salience of re-election incentives has been widely recognised in different contexts (Besley et al., 2010, Albornoz and Cabrales, 2013, Finan and Mazzocco, 2021). We examine the effect of a *Relevant Third* on two primary electoral outcomes for the incumbent in the next election: (i) the probability that the incumbent re-contests the next election; and (ii) conditional on re-contesting, the probability that the incumbent is re-elected.

The regression results are presented in Table 10. In columns 1–5, the dependent variable is the likelihood of the incumbent re-contesting in the next election while in columns 6–10 the dependent variable is the likelihood of winning in the next election (re-election), conditional

Table 10: Effect of a *Relevant Third* on Electoral Outcomes. Re-contesting and Re-election

	Incumbent Re-contesting in Next Election					**Incumbent Wins in Next Election (Conditional on Re-contesting)**				
	$p = 1$				$p = 2$	$p = 1$				$p = 2$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Full Sample of Incumbents										
Relevant Third	0.044	0.010	-0.043	0.021	-0.014	-0.159*	-0.040	0.260*	-0.088	-0.253*
	(0.069)	(0.045)	(0.095)	(0.050)	(0.099)	(0.096)	(0.062)	(0.136)	(0.072)	(0.142)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	2.75	7.12	1.37	5.49	2.75	2.34	6.24	1.17	4.68	2.34
Observations	764	1699	391	1398	764	460	1052	236	822	460
Panel B: Politically Aligned Incumbents										
Relevant Third	0.058	0.021	-0.048	0.034	-0.003	-0.040	0.065	-0.050	0.053	-0.060
	(0.088)	(0.059)	(0.120)	(0.064)	(0.124)	(0.116)	(0.076)	(0.164)	(0.084)	(0.168)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	3.05	7.20	1.53	6.11	3.05	2.88	7.22	1.44	5.77	2.88
Observations	545	1111	270	977	545	334	710	163	596	334
Panel C: Politically Non-Aligned Incumbents										
Relevant Third	0.012	0.005	0.062	-0.003	0.089	-0.284**	-0.159*	-0.433**	-0.171*	-0.378**
	(0.090)	(0.062)	(0.122)	(0.069)	(0.127)	(0.129)	(0.089)	(0.180)	(0.097)	(0.187)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	3.07	8.09	1.53	6.14	3.07	2.98	7.43	1.49	5.95	2.98
Observations	308	655	162	543	308	235	471	125	406	235
p–value (Aligned − Non-Aligned)	*0.714*	*0.856*	*1.000*	*0.694*	*1.000*	*0.159*	*0.055*	*0.115*	*0.082*	*0.203*

Notes: Local linear RD regression ($p = 1$) results presented in Columns 1–4 and 6–9. Columns 5 and 10 present results for a local quadratic RD regression ($p = 2$) using a triangular kernel sing the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parentheses. Across all panels, the outcome variable in Columns 1–5 is a binary variable indicating whether the incumbent re-contests in the next election, while in Columns 6–10, the outcome variable is a binary variable indicating whether the incumbent gets re-elected (conditional on re-contesting) Panel A: full sample of incumbent; Panel B: sub-sample of politically aligned incumbents; Panel C: sub-sample of politically non-aligned incumbents. The p-values for equality of coefficients across the two sub-samples (Aligned vs Non-Aligned Incumbents) using a Wald χ^2 test presented in italics. Significance: $^{***}p < 0.01$;$^{**}\, p < 0.05$;$^{*}\, p < 0.1$.

on re-contesting. Having a *Relevant Third* does not have a statistically significant effect on the likelihood of the incumbent re-contesting. On the other hand, we find a weak negative impact of a *Relevant Third* on the probability that a re-contesting incumbent gets re-elected in the next election (see column 6 of Panel A). The mild negative effect on the re-election probability of re-contesting winners is puzzling given that the incumbents who face a potential coalitional threat induce a higher growth in economic prosperity over the course of the electoral term. We conduct a heterogeneity analysis identical to the one presented in Section 9.1 to further examine what *type* of incumbents witness a decline in their re-election probability. In particular, we present separate estimates for these outcomes for winners who are aligned with the state ruling party (Panel B) and those who are not (Panel C). As in the full sample, there is no significant impact of a *Relevant Third* on the probability of re-contesting in the subsequent election for the two sub-samples based on alignment of the incumbent (Panels B and C).

On the other hand, we find that the negative impact on the incumbent's re-election probability is driven by the 28–43 percentage points drop in the likelihood of the incumbent winning the next election (conditional on re-contesting) if the incumbent is not politically aligned to the ruling party at the state legislature (Panel C). The effect is close to zero for politically aligned incumbents (Panel B).[33]

One potential explanation for these effects is as follows. It is now well documented that there is a considerable incumbency disadvantage in Indian elections (Linden, 2004, Uppal, 2009, Ravishankar, 2009, Lee, 2020, Karnik et al., 2023). Uppal (2009, page 11) argues that the *incumbency disadvantage is driven by variation in the state governments' inability to provide public goods, such as health facilities, and in other indices of governmental failure, such as high rates of unemployment and lower per capita income levels.* Our results are more nuanced. We too find evidence of an incumbency disadvantage, but only when the incumbent is not aligned to the state government. In the presence of a potential coalitional threat, incumbents aligned to the state governments benefit from the possible diversion of resources towards development of constituencies that are held by the governing party at the state level. This offsets the negative effect of competition on re-election probability. Non-aligned incumbents, who are unable to deliver improved economic outcomes, are voted

[33]Figure B6 in the Appendix presents the graphical analogue of the results on re-contesting and re-election, for the full sample and separately for the sample of aligned and non-aligned incumbents. There is a slight drop in the likelihood of re-election (conditional on re-contesting), driven by the drop in the probability of re-election for incumbents not aligned with the state ruling party. Additionally, we do not observe any discontinuity in the likelihood of re-contesting, at the cut-off.

out with a higher probability in the subsequent election.

Given our emphasis on the effect of non-incumbents, a natural question to ask is what happens to the electoral outcomes of the runner-up and the third-placed candidate. Table A9 in the Appendix presents results for the same outcomes for the runner-up and the third-ranked candidates. For these non-incumbents, there is no effect of the presence of a *Relevant Third* on their probability of (*i*) re-contesting and (*ii*) winning the subsequent election. The effects are generally not statistically significant, either for the runner-up or for the third placed candidate.[34]

11 Conclusion

Unlike market competition (between firms), electoral competition (between political parties and/or candidates) usually culminates in a clear winner. Therefore, while rents from consolidating market shares can potentially be diffused among competitors, rents from consolidated vote shares usually accrues fully to the winner. Consequently, the intensity of competition and efforts made towards winning have important implications for post-electoral outcomes and the actions of the incumbent. This paper, estimates the economic impact of political competition, using nighttime lights as a proxy for the level of economic activity at the constituency level. We use a novel measure of political competition, *threat from collusion*, which captures the effect of re-election uncertainty (induced by the *Relevant Third*) on the winning candidate. In politics there are no legal restrictions to competitors forging explicit and implicit alliances (engage in collusion) with an aim to consolidating vote shares. In fact such agreements are often welcomed because it is argued that then candidates need to make a case to elect them and cannot depend purely on what is termed as vote bank politics.

Using our new definition of electoral competition, we find that constituencies with a barely *Relevant Third*) witness a higher growth in nighttime lights, compared to constituencies

[34] We also examine the probability of the runner-up and the third placed candidate finishing in the top-3 in the next election and contesting from a different party (i.e., being a turncoat) in the next election. Having a *Relevant Third* does not generally have a statistically significant effect on either outcome The only exception is that third placed candidates are significantly more likely to contest from a different party in the next election (results available on request), but even in this case the effect is statistically significant only for $p = 1$. One way of interpreting this is that the winners can either work hard for constituency development or they can somehow break up the coalition, or engage in horse trading.

barely without a *Relevant Third*). These effects are economically meaningful in that they translate to a 0.1–0.3 percentage points higher GDP growth in the constituency, or more broadly, a growth premium of 1.8–5.5%. Importantly we show that our results hold only when the threat of coalition (between the runner-up and the third placed candidate) is a credible one.

In terms of mechanisms we ind that having a *Relevant Third* results in provision of better health care goods, better education infrastructure improved drainage and market infrastructure and higher electricity supply to marginal, small and medium enterprises (MSMEs). We also find that a higher fraction of *Relevant Thirds* in a district can result in reduction in district-level crimes.

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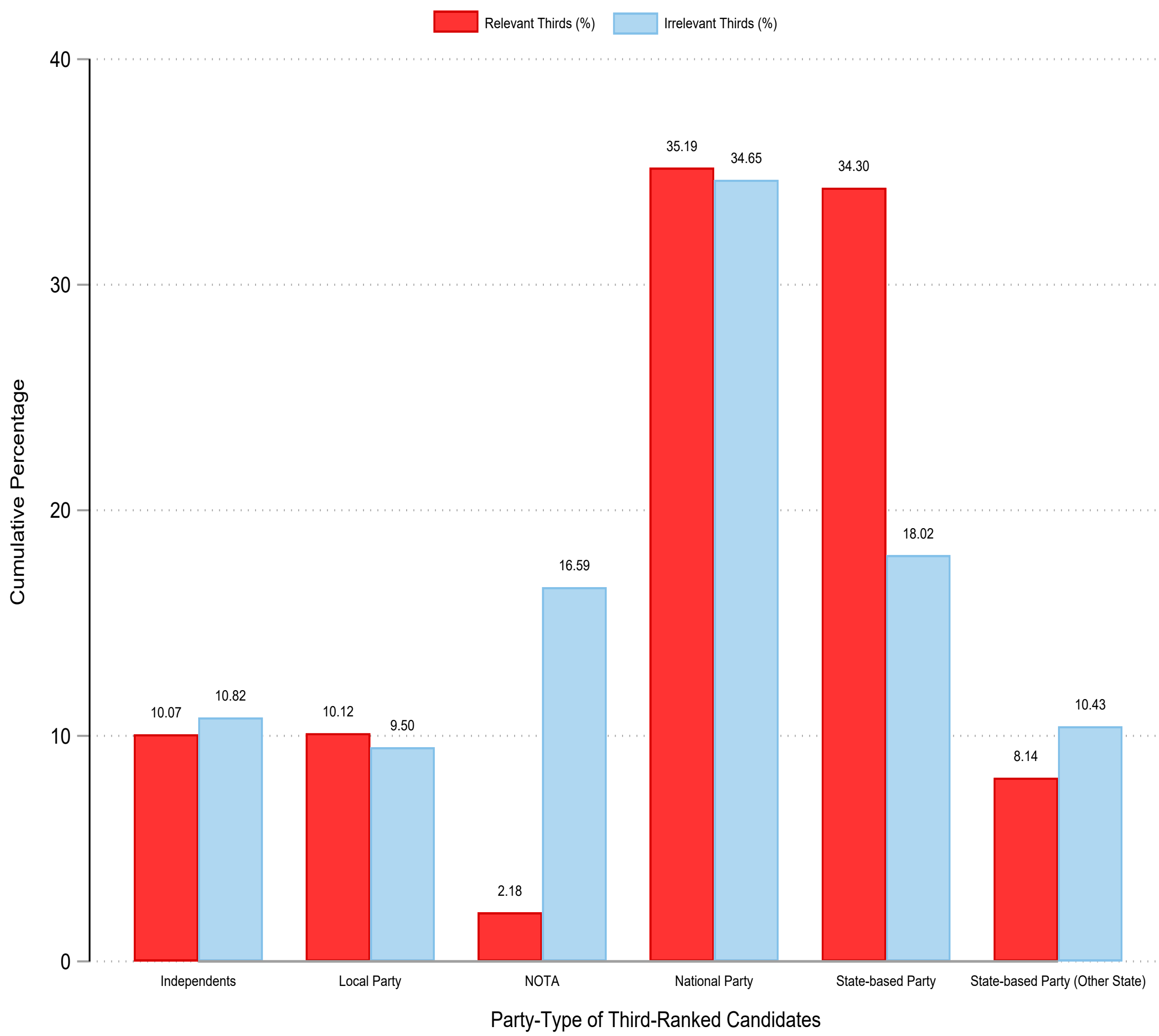
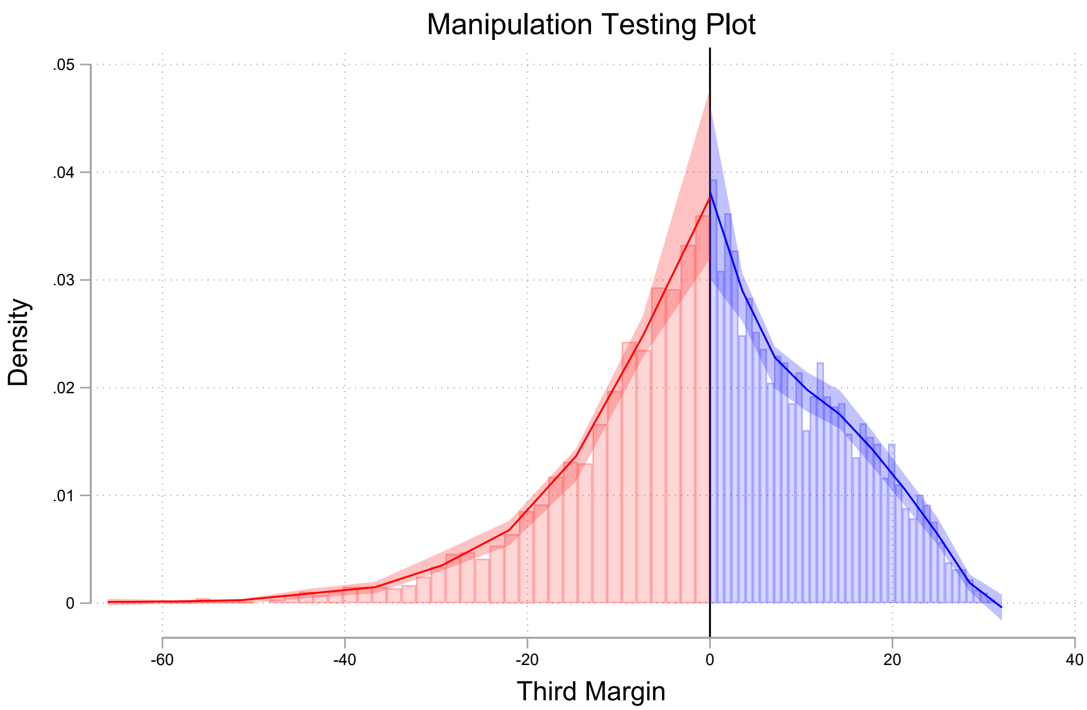
Appendix. Additional Figures and Tables

Figure A1: Distribution of *Relevant Thirds* by Candidate-Party Type



Notes: Data from all assembly elections in the period 2013–2017 included. The red bar corresponds to the number of *non-relevant* third-ranked candidates, i.e., when $v_3 < v_1 - v_2$, while the blue bar depicts the number of *relevant* third-ranked candidates, i.e., when $v_3 > v_1 - v_2$). The value at the top of each bar is the fraction of the group's (relevant v/s non-relevant third) candidates belonging to that particular party-type. We use the categorization of the Trivedi Centre for Political Data (TCPD) to divide our sample of third-ranked candidates into different candidate-party types. 'Independents' describes candidates that contest the election without a political party affiliation; 'NOTA' refers to the ballot option 'none of the above'; 'State-based Party' refers to a political party contesting elections in several states but being principally associated with one state; 'Other State-based Party' refers to a State-based party that is contesting outside its principal state; 'Local Party' refers to a party that is limited to a particular state or a sub-region of a single state; and a 'National Party' is defined as a party with a significant presence in different Legislative Assemblies (States) as well in the National Assembly.

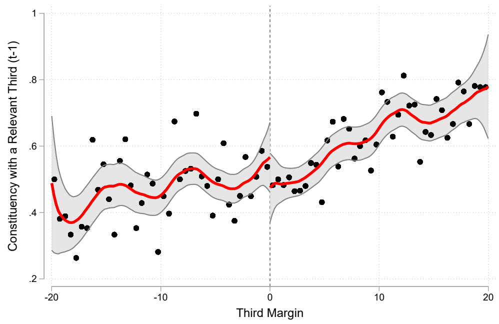
Figure A2: Discontinuity Test



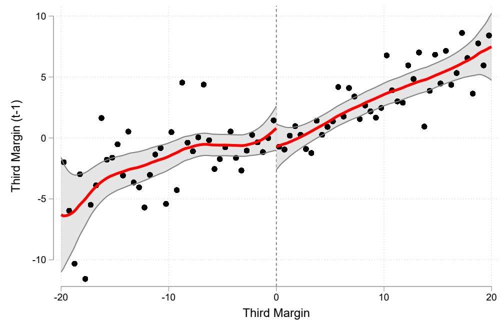
Notes: This presents the density plot using the method suggested by Cattaneo et al. (2020) to estimate the continuity of the forcing variable, *Third Margin*, at the threshold (zero).

Figure A3: Balance Test for Pre-Determined Characteristics

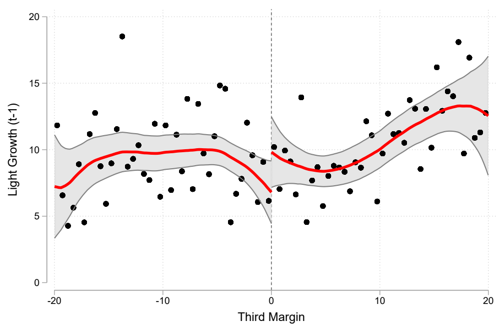
Panel A: Relevant Third Constituency $(t-1)$



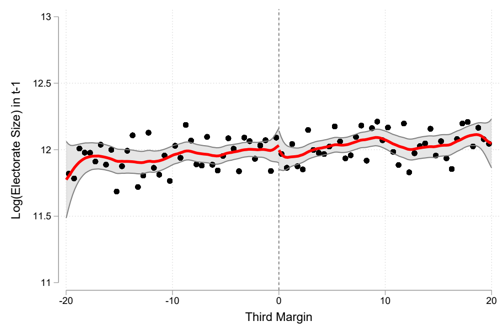
Panel B: Third Margin $(t-1)$



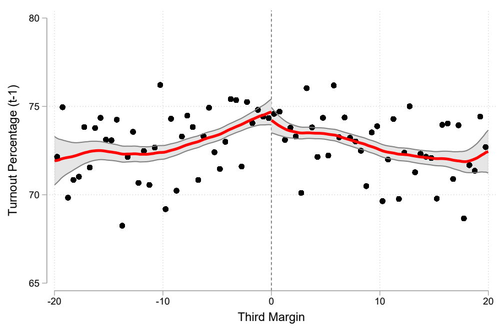
Panel C: Nightlight Growth $(t-1)$



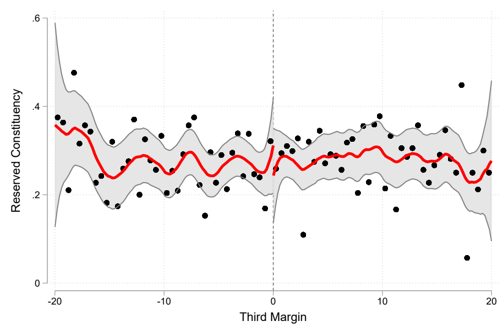
Panel D: Log Electorate Size $(t-1)$



Panel E: Voter Turnout $(t-1)$



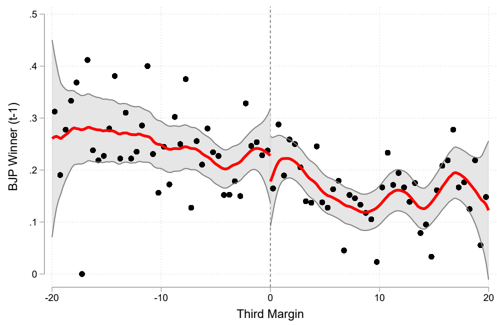
Panel F: SC/ST Reserved Constituency



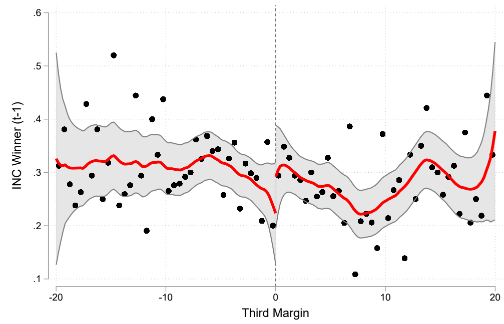
Continued ...

Figure A3 (Continued): Balance Test for Pre-Determined Characteristics

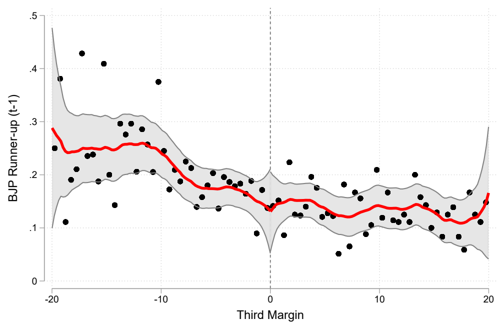
Panel G: BJP Winner ($t-1$)



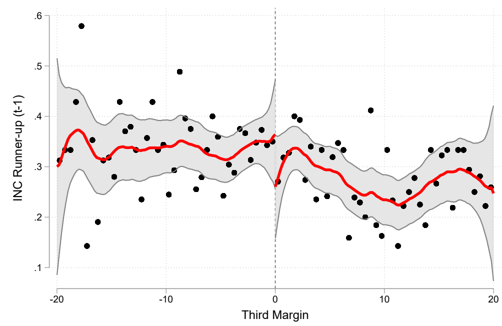
Panel H: Congress(I) Winner ($t-1$)



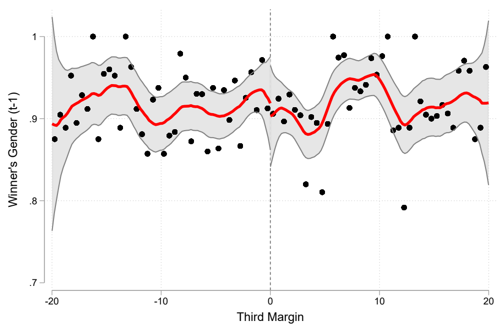
Panel I: BJP Runner-up ($t-1$)



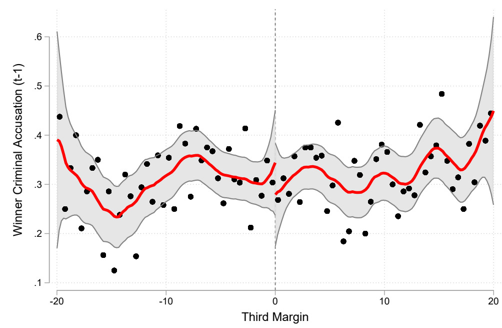
Panel J: Congress(I) Runner-up ($t-1$)



Panel K: Male Winner ($t-1$)



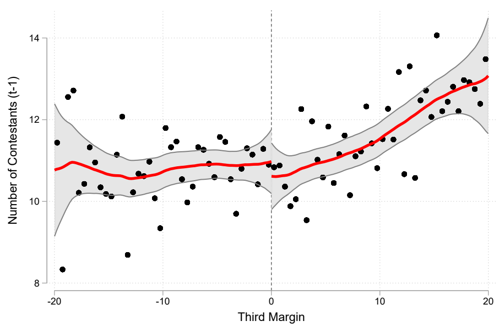
Panel L: Criminal Winner ($t-1$)



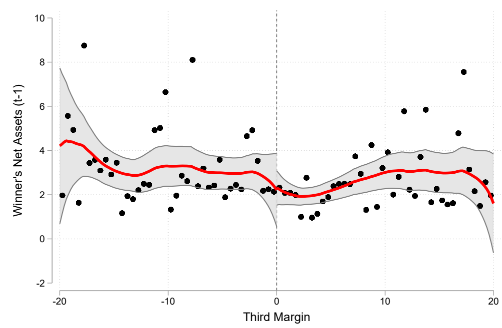
Continued ...

Figure A3 (Continued): Balance Test for Pre-Determined Characteristics

Panel M: Number of Contestants $(t-1)$



Panel N: Winner's Net Assets $(t-1)$



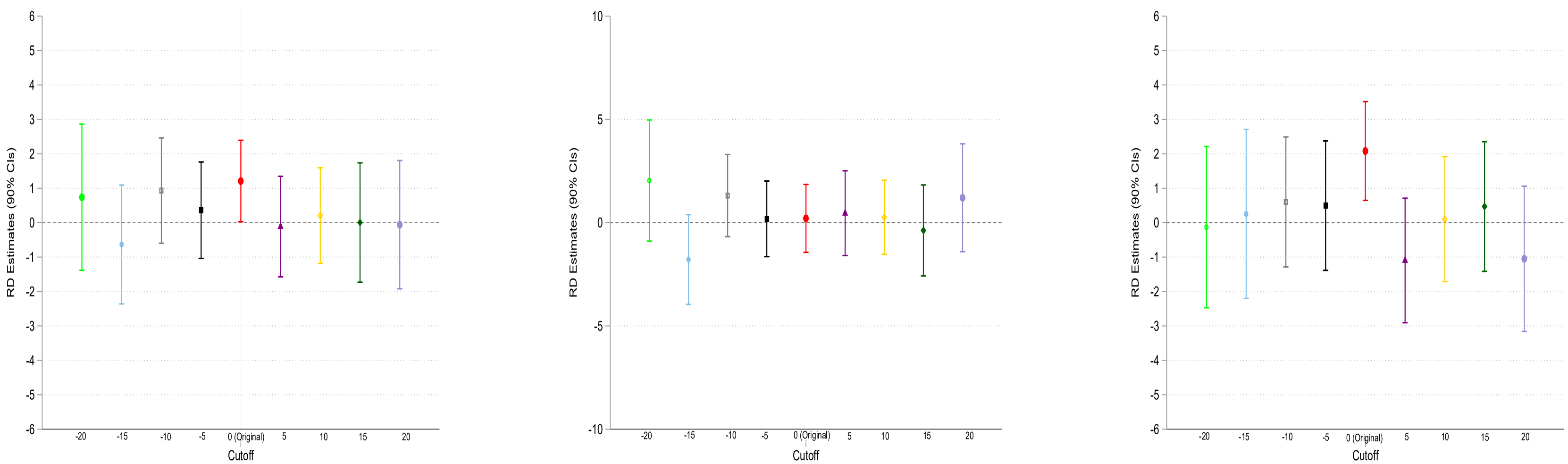
Notes: The running variable is $Third\_Margin$, defined as the difference between the third-position candidate's vote share and the winning margin. Each dot on the scatter plot is an average over successive bins of 0.5% of the running variable. The curves are local linear regressions fit separately for regions above and below the cut-off using a triangular kernel and an optimal bandwidth à la (Imbens and Kalyanaraman, 2012).

Figure A4: Placebo Discontinuities

Panel A: Full Electoral Term

Panel B: First-Half of the Electoral Term

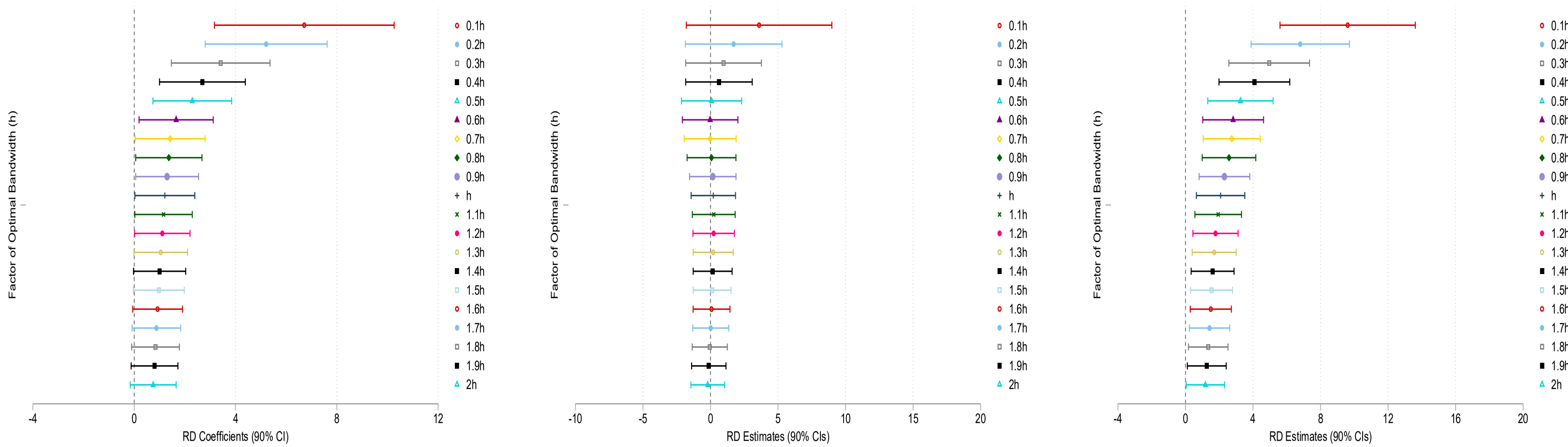
Panel C: Second-Half of the Electoral Term



Notes: This presents different point estimates (and the 90% confidence interval) at placebo cut-offs in increments of 5 percentage points on either side of zero (which is the original cut-off). For instance, a placebo cut-off of -5 implies that a third-ranked candidate is *not* relevant only when her vote share falls at least 5 percentage points short of the winning margin- i.e., she is relevant even if her vote share is, say, 4 percentage points short of the winning margin. We reproduce our main findings at zero (red), and show that the estimated 'treatment effects' for placebo cut-offs on either side of zero are statistically not significant.

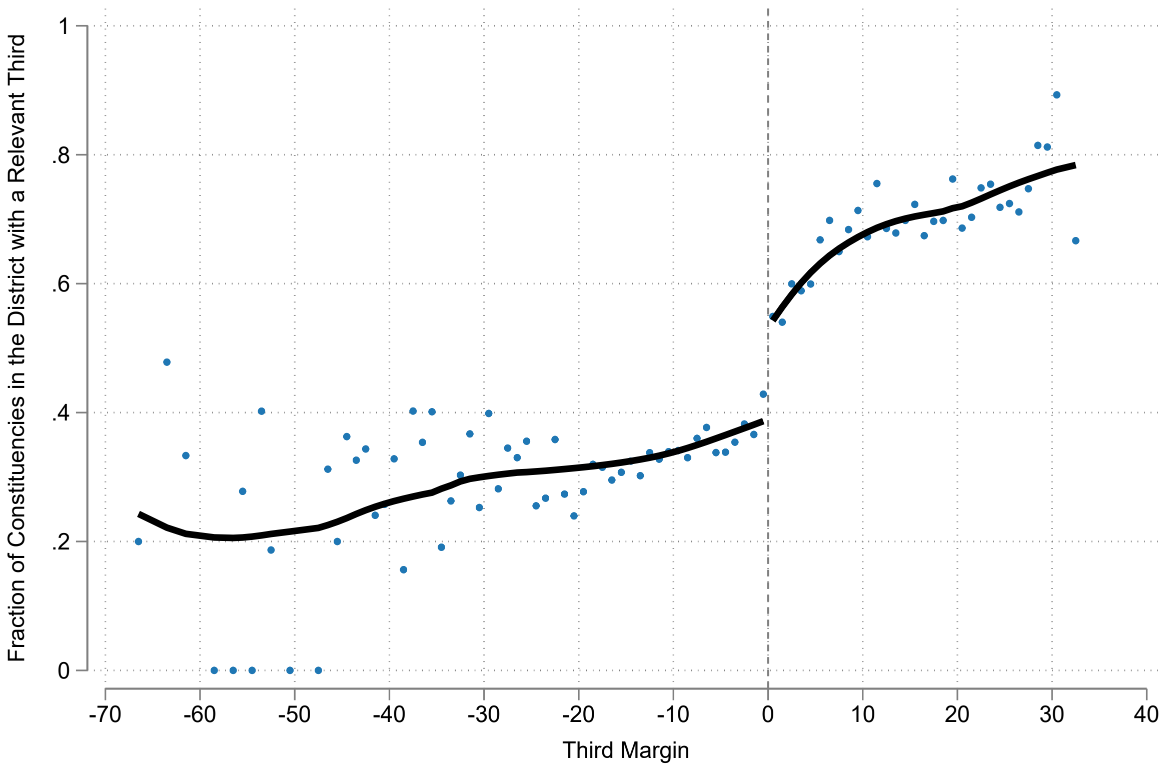
Figure A5: Robustness to Choice of Bandwidth

Panel A: Full Electoral Term | **Panel B: First-Half of the Electoral Term** | **Panel C: Second-Half of the Electoral Term**



Notes: This presents different point estimates (and the 90% confidence interval) by varying bandwidth (h) between a factor of 0.1 and 2 of the optimal bandwidth in increments of 0.1.

Figure A6: First Stage for *Relevant Third*



Notes: District level fraction of constituencies with a *Relevant Third* plotted against the *Third Margin* in each constituency of the district. The curves are local polynomial regressions fitted separately for the positive and negative parts of the *Third Margin*.

Table A1: Timing of Elections and Sample Period of Nighttime Lights

States	Election-Year	Nighttime Lights Time-Period
Chhattisgarh, Karnataka, Madhya Pradesh, Meghalaya, Mizoram, Nagaland Rajasthan, Tripura	2013	2013–2017
Andhra Pradesh, Arunachal Pradesh, Haryana, Jammu & Kashmir, Jharkhand Maharashtra, Odisha, Sikkim, Telangana	2014	2014–2018
Bihar, Delhi	2015	2015-2019
Assam, Kerala, Puducherry, Tamil Nadu West Bengal	2016	2016–2020
Goa, Gujarat, Himachal Pradesh Manipur, Punjab, Uttar Pradesh Uttarakhand	2017	2017–2021

Notes: The table presents the year of each state election in the sample and the corresponding time period of nighttime lights considered in the main analysis. For our balance test, we consider previous-year growth in nighttime lights, starting from 2012 for the 2013 electoral cycle, and so on.

Table A2: Balance Test: Pre-Determined Characteristics

	Full Sample			Within 5% of the Winning Margin		
	Relevant Third	Irrelevant Third	Diff.	Relevant Third	Irrelevant Third	Diff.
	(1)	(2)	(3)	(4)	(5)	(6)
Relevant Third $(t-1)$	0.630	0.470	-0.160***	0.490	0.502	0.012
	(0.483)	(0.499)	(0.016)	(0.500)	(0.500)	(0.028)
Third Margin $(t-1)$	3.379	-2.680	-6.059***	-0.006	-0.481	-0.475
	(12.234)	(15.471)	(0.445)	(12.123)	(12.962)	(0.704)
NL Growth (previous year)	10.597	8.839	-1.758***	8.626	8.997	0.371
	(19.211)	(16.633)	(0.563)	(17.857)	(16.691)	(0.953)
Log(Electorate Size) $(t-1)$	12.009	11.943	-0.066***	11.970	12.006	0.036
	(0.683)	(0.723)	(0.022)	(0.687)	(0.634)	(0.037)
Voter Turnout $(t-1)$	69.753	69.311	-0.442	70.960	70.872	-0.088
	(11.553)	(12.684)	(0.385)	(11.474)	(12.287)	(0.665)
SC/ST Reserved	0.286	0.270	-0.016	0.277	0.271	-0.006
	(0.452)	(0.444)	(0.014)	(0.448)	(0.445)	(0.025)
BJP Winner $(t-1)$	0.165	0.260	0.095***	0.205	0.220	0.015
	(0.371)	(0.439)	(0.013)	(0.404)	(0.415)	(0.023)
INC Winner $(t-1)$	0.285	0.308	0.023	0.294	0.281	-0.013
	(0.452)	(0.462)	(0.015)	(0.456)	(0.450)	(0.025)
BJP Runner-up $(t-1)$	0.130	0.201	0.071***	0.150	0.161	0.011
	(0.336)	(0.401)	(0.011)	(0.150)	(0.367)	(0.020)
INC Runner-up $(t-1)$	0.276	0.353	0.076***	0.314	0.331	0.016
	(0.447)	(0.478)	(0.015)	(0.464)	(0.471)	(0.026)
Male Winner $(t-1)$	0.918	0.915	-0.004	0.894	0.919	0.025
	(0.274)	(0.279)	(0.009)	(0.309)	(0.273)	(0.016)
Criminally Accused Winner $(t-1)$	0.317	0.307	-0.010	0.319	0.308	-0.011
	(0.465)	(0.461)	(0.015)	(0.466)	(0.462)	(0.026)
Number of contestants $(t-1)$	11.500	10.829	-0.671***	10.746	10.922	0.175
	(5.397)	(5.319)	(0.170)	(5.293)	(5.125)	(0.291)

Notes: The 'Irrelevant Third' column reports statistics from constituencies where the vote share of the third-ranked candidate was lower than the winning margin; the 'Relevant Third' column corresponds to constituencies where the third-ranked candidate's vote share was higher than the winning margin. The first three columns contain all constituencies where there were more than 2 candidates, and the last three columns contain only those constituencies where the third-ranked candidate's vote share was at most 5 percentage points higher (or lower) than the winning margin. All variables recorded at $t-1$ correspond to the (previous) 2008–2012 election cycle. Significance: $^{***}p < 0.01$;$^{**}p < 0.05$;$^{*}p < 0.1$.

Table A3: Effect of a *Majoritarian Winner* on Growth of Nightlights

	$p = 1$				$p = 2$
	(1)	(2)	(3)	(4)	(5)
Panel A: Full Electoral Term					
Majority Winner	0.304	0.288	0.496	-0.094	0.222
	(0.564)	(0.575)	(0.754)	(0.428)	(0.793)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.10	4.88	2.55	10.20	5.10
Observations	6308	6088	3472	10244	6308
Panel B: First-Half of the Electoral Term					
Majority Winner	0.155	0.145	0.217	0.173	-0.182
	(0.756)	(0.761)	(1.031)	(0.581)	(1.084)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.85	5.76	2.92	11.69	5.85
Observations	3508	3474	1964	5496	3508
Panel C: Second-Half of the Electoral Term					
Majority Winner	0.507	0.506	0.780	-0.142	0.753
	(0.920)	(0.903)	(1.271)	(0.681)	(1.343)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	4.40	4.57	2.20	8.81	4.40
Observations	2764	2844	1532	4676	2764

Notes: Local linear RD regression ($p = 1$) results presented in Columns 1–4. Column 5 presents results for a local quadratic RD regression ($p = 2$) using a triangular kernel using the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parentheses. In each column, the outcome variable is the annual growth in luminosity density (net of year fixed-effects) as defined in Section 4. Panel A: sample of annual growth rate in the full electoral term ($t + 1$ to $t + 4$); Panel B: annual growth rate in the first half of the term ($t+1$ and $t+2$); Panel C: annual growth rate in the second half of the term ($t + 3$ and $t + 4$). *Majority Winner* is an indicator variable equal to 1 if $v_1 > 50$, and 0 otherwise (see equation (4) for more details). Significance: $^{***}p < 0.01$;$^{**}\, p < 0.05$;$^{*}\, p < 0.1$.

Table A4: Impact of a *Relevant Fourth/Fifth* on Growth of Nightlights

	Fourth-Ranked Candidate					**Fifth-Ranked Candidate**				
	$p=1$				$p=2$	$p=1$				$p=2$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Full Electoral Term										
Relevant Candidate	-0.361	-0.895	-1.343	-0.034	-1.344	0.350	0.205	0.186	0.293	0.0468
	(0.714)	(0.843)	(0.901)	(0.569)	(0.954)	(0.740)	(0.828)	(0.915)	(0.601)	(0.975)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.18	3.25	2.59	10.35	5.18	5.41	3.62	2.71	10.82	5.41
Observations	5348	3740	3120	5438	3916	5132	3956	3160	8376	5132
Panel B: First-Half of the Electoral Term										
Relevant Candidate	-0.304	-0.697	-1.102	0.162	-1.089	0.585	0.321	0.231	0.683	0.227
	(0.941)	(1.107)	(1.197)	(0.752)	(1.271)	(0.979)	(1.129)	(1.216)	(0.802)	(1.315)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.39	3.46	2.69	10.78	5.39	5.56	3.39	2.78	11.13	5.56
Observations	2760	1948	1604	4510	2760	2622	1898	1630	4274	2622
Panel C: Second-Half of the Electoral Term										
Relevant Candidate	-0.191	-0.438	-1.078	-0.318	-1.201	0.198	0.006	0.092	-0.232	-0.098
	(0.901)	(0.972)	(1.118)	(0.719)	(1.172)	(0.969)	(1.041)	(1.141)	(0.804)	(1.198)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	6.22	4.89	3.11	12.43	6.22	6.29	4.69	3.14	12.57	6.29
Observations	3078	2544	1800	4874	3078	2868	2324	1790	4598	2868

Notes: Local linear RD regression ($p = 1$) results presented in Columns 1–4 and 6–9. Columns 5 and 10 present results for a local quadratic RD regression ($p = 2$) using a triangular kernel using the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parentheses. Across all panels, columns 1–5 correspond to regressions with *Fourth Margin* as the running variable, while columns 6–10 report RD estimates with *Fifth Margin* as the running variable (see Section 6.1.1). *Relevant Candidate* is an binary variable which- (a) for Columns 1–5, corresponds to whether the fourth-ranked candidate's vote share exceeds the winning margin, and (b) for Columns 6–10, indicates whether the fifth candidate's vote share exceeds the winning margin. In each column, the outcome variable is the annual growth in luminosity density (net of year fixed-effects) as defined in Section 4. Panel A: sample of annual growth rate in the full electoral term ($t + 1$ to $t + 4$); Panel B: annual growth rate in the first half of the term ($t + 1$ and $t + 2$); Panel B: annual growth rate in the second half of the term ($t + 3$ and $t + 4$). The p-values for equality of coefficients across the two sub-samples (NOTA vs Non-NOTA Thirds) using a Wald χ^2 test presented in italics. Significance: $^{***}p < 0.01$;$^{**}p < 0.05$;$^{*}p < 0.1$.

Table A5: Effect of a *Relevant Third* Candidate on Growth of Nightlights: Effects of Political Alignment

	Politically Aligned Winner					Politically non-Aligned Winner				
	$p=1$				$p=2$	$p=1$				$p=2$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Full Electoral Term										
Relevant Third	2.298**	2.166**	3.708***	1.039	3.564***	-0.089	0.688	-0.818	0.621	-0.778
	(0.989)	(0.955)	(1.273)	(0.745)	(1.364)	(0.989)	(0.880)	(1.369)	(0.835)	(1.444)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	4.66	5.09	2.33	9.32	4.66	6.55	10.37	3.28	13.10	6.55
Observations	2744	2992	1496	4848	2744	1996	2752	1136	3196	1996
p–value (Aligned − Non-Aligned)						*0.088*	*0.255*	*0.015*	*0.708*	*0.027*
Panel B: First-Half of the Electoral Term										
Relevant Third	0.916	0.482	1.648	0.079	1.343	-0.806	-0.101	-2.156	-0.083	-2.066
	(1.441)	(1.193)	(1.916)	(1.072)	(2.011)	(1.570)	(1.358)	(2.240)	(1.231)	(2.313)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.61	8.78	2.80	11.22	5.61	6.07	9.14	3.04	12.14	6.07
Observations	1614	2286	894	2796	1614	946	1258	544	1526	946
p–value (Aligned − Non-Aligned)						*0.419*	*0.747*	*0.198*	*0.921*	*0.267*
Panel C: Second-Half of the Electoral Term										
Relevant Third	3.686***	3.535***	5.062***	1.642*	5.022***	0.621	1.440	0.493	1.480	0.217
	(1.301)	(1.270)	(1.721)	(0.963)	(1.809)	(1.216)	(1.120)	(1.656)	(1.106)	(1.767)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	4.77	5.04	2.38	9.54	4.77	6.67	12.36	3.34	13.34	6.67
Observations	1406	1480	766	2468	1406	1004	1540	582	1628	1004
p–value (Aligned − Non-Aligned)						*0.085*	*0.216*	*0.056*	*0.911*	*0.057*

Notes: Local linear RD regression ($p = 1$) results presented in Columns 1–4 and 6–9. Columns 5 and 10 present results for a local quadratic RD regression ($p = 2$) using a triangular kernel using the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parentheses. Across all panels, Columns 1–5 correspond to the sub-sample of politically aligned incumbents, while Columns 6–10 report results for politically non-aligned incumbents as defined in Section 9. In each column, the outcome variable is the annual growth in luminosity density (net of year fixed-effects) as defined in Section 4. Panel A: sample of annual growth rate in the full electoral term ($t+1$ to $t+4$); Panel C: annual growth rate in the first half of the term ($t+1$ and $t+2$); Panel B: annual growth rate in the second half of the term ($t+3$ and $t+4$). The p-values for equality of coefficients across the two sub-samples (Aligned vs Non-Aligned) using a Wald χ^2 test presented in italics. Significance: $^{***}p < 0.01$;$^{**}p < 0.05$;$^{*}p < 0.1$.

Table A6: Effect of a *Relevant Third* on Growth of Nightlights. Institutional Heterogeneity

	BIMAROU States					Non-BIMAROU States				
	$p=1$				$p=2$	$p=1$				$p=2$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Full Electoral Term										
Relevant Third	3.385**	2.860*	5.707***	1.598	5.634**	0.114	0.139	0.084	-0.132	0.017
	(1.624)	(1.528)	(2.123)	(1.229)	(2.265)	(0.596)	(0.560)	(0.805)	(0.477)	(0.854)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.06	5.92	2.53	10.13	5.06	6.28	7.50	3.14	12.56	6.28
Observations	1692	1944	916	2952	1692	3568	4084	2044	5972	3568
p–value (BIMAROU − Non-BIMAROU)						*0.059*	*0.095*	*0.013*	*0.189*	*0.020*
Panel B: First-Half of the Electoral Term										
Relevant Third	2.147	1.811	3.825	0.967	4.168	-0.797	-0.751	-1.543	-1.013	-1.781
	(2.225)	(2.077)	(2.910)	(1.669)	(3.048)	(0.957)	(0.870)	(1.344)	(0.724)	(1.412)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	6.18	7.40	3.09	12.35	6.18	6.66	8.30	3.33	13.32	6.66
Observations	1010	1158	556	1698	1010	1862	2214	1074	3106	1862
p–value (BIMAROU − Non-BIMAROU)						*0.224*	*0.255*	*0.094*	*0.276*	*0.076*
Panel C: Second-Half of the Electoral Term										
Relevant Third	4.138***	2.784**	6.344***	1.861	6.404***	1.043	0.970	1.576	0.624	1.661
	(1.548)	(1.352)	(2.084)	(1.175)	(2.218)	(1.005)	(0.960)	(1.340)	(0.822)	(1.418)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.04	6.94	2.52	10.09	5.04	7.11	8.22	3.55	14.22	7.11
Observations	842	1102	456	1474	842	1958	2202	1132	3224	1958
p–value (BIMAROU − Non-BIMAROU)						*0.093*	*0.274*	*0.054*	*0.388*	*0.072*

Notes: BIMAROU states include Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttar Pradesh and Uttarakhand. Local linear RD regression ($p = 1$) results presented in Columns 1–4 and 6–9. Columns 5 and 10 present results for a local quadratic RD regression ($p = 2$) using a triangular kernel using the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parentheses. Across all panels, Columns 1–5 correspond to the sub-sample of BIMAROU states, while Columns 6–10 report results for non-BIMAROU states. In each column, the outcome variable is the annual growth in luminosity density (net of year fixed-effects) as defined in Section 4. Panel A: sample of annual growth rate in the full electoral term ($t+1$ to $t+4$); Panel B: annual growth rate in the first half of the term ($t+1$ and $t+2$); Panel B: annual growth rate in the second half of the term ($t+3$ and $t+4$). The p-values for equality of coefficients across the two sub-samples (BIMAROU vs Non-BIMAROU) using a Wald χ^2 test presented in italics. Significance: $^{***}p < 0.01$;$^{**}p < 0.05$;$^{*}p < 0.1$.

Table A7: Effect of a *Relevant Third* on Growth of Nightlights: Gender of the Incumbent

	Male Incumbent					Female Incumbent				
	$p=1$				$p=2$	$p=1$				$p=2$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Full Electoral Term										
Relevant Third	1.507*	1.462**	2.730***	0.992*	2.359**	-1.019	-0.964	0.403	-0.028	0.179
	(0.790)	(0.736)	(1.041)	(0.595)	(1.118)	(1.870)	(1.895)	(2.325)	(1.545)	(2.464)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	4.72	5.48	2.36	9.44	4.72	6.96	6.35	3.48	13.92	6.96
Observations	3944	4568	2248	6936	3944	572	540	312	956	572
p–value (Male − Female)						*0.214*	*0.234*	*0.361*	*0.538*	*0.421*
Panel B: First-Half of the Electoral Term										
Relevant Third	0.561	0.560	0.470	0.492	-0.130	-2.512	-2.777	-2.871	-1.137	-3.327
	(1.067)	(1.064)	(1.462)	(0.801)	(1.530)	(2.526)	(2.629)	(2.939)	(2.109)	(3.027)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	6.49	6.54	3.25	12.98	6.49	7.90	5.78	3.95	15.80	7.90
Observations	2616	2634	1476	4366	2616	310	262	178	510	310
p–value (Male − Female)						0.263	0.241	0.310	0.656	0.260
Panel C: Second-Half of the Electoral Term										
Relevant Third	2.278**	2.238**	3.267***	1.235*	3.458***	0.313	0.457	2.748	1.125	1.999
	(0.894)	(0.882)	(1.215)	(0.710)	(1.292)	(2.743)	(2.870)	(3.386)	(2.142)	(3.563)
Bandwidth Type	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)	IK(h)	CCT	IK($h/2$)	IK($2h$)	IK(h)
Bandwidth size	5.92	6.10	2.96	11.84	5.92	8.86	7.71	4.43	17.72	8.86
Observations	2428	2482	1390	4096	2428	346	306	202	532	346
p–value (Male − Female)						*0.496*	*0.554*	*0.885*	*0.961*	*0.701*

Notes: Local linear RD regression ($p = 1$) results presented in Columns 1–4 and 6–9. Columns 5 and 10 present results for a local quadratic RD regression ($p = 2$) using a triangular kernel using the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parentheses. Across all panels, Columns 1–5 correspond to the sub-sample of male incumbents, while Columns 6–10 report results for constituencies with a female incumbent. In each column, the outcome variable is the annual growth in luminosity density (net of year fixed-effects) as defined in Section 4. Panel A: sample of annual growth rate in the full electoral term ($t+1$ to $t+4$); Panel B: annual growth rate in the first half of the term ($t+1$ and $t+2$); Panel B: annual growth rate in the second half of the term ($t+3$ and $t+4$). The p-values for equality of coefficients across the two sub-samples (Male vs Female incumbent) using a Wald χ^2 test presented in italics. Significance: $^{***}p < 0.01$;** $p < 0.05$;* $p < 0.1$.

Table A8: Effect of a *Relevant Third* on Growth of Nightlights: Electoral Margins

	$p = 1$	$p = 2$	$p = 1$	$p = 2$	$p = 1$	$p = 2$
	(1)	(2)	(3)	(4)	(5)	(6)
I. Winning Margin	≤ 0.025		$\in (0.025, 0.1]$		≥ 0.1	
Full Electoral Term						
Relevant Third	-0.461	2.206	2.110*	3.332**	0.991	1.478
	(1.698)	(2.596)	(1.250)	(1.779)	(1.113)	(1.548)
Bandwidth (h)	2.56	2.56	4.63	4.63	6.04	6.04
Effective Number of Observations	512	512	2032	2032	2112	2112
First Half of Electoral Term						
Relevant Third	-4.495	-3.577	0.935	2.356	1.234	0.305
	(2.818)	(4.937)	(1.737)	(2.419)	(1.554)	(2.372)
Bandwidth (h)	3.004	3.004	6.23	6.23	7.46	7.46
Effective Number of Observations	290	290	1312	1312	1290	1290
Second Half of Electoral Term						
Relevant Third	3.899	8.674*	2.965**	4.182**	0.700	2.326
	(3.068)	(4.826)	(1.460)	(2.055)	(1.464)	(2.234)
Bandwidth (h)	2.11	2.11	4.44	4.44	7.19	7.19
Effective Number of Observations	222	222	962	962	1240	1240
II. Runner-up Margin	≤ 0.2		> 0.2			
Full Electoral Term						
Relevant Third	0.354	0.422	1.367	2.038*		
	(1.051)	(1.449)	(0.858)	(1.225)		
Bandwidth (h)	6.25	6.25	5.21	5.21		
Effective Number of Observations	1652	1652	3444	3444		
First Half of Electoral Term						
Relevant Third	0.728	0.362	-0.043	0.0142		
	(1.572)	(2.402)	(1.191)	(1.665)		
Bandwidth (h)	7.57	7.57	5.74	5.74		
Effective Number of Observations	1002	1002	1858	1858		
Second Half of Electoral Term						
Relevant Third	0.014	0.229	2.642***	3.785***		
	(1.452)	(2.316)	(1.008)	(1.431)		
Bandwidth (h)	7.57	7.57	5.74	5.74		
Effective Number of Observations	1002	1002	1858	1858		
III. Ratio of Margins	≤ 0.3		$(0.3, 1]$		≥ 1	
Full Electoral Term						

Continued ...

Effect of a *Relevant Third* on Growth of Nightlights: Electoral Margins (Continued)

	$p = 1$	$p = 2$	$p = 1$	$p = 2$	$p = 1$	$p = 2$
	(1)	(2)	(3)	(4)	(5)	(6)
Relevant Third	1.481*	1.716	0.201	2.144	0.374	0.457
	(0.838)	(1.205)	(1.732)	(2.632)	(1.252)	(1.732)
Bandwidth (h)	5.64	5.64	6.63	6.63	5.9	5.9
Effective Number of Observations	2856	2856	1396	1396	1172	1172
First Half of Electoral Term						
Relevant Third	0.214	0.507	-0.21	-0.858	0.698	0.305
	(1.252)	(1.670)	(2.170)	(3.409)	(1.873)	(2.927)
Bandwidth (h)	6.67	6.67	7.83	7.83	7.66	7.66
Effective Number of Observations	1580	1580	852	852	738	738
Second Half of Electoral Term						
Relevant Third	2.684**	2.862*	0.055	3.089	0.132	0.497
	(1.076)	(1.557)	(1.708)	(2.475)	(1.818)	(2.883)
Bandwidth (h)	5.73	5.73	8.47	8.47	7.29	7.29
Effective Number of Observations	1440	1440	952	952	702	702

Notes: Local linear RD regression ($p = 1$) results presented in Columns 1, 3 and 5. Columns 2, 4 and 6 present results for a local quadratic RD regression ($p = 2$) using a triangular kernel using the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parentheses. In each column, the outcome variable is the annual growth in luminosity density (net of year fixed-effects) as defined in Section 4. Panel A: sample of annual growth rate in the full electoral term ($t + 1$ to $t + 4$); Panel B: annual growth rate in the first half of the term ($t + 1$ and $t + 2$); Panel B: annual growth rate in the second half of the term ($t + 3$ and $t + 4$). Results for optimal bandwidth (h) using the Imbens and Kalyanaraman (2012) approach presented.

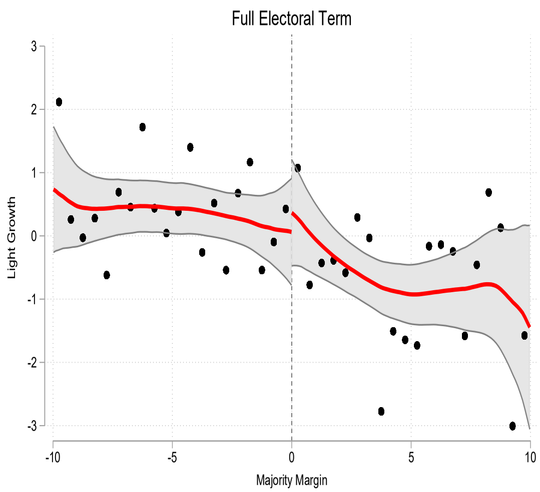
Table A9: The Effect of a *Relevant Third* on Electoral Outcomes of the Runner-up and the Third Placed Candidate

	Electoral Outcomes in the Next Election			
	Runner-up		Third Placed	
	$p = 1$	$p = 2$	$p = 1$	$p = 2$
	(1)	(2)	(3)	(4)
Panel A: Re-contesting in the Next Election				
Relevant Third	0.041	0.0492	-0.1073	-0.2354**
	(0.7491)	(0.1097)	(0.0661)	(0.1040)
Bandwidth (h)	2.878	2.878	2.209	2.209
Effective Number of Observations	821	821	579	579
Panel B: Winning in the Next Election				
Relevant Third	-0.0723	0.0258	0.0511	0.0299
	(0.1174)	(0.1744)	(0.1497)	(0.2384)
Bandwidth (h)	3.002	3.002	3.524	3.524
Effective Number of Observations	386	386	146	146

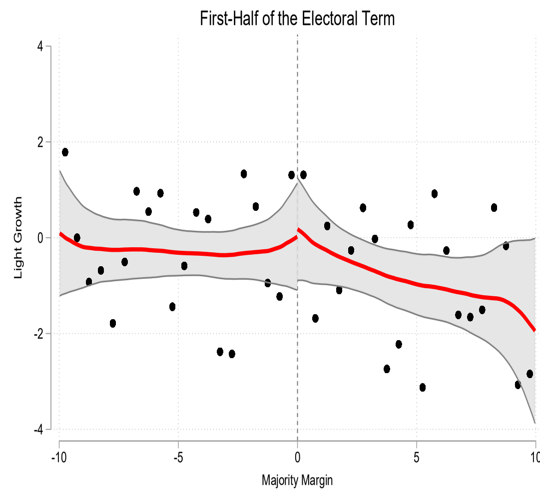
Notes: Local linear RD regression ($p = 1$) results presented in Columns 1 and 3. Columns 2 and 4 present results for a local quadratic RD regression ($p = 2$) using a triangular kernel using the IK(h) bandwidth. Standard errors clustered at the Assembly constituency level presented in parentheses. Significance: $^{***}p < 0.01;^{**}p < 0.05;^{*}p < 0.1$.

Figure B1: Robustness: Effect of a *Majoritarian* Winner

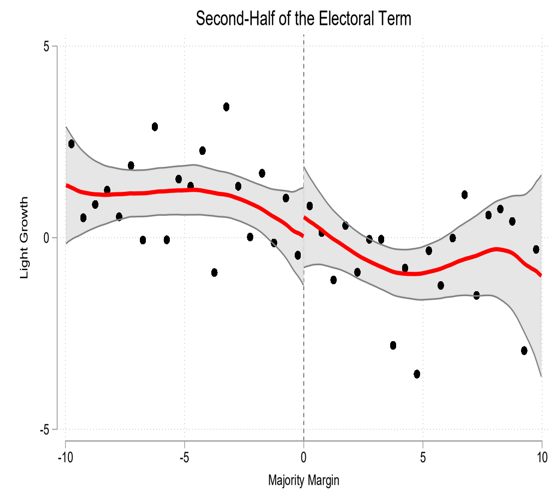
Panel A: Full Electoral Term



Panel B: First-Half of the Electoral Term



Panel C: Second-Half of the Electoral Term

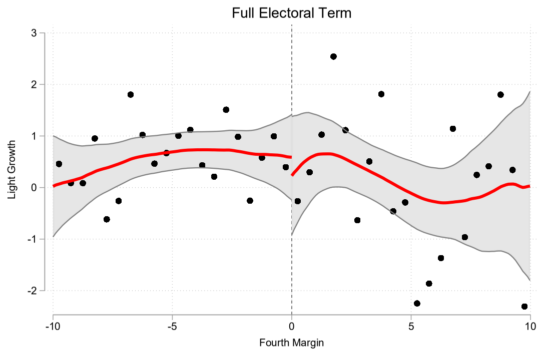


Notes: The figure plots the annual growth in luminosity density (net of year fixed effects) against the running variable, *Majority Margin* (see equation (4). A positive value of the running variable implies that the vote share of the winner exceeds 50% of the total valid votes ($v_1 > 50$); a negative value implies the winner does not secure a majority vote share ($v_1 \leq 50$). Each dot in the figure depicts the averages over successive bins of 0.5% of the running variable. The curves are local linear regression (with 95% confidence intervals) fit separately for the positive and negative parts of the cut-off.

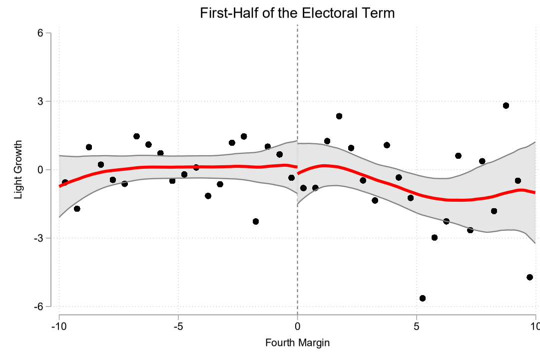
Figure B2: Robustness: Effect of a *Relevant Fourth/Fifth*

Panel A: Fourth-Ranked Candidates

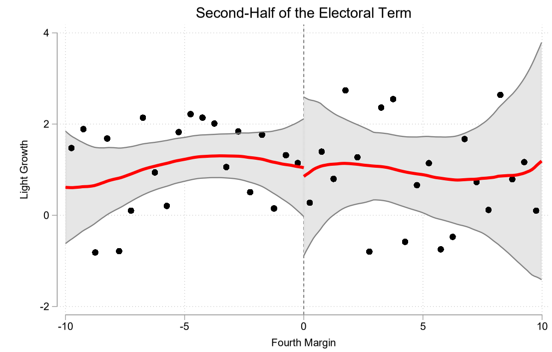
(a): Full Electoral Term



(b): First-Half of the Electoral Term

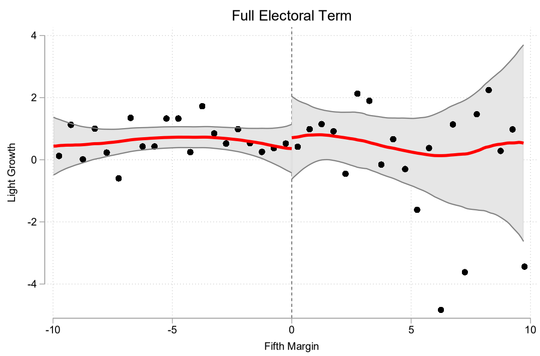


(c): Second-Half of the Electoral Term

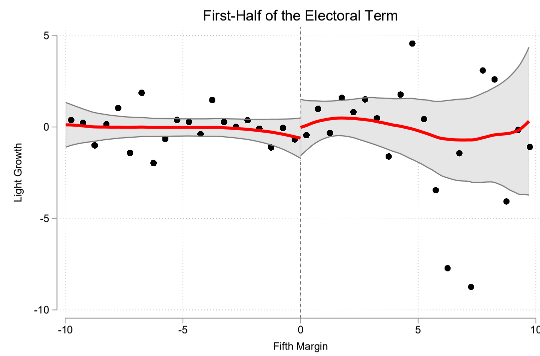


Panel B: Fifth-Ranked Candidates

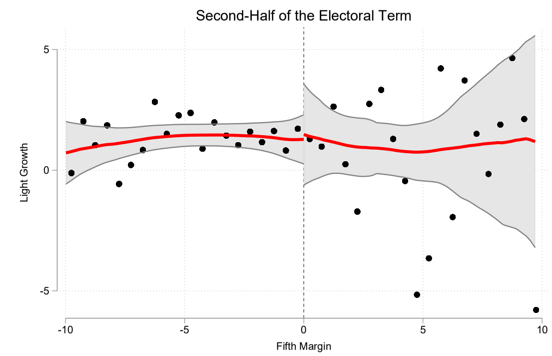
(a): Full Electoral Term



(b): First-Half of the Electoral Term



(c): Second-Half of the Electoral Term

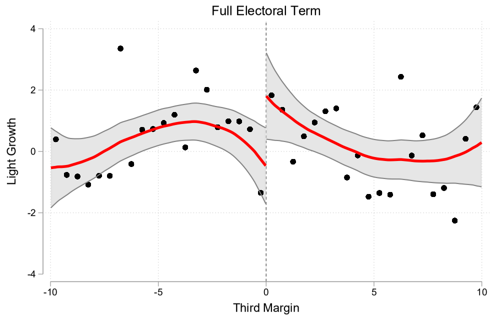


Notes: The figure plots the annual growth in luminosity density (net of year fixed effects) against the running variable, *Fourth Margin* in Panel (A), and *Fifth Margin* in Panel (B) (see Section 6.1.1 for details). A positive value of the running variable implies that the vote share of the fourth-ranked (or fifth-ranked) candidate exceeds the winning margin; a negative value implies the fourth-ranked (or fifth-ranked) candidate's vote share is lower than the winning margin. Each dot in the figure depicts the averages over successive bins of 0.5% of the running variable. The curves are local linear regression (with 95% confidence intervals) fit separately for the positive and negative parts of the cut-off.

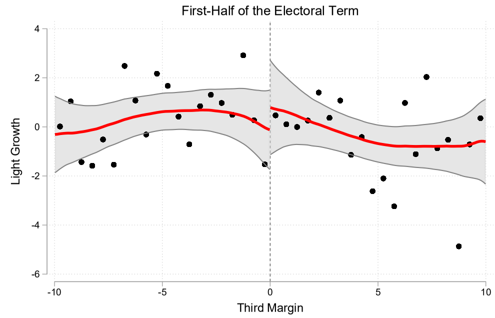
Figure B3: Impact of a *Relevant Third* on Growth of Nightlights: Effects of Political Alignment

Panel A: Politically Aligned Winner

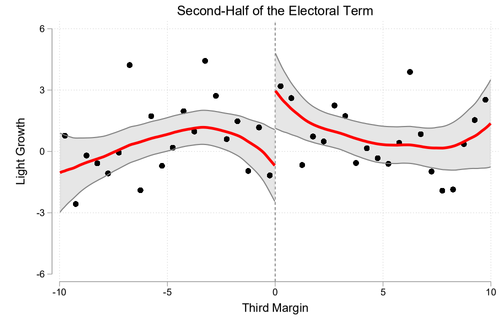
(a): Full Electoral Term



(b): First-Half of the Electoral Term

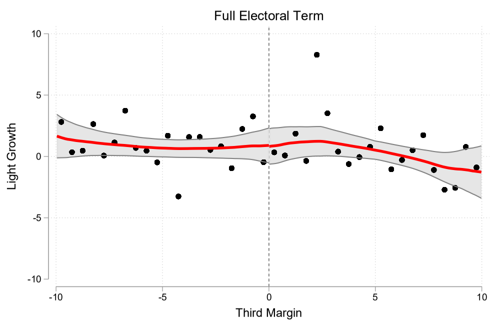


(c): Second-Half of the Electoral Term

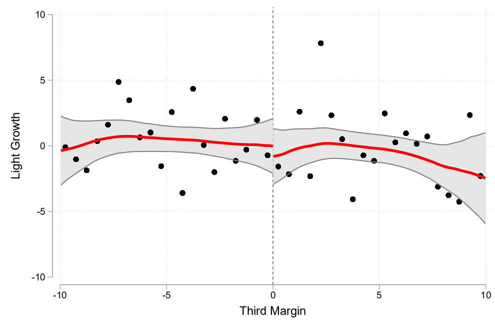


Panel B: Politically non-Aligned Winner

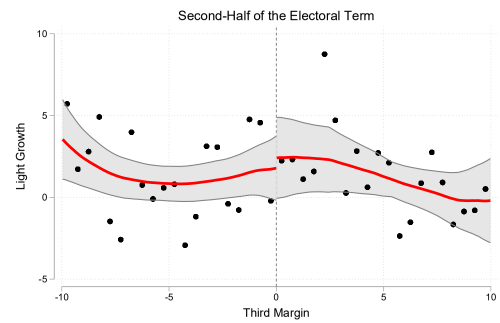
(a): Full Electoral Term



(b): First-Half of the Electoral Term



(c): Second-Half of the Electoral Term

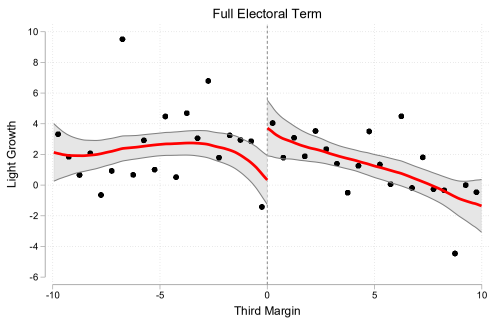


Notes: The figure plots the annual growth in luminosity density (net of year fixed effects) against the running variable, *Third Margin*, separately for the sub-sample of politically aligned (Panel A) and politically non-aligned (Panel-B) winners (Section 9). A positive value of the running variable implies that the vote share of the third-ranked candidate is higher than the winning margin; a negative value implies the winning margin is higher than the vote share of the third-position candidate. Each dot in the figure depicts the averages over successive bins of 0.5% of the running variable. The curves are local linear regression (with 95% confidence intervals) fit separately for the positive and negative parts of the cut-off.

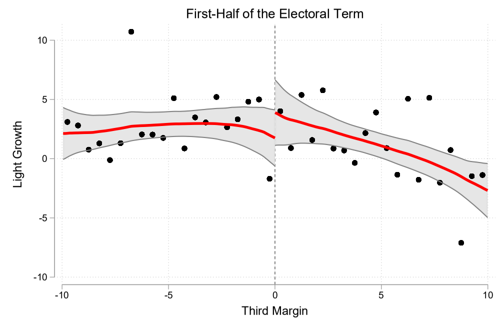
Figure B4: Impact of a *Relevant Third* on Growth of Nightlights. Institutional Heterogeneity

Panel A: BIMAROU States

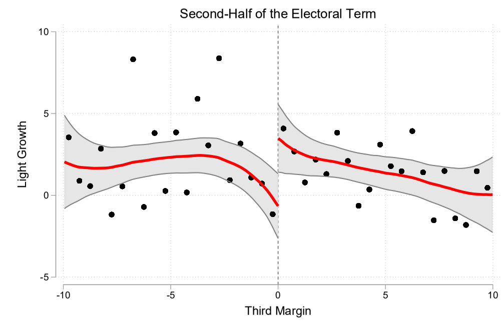
(a) Full Electoral Term



(b) First-Half of the Electoral Term

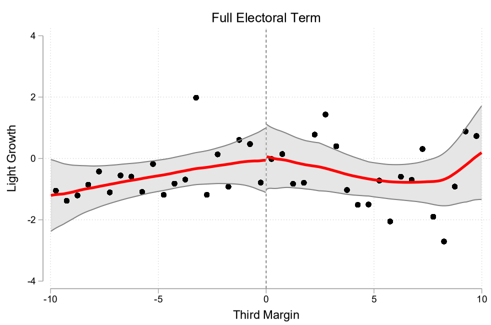


(c) Second-Half of the Electoral Term

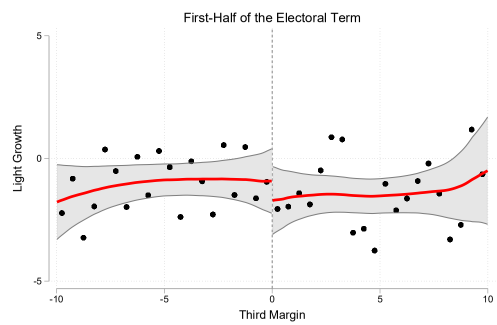


Panel B: Non-BIMAROU States

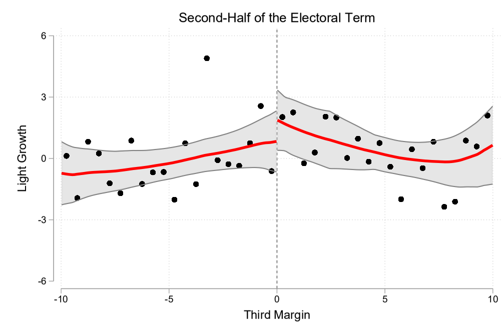
(a) Full Electoral Term



(b) First-Half of the Electoral Term



(c) Second-Half of the Electoral Term

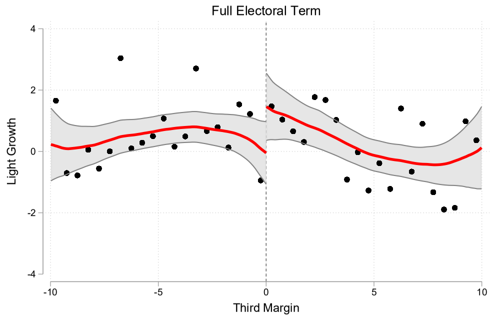


Notes: The figure plots the annual growth in luminosity density (net of year fixed effects) against the running variable, $Third\_Margin$, separately for the sub-sample of BIMAROU (Panel A) and non-BIMAROU (Panel-B) states (Section 9). A positive value of the running variable implies that the vote share of the third-ranked candidate is higher than the winning margin; a negative value implies the winning margin is higher than the vote share of the third-position candidate. Each dot in the figure depicts the averages over successive bins of 0.5% of the running variable. The curves are local linear regression (with 95% confidence intervals) fit separately for the positive and negative parts of the cut-off.

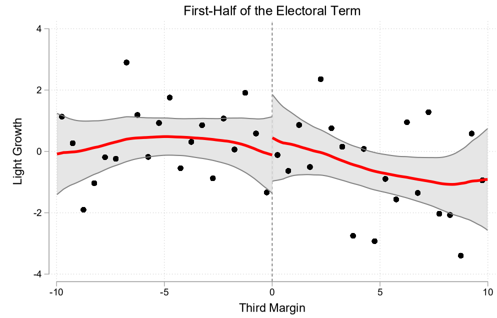
Figure B5: Impact of a *Relevant Third* on Growth of Nightlights. Incumbent Gender

Panel A: Male Incumbents

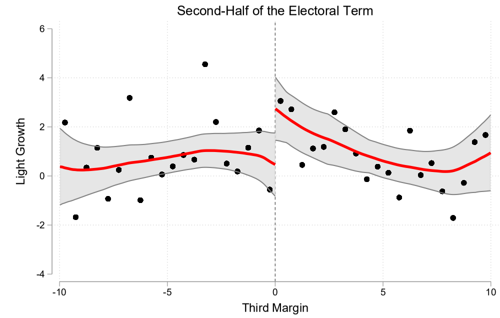
(a) Full Electoral Term



(b) First-Half of the Electoral Term

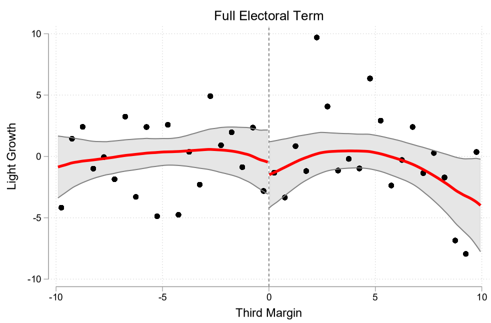


(c) Second-Half of the Electoral Term

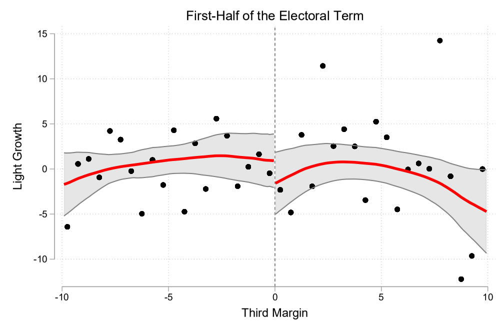


Panel B: Female Incumbents

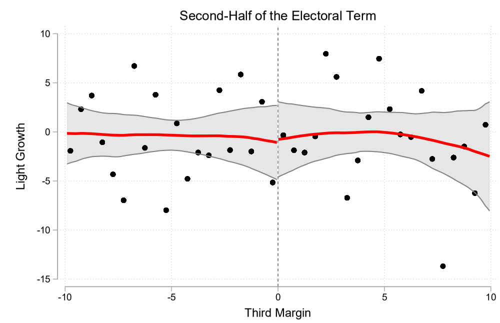
(a) Full Electoral Term



(b) First-Half of the Electoral Term



(c) Second-Half of the Electoral Term

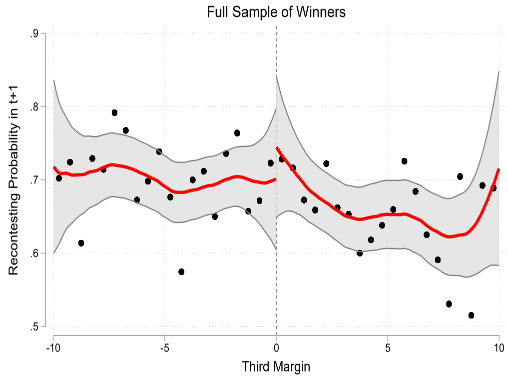


Notes: The figure plots the annual growth in luminosity density (net of year fixed effects) against the running variable, $Third\_Margin$, separately for the sub-sample of constituencies with a male incumbent (Panel A) and contituencies with a female incumbent (Panel-B). A positive value of the running variable implies that the vote share of the third-ranked candidate is higher than the winning margin; a negative value implies the winning margin is higher than the vote share of the third-position candidate. Each dot in the figure depicts the averages over successive bins of 0.5% of the running variable. The curves are local linear regression (with 95% confidence intervals) fit separately for the positive and negative parts of the cut-off.

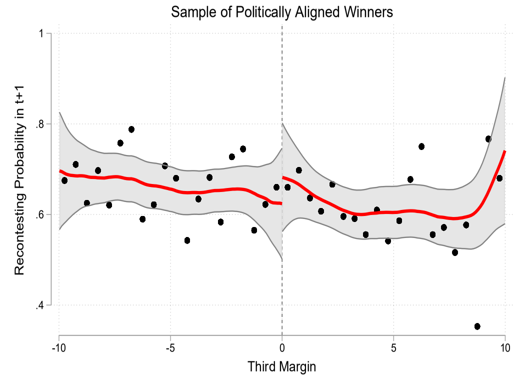
Figure B6: Impact of a *Relevant Third* on Electoral Outcomes. Re-contesting and Re-election

Panel A: Probability of Re-contesting in $t+1$

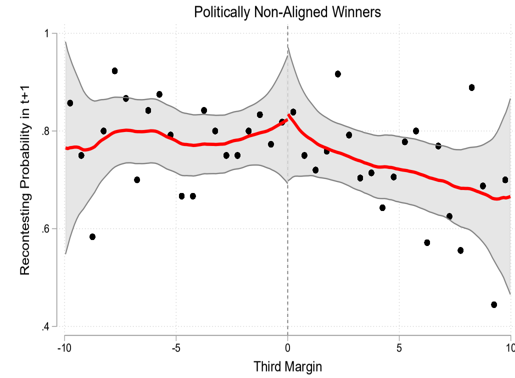
(a) Full Sample of Incumbents



(b) Subsample of Politcally Aligned Incumbents

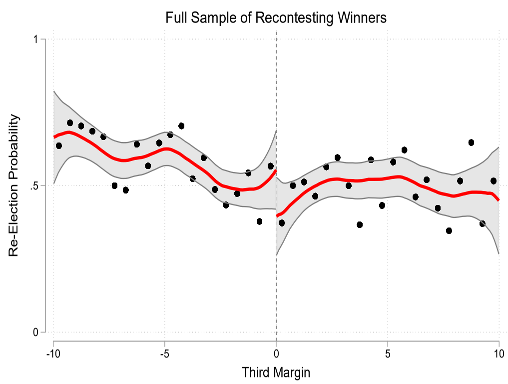


(c) Subsample of Politcally Non-Aligned Incumbents

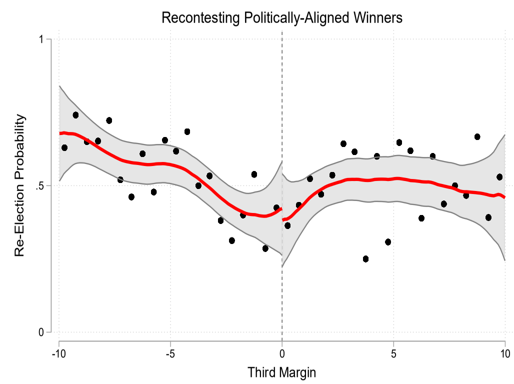


Panel B: Re-Election Probability Conditional on Re-contesting in $t+1$

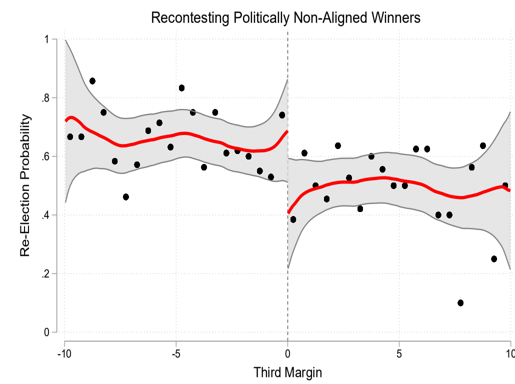
(a) Full Sample of Re-contesting Incumbents



(b) Subsample of Re-contesting Politcally Aligned Incumbents



(c) Subsample of Re-contesting Politcally Non-Aligned Incumbents

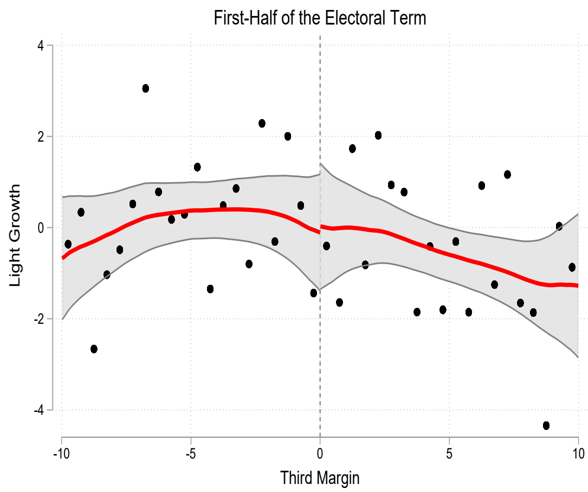


Notes: The figure plots the probability that the incumbent re-contests (Panel A), and gets re-elected in the next election (conditional on re-contesting) (Panel B), against the running variable, *Third Margin*. A positive value of the running variable implies that the vote share of the third-places candidate is higher than the winning margin; a negative value implies the winning margin is higher than the vote share of the third-places candidate. Each dot in the figure depicts the averages over successive bins of 0.5% of the running variable. The curves are local linear regression (with 95% confidence intervals) fit separately for the positive and negative parts of the cut-off.

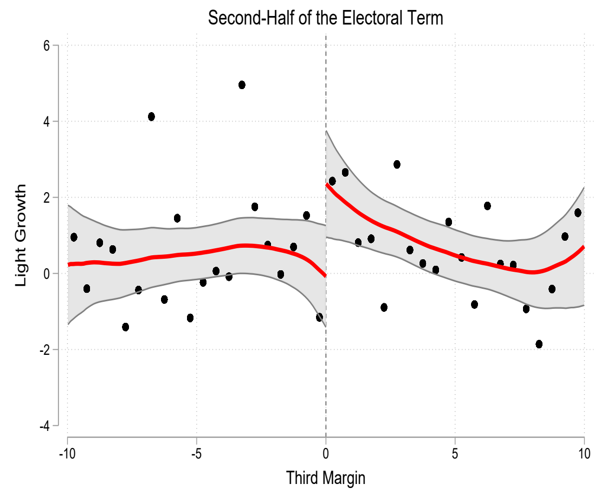
Figure B7: Impact of a *Relevant Third* on Growth of Nightlight: Falsification Tests

Panel A: Non-NOTA Third-Ranked Candidte

(a): First-Half of the Electoral Term

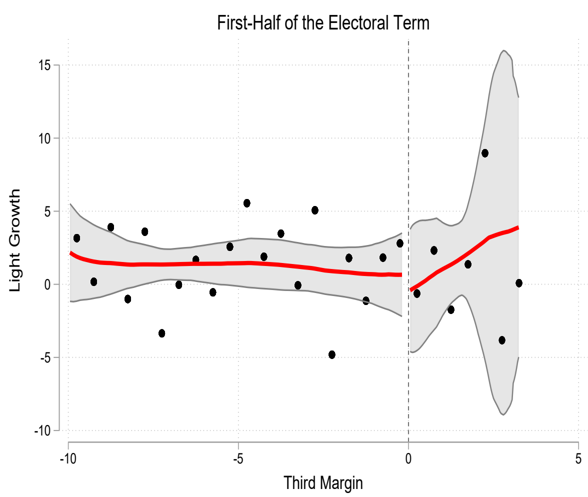


(b): Second-Half of the Electoral Term

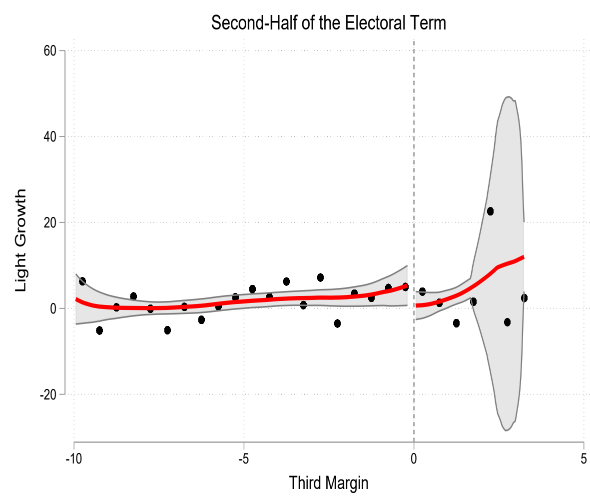


Panel B: NOTA at the Third Rank

(a) First-Half of the Electoral Term



(b) Second-Half of the Electoral Term

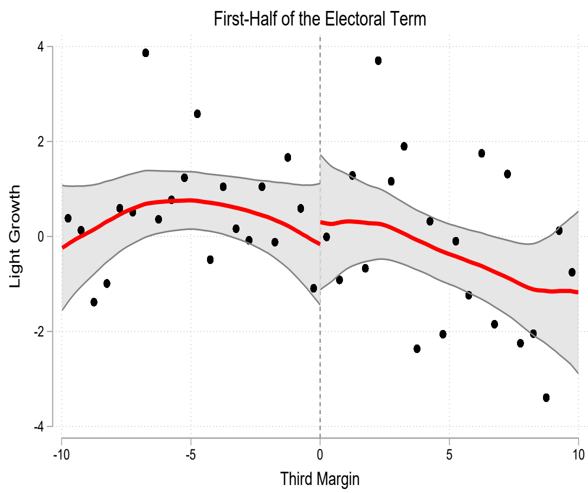


Notes: The figure plots the annual growth in luminosity density (net of year fixed effects) against the running variable, *Third Margin*, separately for the sub-sample of constituencies where the third-ranked candidate is not NOTA (Panel A) and constituencies where NOTA ranked third in the polls (Panel-B). A positive value of the running variable implies that the vote share of the third-ranked candidate is higher than the winning margin; a negative value implies the winning margin is higher than the vote share of the third-position candidate. Each dot in the figure depicts the averages over successive bins of 0.5% of the running variable. The curves are local linear regression (with 95% confidence intervals) fit separately for the positive and negative parts of the cut-off.

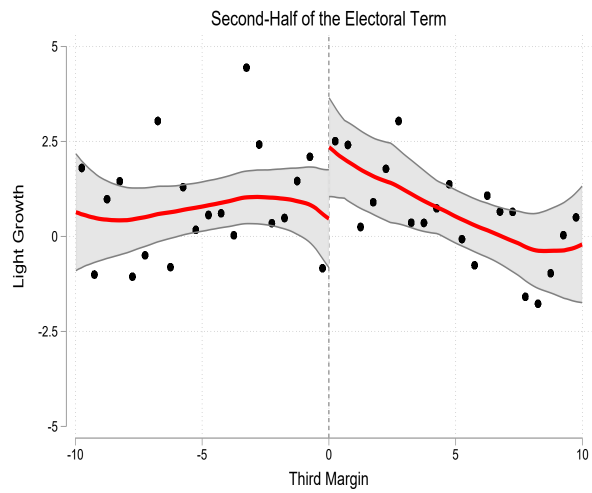
Figure B8: Relevant Third and Growth of Nightlight: Ideological Credibility of Coalitions

Panel A: Ideologically Credible Coalition

(a): First-Half of the Electoral Term

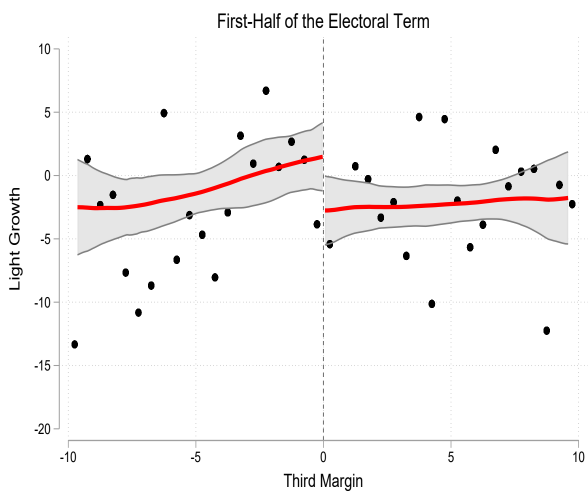


(b): Second-Half of the Electoral Term

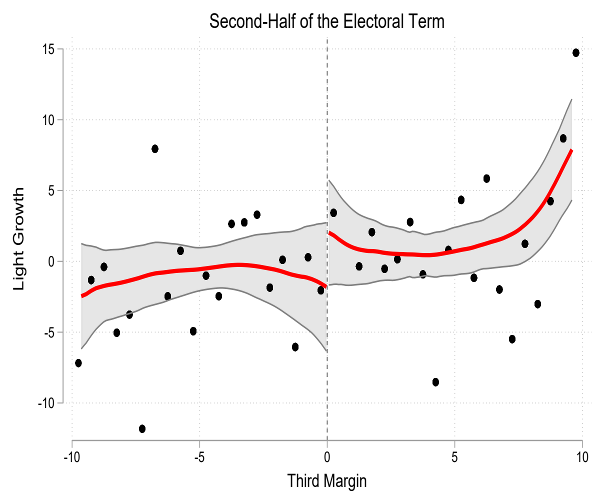


Panel B: Ideologically Non-Credible Coalition

(a) First-Half of the Electoral Term



(b) Second-Half of the Electoral Term

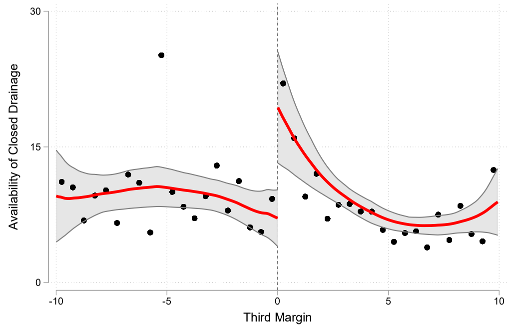


Notes: The figure plots the annual growth in luminosity density (net of year fixed effects) against the running variable, *Third Margin*, separately for the following sub-samples- Panel A: constituencies where the runner-up and the third-ranked candidate are not affiliated to the BJP and the INC (in whichever order), and Panel B: constituencies where the runner-up and the third-ranked candidate are affiliated to the BJP and the INC (in whichever order). A positive value of the running variable implies that the vote share of the third-ranked candidate is higher than the winning margin; a negative value implies the winning margin is higher than the vote share of the third-position candidate. Each dot in the figure depicts the averages over successive bins of 0.5% of the running variable. The curves are local linear regression (with 95% confidence intervals) fit separately for the positive and negative parts of the cut-off.

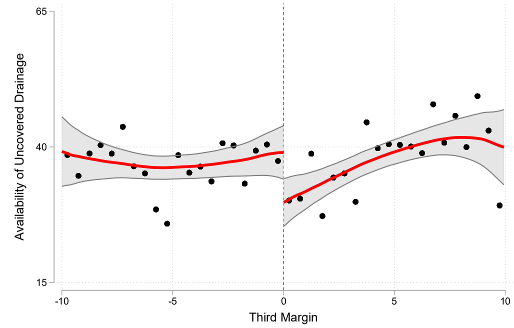
Figure B9: Impact of a *Relevant Third* on Public Goods Provision

Panel A: Drainage Infrastructure

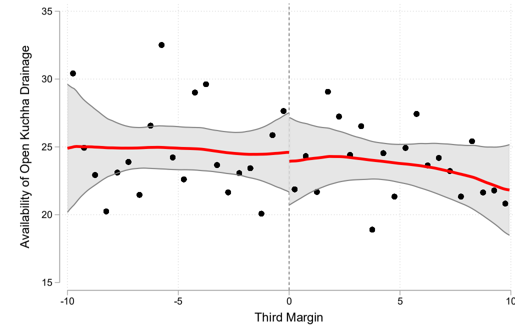
(a): Closed Drainage System



(b): Uncovered Drainage System

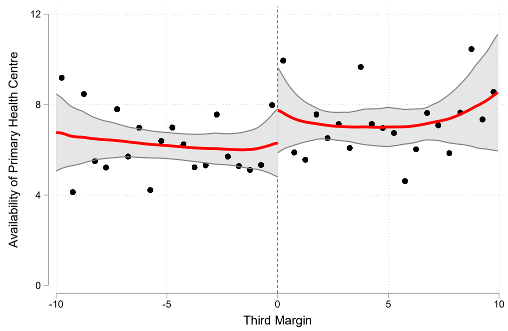


(c): Open Kuchha Drainage System

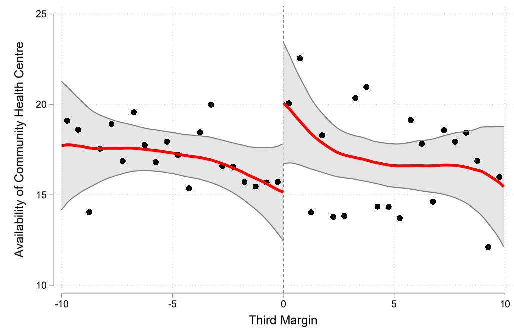


Panel B: Health Infrastructure

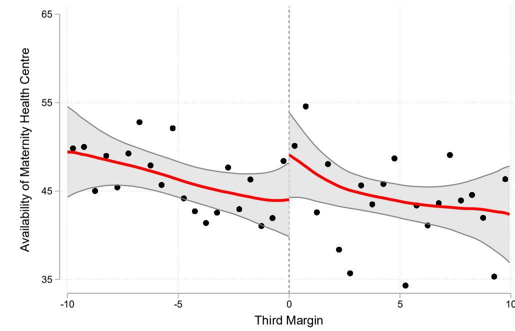
(a): Primary Health Centres



(b): Community Health Centres

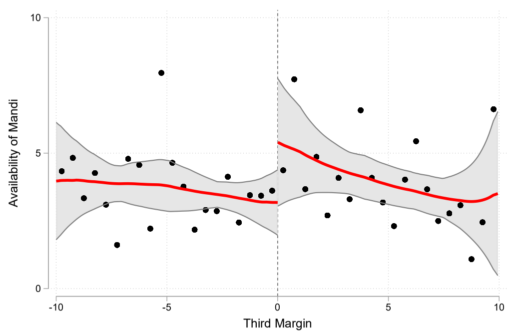


(c): Maternity Health Centres

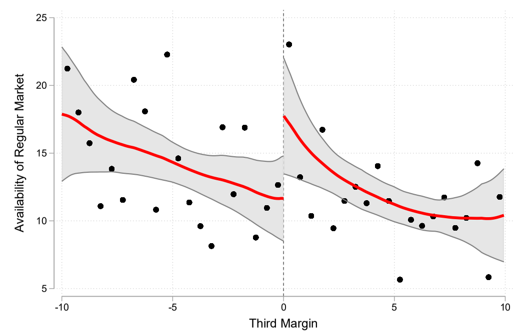


Panel C: Market Infrastructure

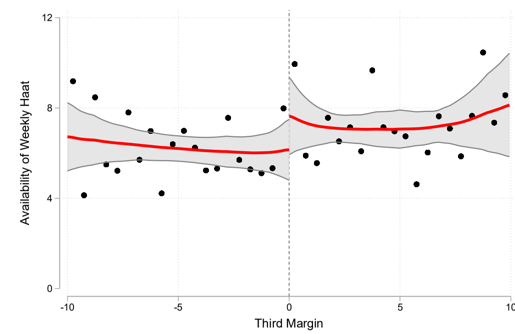
(a): Mandi



(b): Regular Market



(c): Weekly Haat

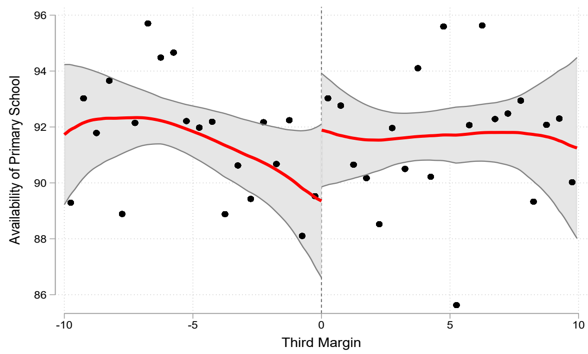


Continued . . .

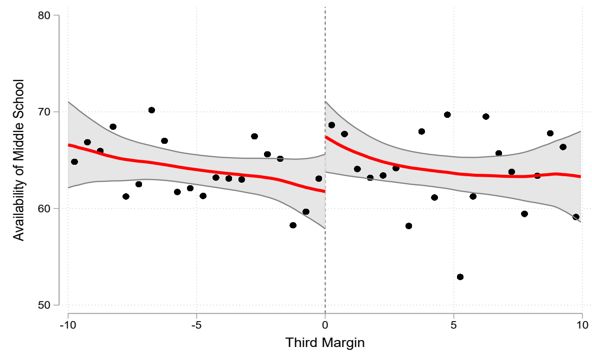
Figure B9 (Continued): Impact of a *Relevant Third* on Public Goods Provision

Panel D: Availability of Schools

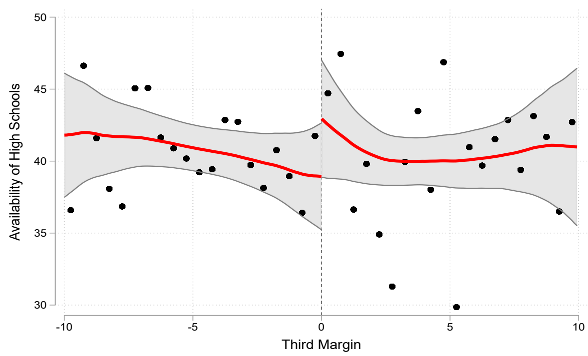
(a) Primary Schools



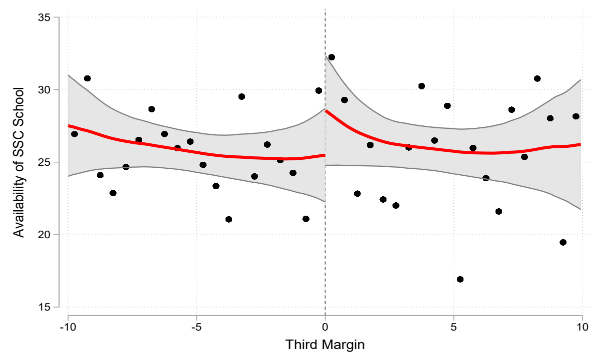
(b) Middle Schools



(c) High Schools

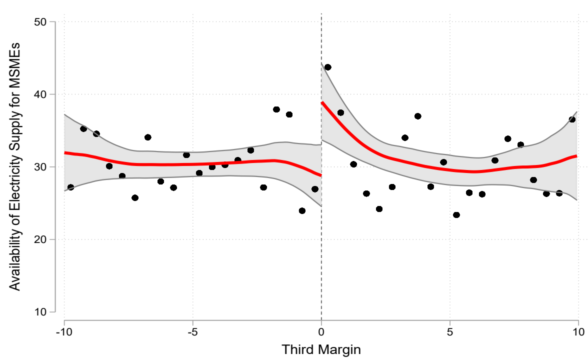


(d) Senior Secondary Schools

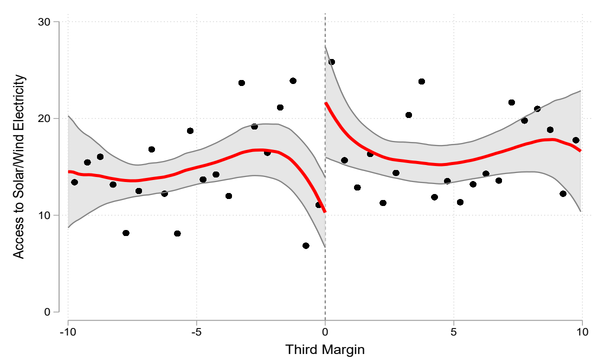


Panel E: Availability of Electricity

(a) Electricity Supply for MSMEs



(b) Solar/Wind Electricity Availability



Notes: The running variable is *Third Margin*, defined as the difference between the third-position candidate's vote share and the winning margin. Each dot on the scatter plot is an average over successive bins of 0.5% of the running variable. The curves are local linear regressions fit separately for regions above and below the cut-off using a triangular kernel and an optimal bandwidth à la Imbens and Kalyanaraman (2012).