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Essays in Development Economics and Political Economy

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ESSAYS IN DEVELOPMENT ECONOMICS
AND POLITICAL ECONOMY

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Abstract

This dissertation is a collection of essays on three important areas of study in development economics and political economy.

The first chapter asks whether local state legislators of a party provide decision-relevant information to voters about the party's overall quality. I study this question mostly in the context of the two main national parties in India. Using a regression discontinuity design to analyze election data, I find that a party that barely wins instead of loses an election in a state constituency has a lower vote share in that constituency in the following national election; in other words, there are negative spillover effects of local incumbency. Alongside this spillover effect, I also find a direct negative incumbency effect in state legislatures. The findings indicate that, on average, the information that local legislators reveal tends to be bad for the party.

The second chapter, co-authored with Sabyasachi Das, examines whether political alignment between local and state governments is beneficial for the local area. In particular, while local administrative units that are politically aligned with the state government may receive more financial resources, the politicians in these units may have a greater incentive to seek rent. We build a dynamic model that studies how the state government may control the rent-seeking activities of local politicians through the assignment of public servants of varying ability. The model predicts that the state government will assign lower ability police officers to aligned local units and rent-seeking in such units will be higher. Our regression analysis, which uses data from the state of Rajasthan in India, is broadly consistent with the predictions of our model.

The third chapter, co-authored with Shoumitro Chatterjee, asks whether trade liberalization, often considered to promote economic growth, is good for child health, an important development indicator. Specifically, we study the impact of tariff changes in India, over the period 1987-1997, on infant and child mortality. We demonstrate that most of the variation

in infant mortality over this period can be attributed to trends at the national and district level, leaving little room for tariffs to have any explanatory power.

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For my sister, Gayatri

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Chapter 1

National spillovers of local politics: evidence from India

1.1 Introduction

The question of whether incumbency carries an electoral advantage has been widely studied. For a given level of government, some papers look at party-level incumbency effects (e.g., Lee (2008) looks at incumbency effects in elections to the U.S. House of Representatives) and others look at candidate-level incumbency effects (e.g., Uppal (2009) looks at incumbency effects in India's state legislatures and Linden (2004) looks at such effects in India's national parliament).

Consider, however, two important, related features of a multi-party political system with elections at different levels of government (e.g., state and national). First, political parties are likely salient for electoral purposes. This is particularly true in the case of India, where electoral battles are often perceived to be battles among parties, as opposed to specific candidates, and parties occupy center-stage in discussions of public good provision (Banerjee and Somanathan (2007)), measures of political competition (Besley and Burgess (2002)) and ethnic politics (Chandra (2005)). Second, if a given party contests elections at multiple levels

of government, e.g. both state and national, and voters do tend to think of a party as the key unit of political competition, then it is reasonable to expect the electoral performance of the party at one level to have a bearing on its electoral performance at another level.

In this paper, I ask whether a party's incumbency in a local state constituency has "spillover effects" in the national elections. I study such effects in the context of elections in India. The unique structure of electoral constituencies in India is what makes this study possible. In India, a national electoral constituency L , from which a candidate is elected to the national parliament, is simply a collection of some state electoral constituencies $\{S_i\}_{i=1}^n$, from which candidates are elected to the legislative assembly of a given state. As such, it is possible to ask whether incumbency in any S_i is related to the vote share in S_i in a national election in L .

I use a regression discontinuity (RD) framework to study this question. Suppose a party's candidate in a state election barely wins in a state constituency. It is then possible to see whether that party's vote share in that state constituency at the time of a subsequent national election is higher or lower relative to what it would have been had the party barely lost in that state constituency. Focusing throughout on the two main national parties in India, the Indian National Congress (INC) and the *Bharatiya Janata Party* (BJP), I find that this spillover effect is negative. Barely winning instead of losing the election in a state electoral constituency reduces a party's vote share in that constituency in the national election. This spillover effect persists even when I look at close state elections for candidates from the party of the member of parliament incumbent in the national constituency. The most straightforward interpretation of this result is that state legislators provide decision-relevant information about a party's national-level quality, over and above what exposure to the national representative of that party may directly provide. Furthermore, this information tends to be bad or unfavorable on average.

To further test the hypothesis that local state legislators of a party provide decision-relevant information to local voters on the overall quality of the party, I also apply my

empirical framework to the analysis of the spectacular victory of the BJP in the national elections of 2014. In the run up to the elections, there was a groundswell of popular support for the BJP, concurrent with widespread disappointment with the Congress. I find that the local vote share of the BJP was higher in state constituencies in which it had barely lost instead of won the preceding state election. On the other hand, I find no such effect for the Congress. Even though the average local vote share of the BJP seems to be uniformly higher than that of the Congress, the local electorate still showed greater enthusiasm for BJP candidates in areas that did not have an incumbent BJP state legislator. The rather comprehensive national dissatisfaction with the Congress, on the other hand, made it particularly unlikely that the electorate would, as in the case of the BJP, show greater enthusiasm for Congress candidates in local areas that did not have incumbent Congress state legislators. This result seems to be consistent with the information hypothesis. If the local legislators of a party usually provide bad information, then a nationwide wave of disappointment against the party would be expected to make such localized bad information less relevant for a national election. At the same time, even when there is nationwide support for a party, the state legislators of the party may continue to disappoint locally, thus dampening the local enthusiasm of the electorate in areas in which the party is incumbent relative to areas in which it is not.

I then proceed to relate this phenomenon of localized negative spillover effects to incumbency effects in both state and national elections for the Congress and the BJP. While I find little evidence of any incumbency effect in elections for the national parliament, I find robust negative incumbency effects in elections for state legislatures. A party that barely wins instead of loses in a constituency in a state election is much more likely to lose in it in the next state election. As such, the same electoral outcome – barely winning instead of losing a constituency in a state election – not only has a direct, negative incumbency effect in the next state election but also, in the interim, has a localized, negative spillover effect in the national election. The main takeaway seems to be that voters are consistently

disappointed with the unfavorable information that a party's incumbent state legislators provide, expressing such disappointment not only in state elections but also against the party's candidates in the national elections. The robust negative incumbency effect in state legislatures makes it unlikely that the results in this paper simply reflect the preference of the electorate to have state and national legislators from different parties.

The question posed in this paper is important for several reasons. First, the spillover effect identified here is almost certainly a party-level effect, since candidates for state and national elections in India are rarely ever the same (see Fowler and Hall (2014) for a discussion of how RD estimates of incumbency effects, such as those reported in Lee (2008), are often a combination of personal and partisan incumbency effects). This paper, thus, provides direct evidence of the importance of political party identities in multi-party electoral systems.

Second, this paper contributes to the debate on how voters gain decision-relevant information or apportion accountability in a multi-level system of governance (see, for instance, Rodden and Wibbels (2011)). The evidence I present here is consistent with the hypothesis that voters use the information they gain through exposure to a party's local legislators to form an estimate of the overall quality of the party. This, in turn, has a bearing on how they vote for that party's candidates in the national elections.

Third, I also contribute to the literature that explores differences in the direction of incumbency effects in developed and developing countries. As discussed in Fowler and Hall (2016), while several papers demonstrate positive incumbency effects in developed countries, the evidence for developing countries is much more mixed. In fact, the paper goes on to conclude that there is little evidence of an incumbency disadvantage in the context of developing countries. Admittedly, Fowler and Hall (2016) do not look at spillover effects of incumbency. The analysis in this paper, thus, not only provides evidence of a negative party-level incumbency effect but also, at the same time, demonstrates a novel channel – local to national spillovers – through which such an effect might operate.

Last, this paper also touches upon the issue of party organization. For instance, papers such as Nellis (2012) and Lee (2016) discuss the role of internal party organization in incumbency effects.¹ To the extent that parties are strategic decision-making units, it may be the case that internal party organization and voter behavior or incumbency effects are determined in a game-theoretic equilibrium. For instance, the evidence in this paper suggests that it is possible that how a party picks candidates or manages its political image in different electoral constituencies may itself be a function of the interdependence of voter behavior across elections at different levels of government.

The remainder of this paper is organized as follows. Section 1.2 provides an overview of the political system in India and the structure of electoral constituencies. Section 1.3 discusses the data used in this paper. Section 1.4 details the empirical framework. Section 1.5 then presents results and Section 1.6 concludes.

1.2 Background

India is a parliamentary democracy consisting of twenty-nine states and seven union territories. All states and the union territories of Delhi and Puducherry have elected legislative assemblies. These legislative assemblies are referred to as *state assemblies* throughout this paper. Elections for the lower house of the national parliament, called the *Lok Sabha*, and all the state assemblies are held every five years, though the five-year cycles vary across states.² For instance, while the most recent national elections were held in 2014, 9 states had elections in 2013, 7 in 2012, 5 in 2011 and so forth. In the case of either national or state

¹Nellis (2012) studies how a party’s internal organization is a key determinant of whether its incumbents in the national parliament support the election bids of its candidates in state elections. However, the outcome variable in the paper is the aggregate vote share of a party across all state constituencies within a national constituency L . It is not clear whether a higher *aggregate* vote share in a state election in the entire area comprising L actually translates into more victories in the individual state constituencies that make up L .

²Elections to the upper house of the national parliament, the *Rajya Sabha*, are not relevant to this paper. Members of the *Rajya Sabha* are not elected directly by the people but indirectly by state legislatures. A few members are nominated by the President of India. As such, throughout this paper, “national elections” or “elections for the national parliament” shall be understood to refer to elections to the lower house or *Lok Sabha*.

elections, the party or coalition of parties that wins the majority of seats in the concerned legislature forms the government. Each state government is headed by a Chief Minister, in the same way that the national government is headed by the Prime Minister.

The organization of electoral constituencies is particularly relevant to this paper. A member of the national parliament, called an *MP* (Member of Parliament), is elected from a national parliamentary constituency and a member of a state legislative assembly, called an *MLA* (Member of the Legislative Assembly), is elected from a state assembly constituency. Each national constituency is entirely contained in a given state, and the number of seats in the national parliament allotted to a state is proportional to the population of that state. For instance, Uttar Pradesh, India's most populous state, has 80 Lok Sabha seats, while Punjab has 13. A national constituency is simply defined, by statute, to be a collection of state assembly constituencies. In particular, any state assembly constituency S is entirely contained in some national constituency L . Furthermore, eligible voters register to vote in the assembly constituency in which they ordinarily reside. Therefore, if L is a national constituency and $S_1, S_2, \dots, S_n$ are the state assembly constituencies that L comprises, then the set of eligible voters in S_i for the state assembly election in S_i and for the national parliamentary election in L is the same.³ Figure 1.1 illustrates the organization of electoral constituencies using the example of the state of Rajasthan. The small units, demarcated by red boundaries, are state assembly constituencies and the larger electoral regions, demarcated by darker, black boundaries, are national constituencies.⁴

Both MPs and MLAs have local area development funds that are earmarked for infrastructure and related development projects, such as irrigation, schools and so on. Furthermore, MPs and MLAs also play an important part in redressing the grievances of local citizens,

³Section 13D of Part IIB of The Representation of the People Act, 1950 states that the electoral roll for every parliamentary constituency, except in the state of Jammu and Kashmir or in a union territory that does not have a legislative assembly, shall consist of the electoral rolls of all the state assembly constituencies that the parliamentary constituency comprises. As such, I drop Jammu and Kashmir throughout the analysis.

⁴There are minor errors in the picture along the boundaries of the constituencies that make it seem that a state constituency may not be entirely within a particular Lok Sabha constituency. This is merely a relic of ArcGIS, the software used to make the picture.

e.g. discussing concerns with police and municipal authorities or raising questions in the legislature.⁵ However, by design, MLAs tend to have a more local role and are responsible for a smaller constituency S that is part of a larger national constituency L . MPs can often be busy for extended periods with legislative business in Delhi. Thus, it is likely that people living in S are more exposed to the local MLA. In informal conversations with a few MPs, I also learnt that MLAs of a party often campaign for a candidate for the national parliament at the grass roots.

Given that political parties are fairly salient in elections in India, people may use the information obtained through interactions with a party's MLA to form an estimate of the quality of the party's candidate for the national parliament. A bad MLA in S may reduce the vote share in S of a Lok Sabha candidate contesting the election in L , where L contains S . In a way, the party's reputation is a public good that members of the party share.

Throughout the analysis in this paper, I look at effects, be it spillovers from state to national elections or usual incumbency effects over time in a given electoral constituency, at the party-level, restricting attention for the most part to the two main national parties in India, the *Bharatiya Janata Party* (BJP) and the Indian National Congress (INC or simply Congress).⁶ These two parties have shaped national politics in India over the entire sample period, with one or the other always leading the government at the center as also in several states. The Congress was the largest party in the coalition that formed the national governments in 2004 and 2009. Likewise, the BJP led the coalition that formed the national government in 1999. In 2014, the BJP formed the national government, winning 282 of the 543 seats in the Lok Sabha, the lower house of the national parliament. This was the first time since the 1984 Lok Sabha election that a single party managed to claim a majority in the Lok Sabha all by itself. In the sample period of 1998-2014, the BJP and Congress together won approximately 50% of all electoral races in state assembly constituencies and approximately 56% of all electoral races in Lok Sabha constituencies. Since these two parties

⁵For instance, MPs and MLAs often have open office hours during which people can go talk to them.

⁶Candidates running independently are, therefore, dropped throughout.

had a significant presence in both state and national politics over the sample period, they provide an apposite context for studying the role of state legislators in influencing voting in national elections.

1.3 Data

The data for this study come from the website of the Election Commission of India.⁷ The reports used are the Statistical Reports of General Elections to the Lok Sabha and Statistical Reports of General Elections to the State Legislative Assemblies (*Vidhan Sabha*). I use data from four Lok Sabha elections – those held in 1999, 2004, 2009 and 2014 – and all state elections between 1998 and 2014.

The data contain information on the political parties of candidates in state and Lok Sabha elections, the votes received by a candidate, the total votes polled and total eligible voters in a constituency, and, for several elections, the age and sex of the candidate and the reservation status of the constituency.⁸

The key feature of the data is that the votes of a Lok Sabha candidate in constituency L are broken down by the state assembly constituencies $S_1, S_2, \dots, S_n$ that make up L . This breakdown, available in Election Commission reports called Details for Assembly Segments of Parliamentary Constituencies, is available from the 1999 national election onward. This breakdown allows the matching of the results of a state assembly election in constituency S_i to a candidate's Lok Sabha vote share in S_i in the subsequent national parliamentary election in constituency L .

Obtaining the data for this project was a particularly difficult and tedious task. The reports that provided a breakdown of votes in the national elections by state constituencies were in PDF format. The data in these reports, which often ran into more than a thousand

⁷The web page with all the results is http://eci.nic.in/eci_main1/ElectionStatistics.aspx.

⁸Some seats in state assemblies and the Lok Sabha are reserved for the Scheduled Castes and Scheduled Tribes, historically disadvantaged groups that have been granted certain protections in the Constitution so that they may have fair political representation.

pages, were not formatted in simple tables and had to be carefully scraped and then matched to voting numbers for state elections.

There were two important events during the period 1998-2014. First, in 2000, three new states were created. Uttarakhand was carved out of Uttar Pradesh, Chhattisgarh out of Madhya Pradesh, and Jharkhand out of Bihar. Second, in February 2008, the President of India brought into force the recommendations of the Delimitation Commission. This Commission, set up under the Delimitation Act of 2002, was given the task of fixing, and redrawing as necessary, the boundaries of state assembly and Lok Sabha constituencies, based on 2001 census population figures. In Appendix 1.C, I explain how I deal with these two events.

Given the aforementioned data adjustments, any sample for the regressions that estimate spillovers from local to national elections is set up as follows. Consider a state assembly constituency S and a national (Lok Sabha) constituency L , where L contains S . Let t_0 and t_2 be the dates of two consecutive national elections, with $t_2 > t_0$. Let $t_1 \in [t_0, t_2)$ be the date of the most recent state assembly election in S , prior to the national election at t_2 . Then, the results of this state election at t_1 are matched to an outcome in S for the national election in L at t_2 . For instance, the margin of victory of a party's candidate in S at t_1 is matched to the vote share in S at t_2 of the party's candidate in L .

1.4 Empirical methodology

This paper uses a regression discontinuity (RD) framework. The main analysis, that of spillovers from local to national elections, is set up as follows. Let L be a national parliamentary constituency and let $\mathcal{S} \equiv \{S_1, S_2, \dots, S_n\}$ be the set of state assembly constituencies that make up L . Let p be a political party, t_1 be the date of a national election and $t_0 < t_1$ the date of the most recent state assembly election in the state that contains $\mathcal{S}$. Let v_{Lpt_1}

be the votes received by party p in L at t_1 . Then,

$$v_{Lpt_1} = \sum_{i=1}^n v_{ipt_1}$$

where v_{ipt_1} are the number of votes that p receives in S_i at t_1 . Let T_{Lt_1} be the total votes cast in L in the national election at t_1 , with $T_{Lt_1} = \sum_{i=1}^n T_{iLt_1}$, where T_{iLt_1} are the total votes cast in S_i . Then, the outcome variable can be defined as:

$$ls_vote_share_{ipt_1} = \frac{v_{ipt_1}}{T_{iLt_1}} \quad (1.4.1)$$

The outcome variable is simply the *local* (i.e., state assembly constituency level) vote share of a party p in the national election in L . I refer to the outcome variable as the *local Lok Sabha vote share*.

Now consider the state assembly election at $t_0 < t_1$. Let $\tilde{v}_{ipt_0}$ be the votes received by party p in the election in S_i and let $\tilde{T}_{it_0}$ be the total votes cast in S_i . Then, the running variable for the RD framework is defined to be:

$$ac_perc_margin_{ipt_0} = \frac{\tilde{v}_{ipt_0} - \tilde{v}_{ip't_0}}{\tilde{T}_{it_0}} \quad (1.4.2)$$

where, if p wins the election, then p' is the party that placed second or, if p loses the election, then p' is the party that wins. Thus, ac_perc_margin is positive for the party that wins the election and negative for any party that loses.

The quantity (NS or national spillover) I estimate is:

$$NS = \lim_{a \downarrow 0} E(ls_vote_share_{ipt_1} \mid ac_perc_margin_{ipt_0} = a) - \lim_{a \uparrow 0} E(ls_vote_share_{ipt_1} \mid ac_perc_margin_{ipt_0} = a) \quad (1.4.3)$$

The treatment effect NS is the change in a party’s *local Lok Sabha vote share* in a state assembly constituency when the party’s candidate barely wins instead of loses the preceding state election in that constituency.

The identifying assumption of the RD setup can be explained using a simple potential outcomes framework (Lee and Lemieux, 2010). “Treatment” occurs if the incumbent state legislator in constituency S_i belongs to party p . Let $ls_vote_share_{ipt_1}(1)$ be the local Lok Sabha vote share of the party in the case of treatment and $ls_vote_share_{ipt_1}(0)$ be the local Lok Sabha vote share in the absence of treatment. Then, NS , the average treatment effect at the cutoff (a zero margin of victory), is consistently estimated so long as $E(ls_vote_share_{ipt_1}(1) \mid ac_perc_margin_{ipt_0})$ and $E(ls_vote_share_{ipt_1}(0) \mid ac_perc_margin_{ipt_0})$ are continuous in $ac_perc_margin_{ipt_0}$.

Intuitively, the key idea is the following. The incumbency status of a party in a state assembly constituency jumps discontinuously at the cutoff of zero margin of victory. To the right of the cutoff, the party becomes the incumbent; to the left, it loses the election. A party, through its campaigning efforts, ideology, and so on, may certainly be able to influence the total votes it receives. Features of constituencies, such as the preferences of voters or the population of minority groups, would also be relevant to the election outcome. However, assuming there still remains some uncertainty in the exact final tally, the probability density of ac_perc_margin will be continuous for the party. Thus, as discussed in Lee (2008), variation in incumbency status in a neighborhood $(-h, h)$ of a zero margin of victory, for some choice of a bandwidth h , would be as good as randomized by an experiment. All baseline observed and unobserved variables that are determined prior to the realization of the election outcome will vary continuously with ac_perc_margin across this cutoff and will thus, in a neighborhood of the cutoff, be independent of incumbency status.

I implement the RD design by estimating regressions of the form:

$$ls_vote_share_{ipt_1} = \beta \mathbf{1}\{ac_perc_margin_{ipt_0} \geq 0\} + f^n(ac_perc_margin_{ipt_0}) + \epsilon_{ipt_1} \quad (1.4.4)$$

where $f^n(\cdot)$ is a polynomial of the form:

$$f^n(x) = \sum_{k=0}^n \alpha_k x^k + \sum_{k=1}^n \lambda_k x^k \mathbf{1}\{x \geq 0\} \quad (1.4.5)$$

for $n \geq 1$ and i denotes state assembly constituency S_i . The fully interacted polynomial $f(\cdot)$ allows for the regression function to be estimated separately on each side of the cutoff. β is the desired treatment effect, NS .

As suggested in Lee and Lemieux (2010), I focus on estimating β with local linear regressions (the case of $n = 1$ in (1.4.4)). Following Imbens and Lemieux (2008), I use a rectangular kernel throughout, not weighting observations in $(-h, h)$. For the sake of uniformity, I use $h = 0.1$ throughout in all the graphs. This is also the bandwidth that Fowler and Hall (2016) use in their reassessment of several RD papers. However, since the *optimal* bandwidth is itself a function of the sample on which (1.4.4) is estimated, I also report estimates of β using the Imbens and Kalyanaraman (2012) (henceforth, IK) optimal bandwidth and the MSE-optimal bandwidth selector detailed in Calonico et al. (2016).⁹ A linear polynomial with the optimal IK bandwidth is also the preferred specification of Anagol and Fujiwara (2016).

⁹This is the default `mserd` option in the `rdrobust` Stata command.

1.5 Results

1.5.1 State to national spillovers

Figure 1.2 graphically depicts the spillover effect, as discussed in Section 1.4, for two cases. Figure 1.2(a) depicts the effect for the universe of all parties while Figure 1.2(b) drops the INC and BJP from the sample. Throughout, unless otherwise noted, observations are pooled over the entire sample period. The x -axis is the margin of victory of a political party in a state assembly constituency (abbreviated as AC). The y -axis is the *local* vote share in this AC in the election in the national parliamentary constituency (abbreviated as PC) that contains it. The dashed vertical line depicts a zero margin of victory; as we cross this line, we transition from candidates who barely lost in a state election to those who barely won. As mentioned previously, all graphs use a bandwidth of $h = 0.1$.

The points on the graphs were plotted as follows. First, the running variable was divided into non-overlapping bins of 1 percentage point. Then, the local averages of the outcome variable in these bins were plotted against the mid-points of the bins. For instance, in Figure 1.2(a), the point just to the right of the cutoff is the average *local* Lok Sabha vote share for all parties that won a preceding state election by a margin of victory of less than 1 percentage point. As discussed in Lee and Lemieux (2010, p. 308), the bin means provide a non-parametric estimate of the regression function. The straight lines on either side of the cutoff plot predicted values of the outcome variable from an estimation of the parametric equation (1.4.4) over a bandwidth of 0.1 with a linear polynomial in the running variable.¹⁰

Figure 1.2(a) shows that, on average, the local Lok Sabha vote share in an AC of a party that barely wins the AC in a state election is about 1.5 percentage points lower than if it barely loses. However, this jump almost entirely goes away in Figure 1.2(b), when the INC and BJP are dropped from the sample. This finding lends qualitative support to the decision to focus on the two main national parties in the study of spillovers from state to national

¹⁰All regression are estimated on the raw, unbinned data.

elections. For parties other than the INC and BJP, there do not seem to be any spillover effects.

Figure 1.3 thus proceeds to reproduce the graphs discussed above for the pooled sample of INC and BJP. As is evident, there is a sizable discontinuity at the cutoff – barely winning an AC reduces a national party’s local Lok Sabha vote share in that AC by about 2.2 percentage points. In other words, on average, the incumbent MLAs of a national party hurt its performance in the local area in the national parliamentary elections.

Table 1.1 reports estimates of the spillover effect β from estimations of equation (1.4.4) over different bandwidths for the case of a linear polynomial in the running variable (i.e., $n = 1$ in (1.4.5)). Column 1 reports estimates from my preferred specification – a linear polynomial and the IK bandwidth. The numbers reported in column 2 correspond to the jumps depicted in the graphs. Column 3 uses the default MSE-optimal bandwidth selector detailed in Calonico et al. (2016) and is reported as a robustness check. Consistent with Figures 1.2 and 1.3, the estimates indicate a robust negative spillover from state to national elections for the Congress and BJP. The estimate appears robust to the choice of bandwidth. For either the BJP or the Congress, having a local legislator in an AC reduces vote share in that AC in a Lok Sabha election by about 2.1 percentage points.

1.5.2 Informativeness of state legislators

As mentioned in Section 1.2, it is possible that voters in a state constituency infer, in some part, the quality of a party, and thus its candidates for the national parliament, through exposure to the party’s local legislator. If the information that local legislators provide is distinctly decision-relevant, over and above the information that looking at the MP for that region may provide, then the spillover effect seen in Figure 1.3 should persist even when the sample is restricted to state electoral races of candidates from the party of the incumbent member of parliament. Formally, suppose t_0 and t_2 are the dates of two consecutive national elections, with $t_0 < t_2$. Let $t_1 \in [t_0, t_2)$ be the date of the most recent state election in

constituencies $S_1, S_2, \dots, S_n$. Let L be the national parliamentary constituency that comprises $S_1, S_2, \dots, S_n$. Suppose party p won L at t_0 and is thus the incumbent party at the time of the national election at t_2 . Then, for the purposes of estimating spillover effects, the sample at t_1 is restricted to candidates of p in $S_1, S_2, \dots, S_n$. The idea is to test whether state electoral outcomes of p at t_1 continue to affect its national vote shares even when the electorate is exposed to p 's MP. If so, it would theoretically suggest that, at least to some extent, voters think of a political party as a cohesive whole, ascribing an estimate of the overall reputation of the party to all its members and updating this estimated reputation upon exposure to the party's local state legislators.

Figure 1.4 confirms that the robust, negative spillover effect reported for the INC and BJP in Section 1.5.1 persists even in the present case. The AC level national vote share of the incumbent party in the PC is lower if the party had also barely won instead of lost the AC in the preceding state election. Table 1.2 reports local linear regression estimates of equation (1.4.4). Column 1 reports the preferred specification. The AC level vote share of a party in the PC election reduces by 2.7 percentage points when it is incumbent in the PC and also barely wins instead of loses the previous AC election.

The “Modi Wave” in 2014

In the national elections in 2009, the Congress, having won 209 of the 543 seats in the Lok Sabha, came to power at the center, leading a coalition called the United Progressive Alliance (UPA). In the period 2009-2014, the UPA, and thus the Congress, was beset with a host of problems, such as the Anna Hazare anti-corruption movement and the scam in the allocation of 2G spectrum. To gauge the extent to which the Congress was losing ground, consider the 2013 state assembly elections in Delhi. The Congress had ruled Delhi for 15 years, a full three terms of office. But the results of the 2013 elections portended trouble for the Congress. It managed to claim a mere 8 of the 70 seats in the legislative assembly, down from the 43 seats it had won in 2008.

Narendra Modi led the BJP’s campaign for the 2014 national elections. The BJP won 282 of the 543 seats in the Lok Sabha, becoming the first party since 1984 to win a majority all by itself. Modi took over as Prime Minister. Many commentators referred to this groundswell of popular support for the BJP as the “Modi Wave” (Chhibber and Verma, 2014; Gowen and Lakshmi, 2014). Modi promised change, a new polity of inclusive development (with such slogans as “*sabka saath, sabka vikaas*,” roughly translated as “with the support of all, all shall prosper”). The electorate’s disappointment with the Congress, which had been in power at the center for two full terms, seemed widespread. Its leadership “looked ineffective and directionless” (Shastri and Syal, 2014).

If local state legislators of a party provide decision-relevant information on party quality, then the analysis so far suggests that this information is usually unfavorable or disappointing. As such, even though there was widespread support for the BJP in the 2014 national elections, we may still expect the BJP to do better in ACs that it barely lost instead of won in earlier state elections. Voters who had not been exposed to the BJP at the local level may have shown greater enthusiasm for the new polity it promised. However, since voter discontent with the Congress was mostly uniform, it is unlikely that local legislators of the Congress would have provided information any more disappointing or upsetting than what was already widely known. As such, we shouldn’t find a differential response to the Congress across ACs that it barely won or barely lost.

Figure 1.5 confirms this. The sample for this figure was constructed by matching all state elections that took place (strictly) between the national elections of 2009 and 2014 to the national election of 2014. First, note that the linear polynomial that plots the predicted values of the outcome variable for the BJP is entirely above that for the Congress. This is consistent with the BJP doing uniformly better than the Congress. Second, the BJP indeed fared better in ACs that it had barely lost instead of won; there is no such differential effect for the Congress. Table 1.3 provides regression estimates of this effect (β), using equation (1.4.4) and a linear polynomial. Though there is some variation across bandwidths

in the estimated effect for the BJP, it is robustly negative. The corresponding effect for the Congress is found to be robustly null.

1.5.3 Running decisions of parties

To estimate equation (1.4.4), the margin of victory of a party in an AC must be matched to its vote share in that AC in a subsequent PC election. Therefore, it is important that this matching process not differ systematically across the cutoff of zero margin of victory. If there is a systematic difference in the decision of a party to contest the national election in a PC when it barely wins instead of loses any of the constituent ACs of that PC, then the estimates of β from equation (1.4.4) would be biased.

Intuitively, however, this should not prove to be a problem. It is unlikely that a party's decision to contest an election in a large, national constituency L varies systematically with close elections in any of the state constituencies $\{S_i\}_{i=1}^n$ that make it up. Even though it is possible that winning or losing a large subset of $\{S_i\}_{i=1}^n$ may have some bearing on the decision to contest in L , it is unlikely that such profiles of victories or losses across ACs are systematically related to instances of close elections in the ACs.

To check this, I estimate, in a manner analogous to equation (1.4.4):

$$\begin{aligned} contest_{ipt_1} &= \gamma \mathbf{1}\{ac_perc_margin_{ipt_0} \geq 0\} + \\ &\quad f^1(ac_perc_margin_{ipt_0}) + \epsilon_{ipt_1} \end{aligned} \tag{1.5.1}$$

where $f^1(\cdot)$ is as defined in (1.4.5), p denotes a party, i denotes a state assembly constituency S_i and $contest_{ipt_1} \equiv \mathbf{1}\{p \text{ contested } L(i)\}$, where $L(i)$ is the national parliamentary constituency that contains S_i .

Table 1.4 reports estimates of equation (1.5.1) for the main samples used in the preceding analysis. As is clear, there is no significant estimate anywhere in the table. It can therefore

be concluded that the decisions of parties to run in the national elections do not vary systematically across the cutoff in the running variable in the spillover regressions.

1.5.4 Baseline covariates

As discussed in Section 1.4, if the identification assumption holds, then, in a neighborhood of the RD cutoff $(-h, h)$, the distribution of baseline covariates, determined *prior* to the realization of the exact vote count in a state constituency, will be the same among winners and losers. In other words, a discontinuity at the RD cutoff in any predetermined covariate would be a threat to the validity of the RD design. If a covariate is determined prior to the assignment of treatment status, and if treatment status is indeed randomized in a neighborhood of the RD cutoff, then the distribution of the covariate should vary smoothly (continuously) across the cutoff.

To empirically check this consequence of the local randomization assumption, I examine the distribution of six baseline covariates – the age, sex (indicator for female) and category of the candidate in the state constituency, an indicator for whether the candidate belongs to the Congress party, the number of eligible voters in the state constituency, and the reservation status of the state constituency.¹¹ These baseline covariates are already determined at the time at which voters cast their votes in the state election. The estimation framework is given by equation (1.4.4), where, in place of the local Lok Sabha vote share, the outcome variable is now any of the baseline covariates. The sample for the regressions is the same as the primary sample for the analysis of spillover effects – the BJP and Congress for all years in the data, as in the third row of Table 1.1.

Table 1.5 presents the results of the regressions. As is clear, there is no significant coefficient anywhere in the table, strong evidence consistent with the local randomization

¹¹The “category” of the candidate is an indicator for whether the candidate belongs to one of the historically disadvantaged groups mentioned in Footnote 8. Likewise, “reservation status” is an indicator for whether the state constituency was reserved for candidates from these groups.

assumption. Predetermined baseline covariates seem to be nicely balanced on either side of the cutoff in a neighborhood of the cutoff.

1.5.5 Direct incumbency effects

In this section, I look at incumbency effects in a particular type of constituency – state or national – over time. The purpose here is to see how voters respond to a party at a given tier of government. For instance, if voters are, on average, disappointed with state legislators, then we should see a negative incumbency effect at the level of state constituencies. This would help shed light on the spillover effects reported earlier.

To study such direct incumbency effects, I estimate the equation:

$$\begin{aligned} outcome_{ip,t+1} = & \beta \mathbf{1}\{victory_margin_{ipt}\} + \\ & f^1(victory_margin_{ipt}) + \epsilon_{ip,t+1} \end{aligned} \quad (1.5.2)$$

where $f^1(\cdot)$ is a fully interacted linear polynomial in the running variable, as defined in (1.4.5), i denotes a state or national constituency, t and $t + 1$ are the dates of two consecutive elections in constituency i , p denotes a party and $victory_margin_{ipt}$ is the percentage margin of victory of party p in constituency i at time t . In other words, if p wins, then $victory_margin_{ipt}$ is the vote share of p minus the vote share of the party that finishes second, and if p loses, then it is the vote share of p minus the vote share of the party that wins; this is just like the measure defined previously in (1.4.2). The outcome referred to in the variable $outcome_{ip,t+1}$ may be any of the following three – vote share of party p in the election in i at $t + 1$, an indicator for whether party p wins i at $t + 1$, and an indicator for whether party p contests the election in i at $t + 1$. It is assumed throughout that a party loses an election if it does not contest it (i.e., there is no sample selection on the decision to contest an election). Throughout, I estimate regressions restricting the sample to the BJP and INC.

Figure 1.6 shows that there is a sizable anti-incumbency effect for the national parties in state elections. Figure 1.6(a) shows that a party's vote share in an AC is 4 percentage points lower at $t + 1$ if it barely wins instead of loses that AC at t . More importantly, since what matters here is whether a party actually manages to win the constituency in question, Figure 1.6(b) shows that barely winning an AC at t reduces a party's chances of reelection in that AC at $t + 1$ by around 18 percentage points. Lastly, Figure 1.8(a) shows that a party is more likely to re-contest if it is incumbent. A party that barely wins an AC is around 2 percentage points more likely to run in it again in the next election. Table 1.6 reports estimates of β from equation (1.5.2). As is clear, the effects discussed in the context of Figures 1.6 and 1.8(a) are robust to choice of bandwidth.

Note that the running variable in the analysis of incumbency effects in state legislatures is the same as that in the analysis of spillovers from state to national elections. In particular, the results in Figure 1.6 and Table 1.6 may be interpreted as follows. Suppose a party barely wins a state election in state constituency S at time t . Then, not only does the party suffer an anti-incumbency effect in the state election in S at time $t + 1$ but also in the national election in the national constituency L at time $t' \in [t, t + 1)$, where L contains S . Both effects – the direct effect in the state legislature and the spillover effect in the national election – stem from precisely the same electoral result, i.e., the narrow victory in S in the state election at time t .

The results for national elections are markedly different. As can be seen in Figure 1.7, there is no evidence of any anti-incumbency effect for the BJP and INC in national elections. The vote share or probability of victory at $t + 1$ of a party that barely wins at t is no different from that of a party that barely loses. Figure 1.8(b) shows that a party that barely wins a PC is around 7 percentage points more likely to re-contest that PC than a party that barely loses. Even though a barely incumbent party is more likely to run again in the next election, it does not seem to enjoy any electoral advantage. Consistent with the graphical

analysis, Table 1.7 shows that there is no evidence of any incumbency effect in national constituencies.¹²

The preceding analysis is consistent with voter disappointment with state legislators. Even though there is no evidence of any direct incumbency effect for national constituencies, consistent disappointment with state legislators seems to have spillover effects in national elections, as seen in earlier sections. Both the direct anti-incumbency effect in state legislatures and the negative spillover effect from state to national elections seem to be driven primarily by the experience of the electorate in the local area.

1.6 Conclusion

In this paper, I ask whether the incumbency status of a party in a state constituency has spillover effects in the national elections. I study this question in the context of state and national elections in India. I use a regression discontinuity design, matching the margin of victory of a party in elections in state constituencies $\{S_i\}_{i=1}^n$ to local S_i -level vote shares of that party in the election in the national constituency L that is comprised of $\{S_i\}_{i=1}^n$. Focusing on the two main national parties, the Congress and the BJP, I find a robust negative spillover effect. A party that barely wins instead of loses in a state constituency in a state election has a lower local vote share in that constituency in the national election. This negative spillover effect persists even when I restrict attention to state-level candidates from the party of the MP incumbent in the national constituency. I also find a robust negative incumbency effect in elections in state legislatures, though I find no incumbency effect in elections to the national parliament.

¹²The estimate of β from equation (1.5.2) for the outcome of period $t + 1$ vote share is statistically significant, with a p -value of 0.045, when estimated over the MSE-optimal bandwidth. While the magnitude of the coefficient is quite close to that of the statistically *insignificant* point estimates obtained with the optimal IK and 0.1 bandwidths, the standard error computed by the MSE-optimal routine is smaller. Broadly, the first row of Table 1.7 makes it clear that the estimated effect for period $t + 1$ vote share is not robust.

The findings in this paper thus suggest that voters gain decision-relevant information from the local state legislators of a party, over and above anything they may learn through direct exposure to the national-level legislators of that party, and use that information to form or update an estimate of the overall quality of the party. This, in turn, has some bearing on the way voters vote for that party in the national elections. On average, it seems that voters are disappointed with local legislators, expressing such disappointment against the parties of those legislators in both state and national elections.

This paper provides evidence on the salience of parties in multi-party electoral systems. Furthermore, in contrast to the usual incumbency effects studied in the literature for a given level of government, this paper demonstrates a novel channel – that of local to national spillovers – through which a party-level incumbency effect might operate, suggesting that voter behavior in elections to different levels of a multi-level government may be interdependent.

With data on local public works or on other related measures of the quality of local governance, it would be possible to relate the notion of voter disappointment put forth in this paper to a more concrete conception of the performance of state legislators. It may also be interesting to study whether such spillover effects also operate through political alliances, with voters holding a national-level political party accountable for the performance of its regional ally. I leave the analysis of such questions to future work.

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Appendix

1.A Figures

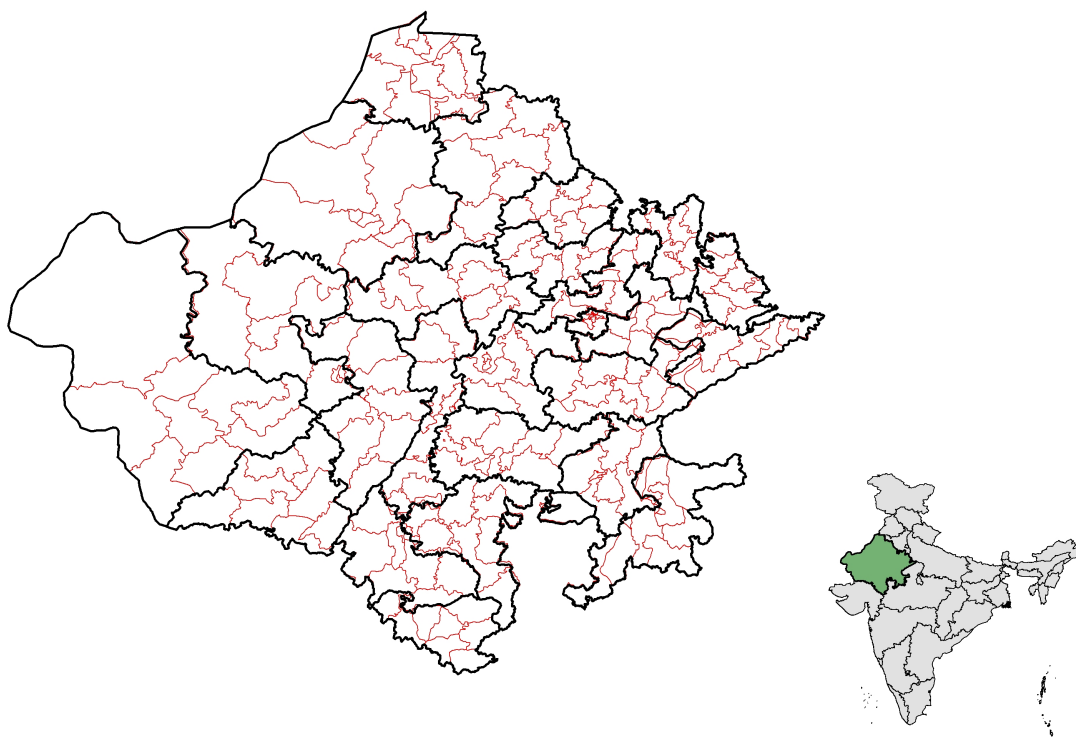


Figure 1.1: Organization of State and National Electoral Constituencies

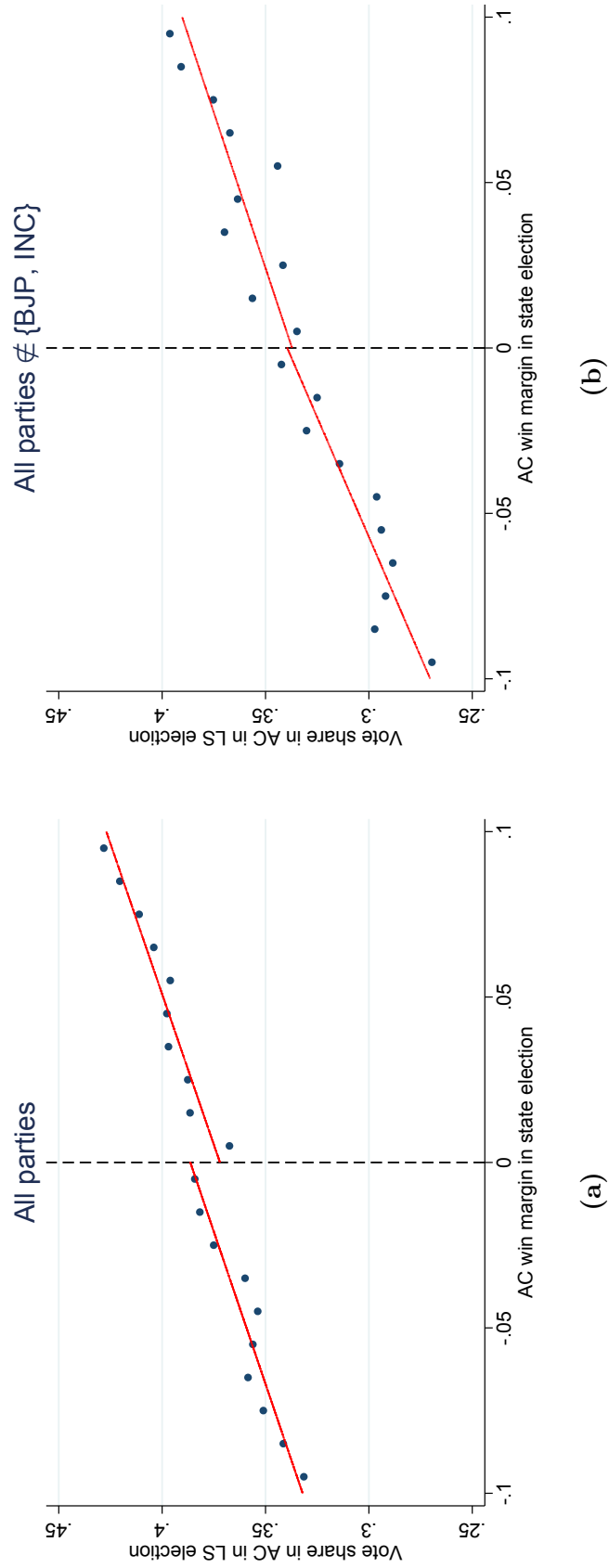


Figure 1.2: Spillover effects – looking at the effect of dropping INC and BJP from the universe of parties

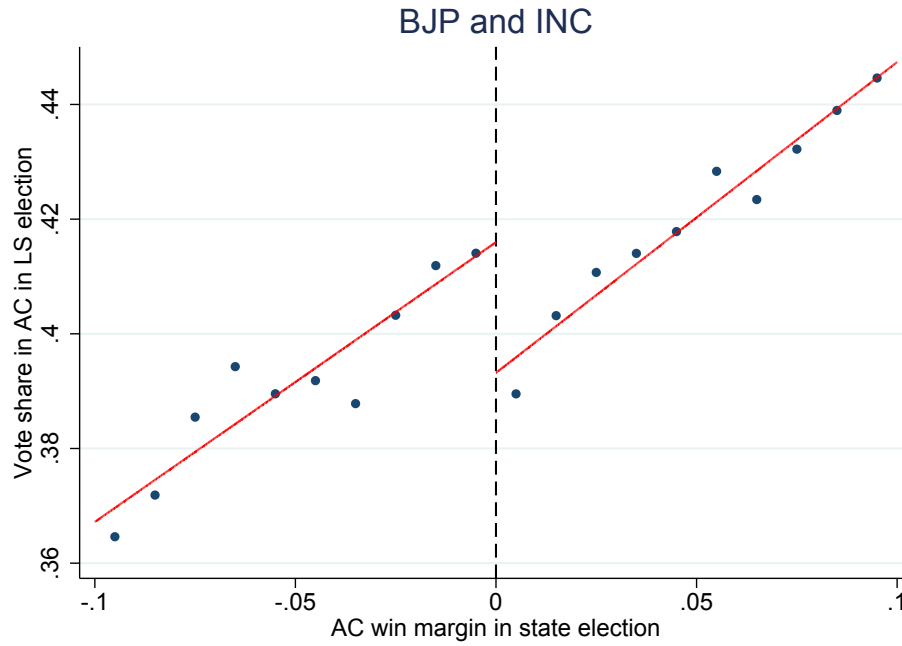


Figure 1.3: State to national spillover effect for the two main national parties, INC and BJP

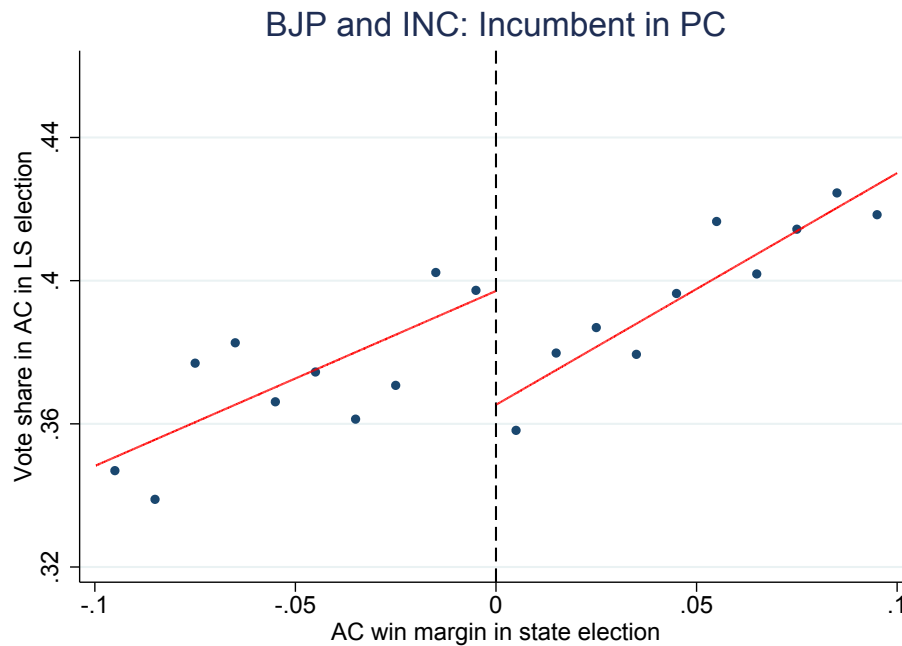


Figure 1.4: Spillover effects when party incumbent in PC

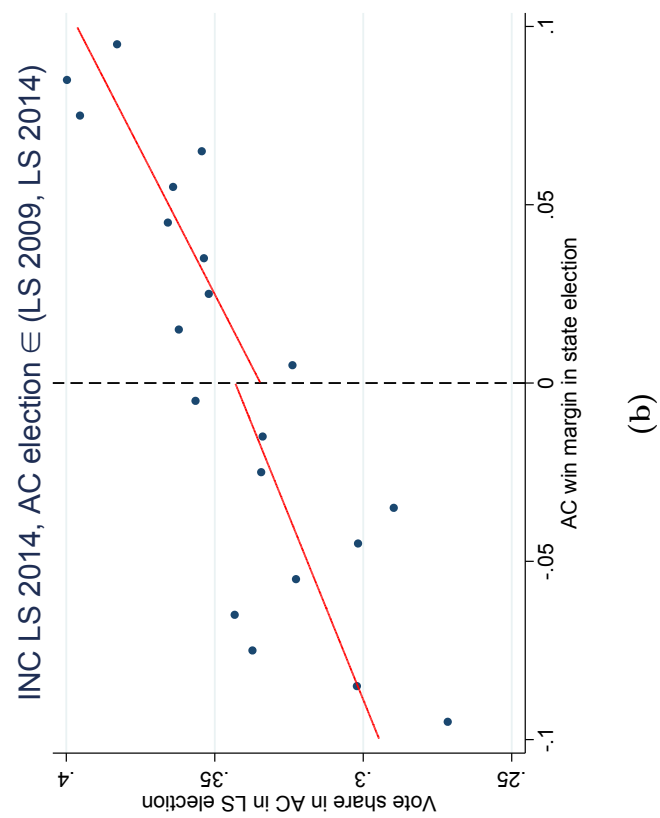
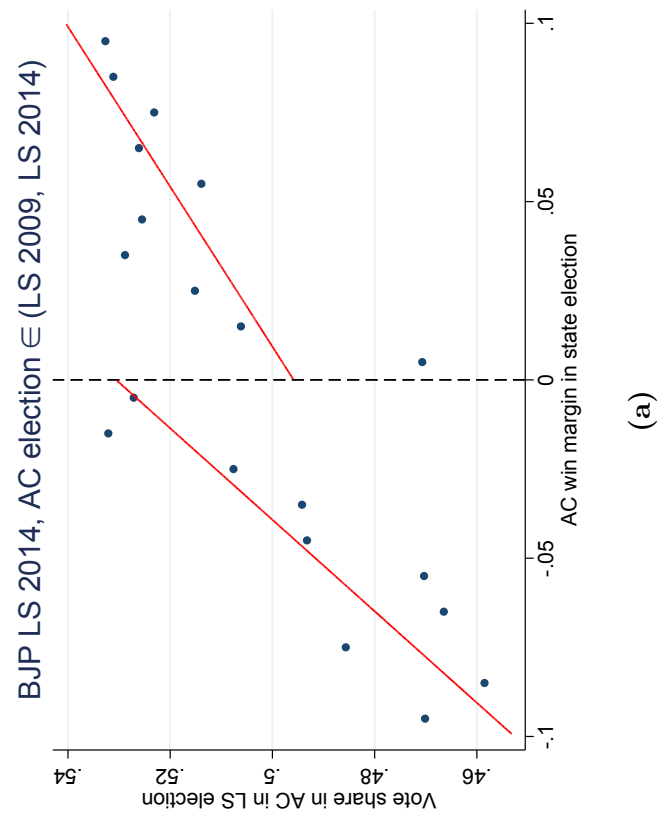


Figure 1.5: Spillover effects in the context of the “Modi Wave”

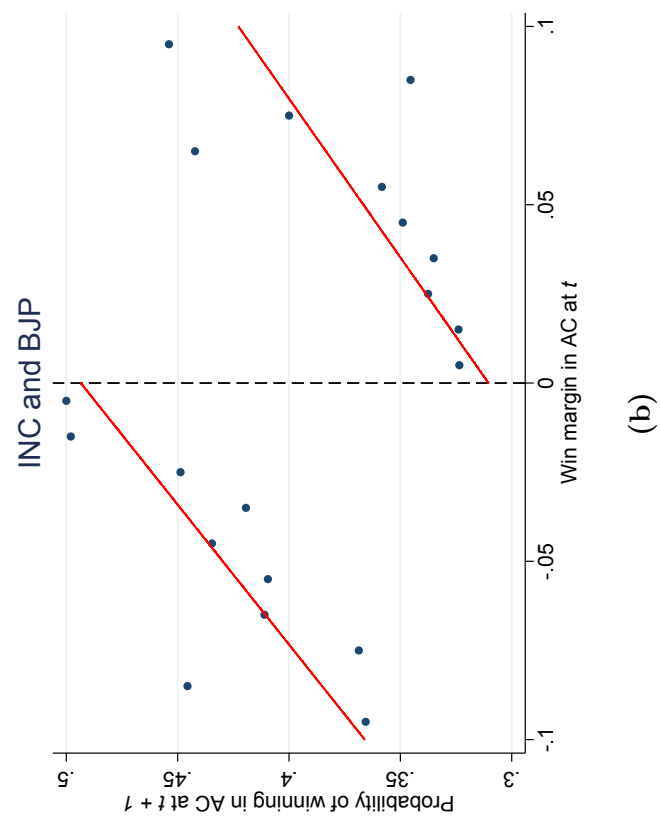
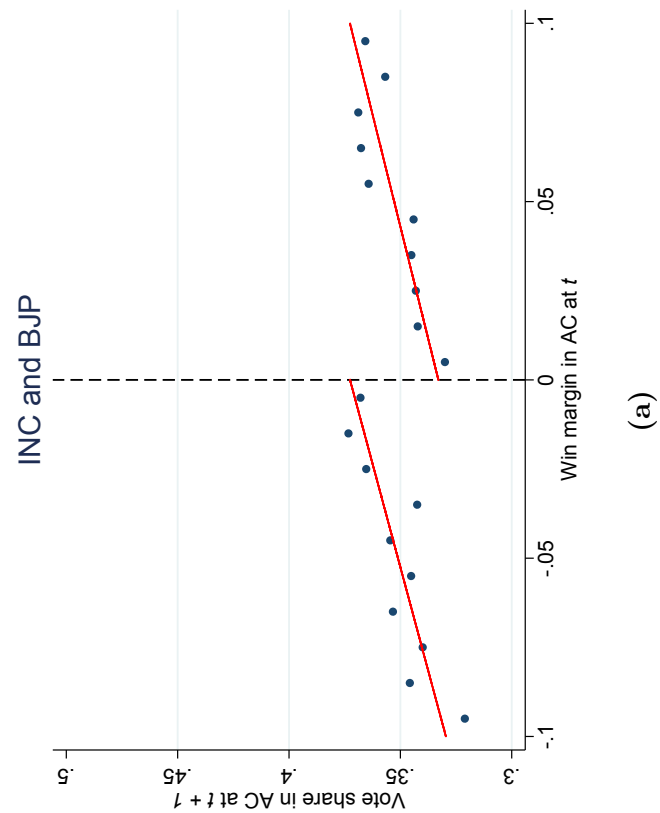


Figure 1.6: Incumbency effect in state constituencies

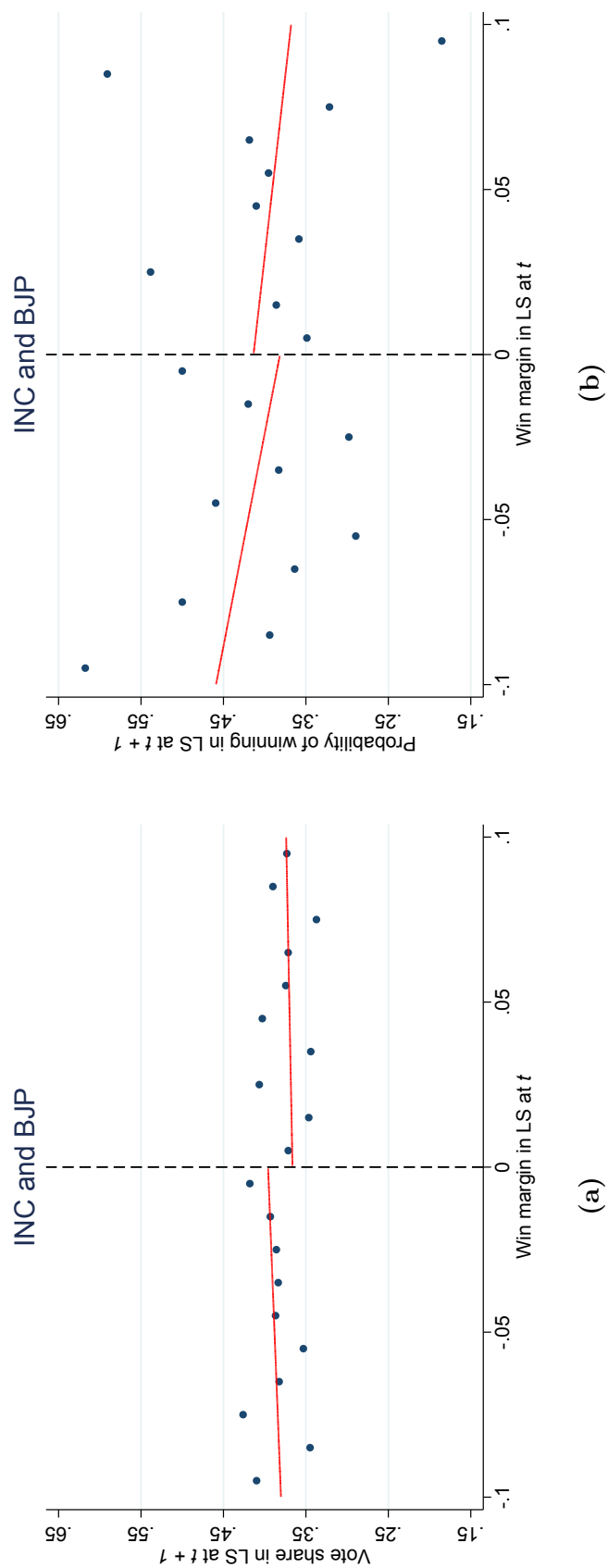


Figure 1.7: Incumbency effect in Lok Sabha (i.e., national) constituencies

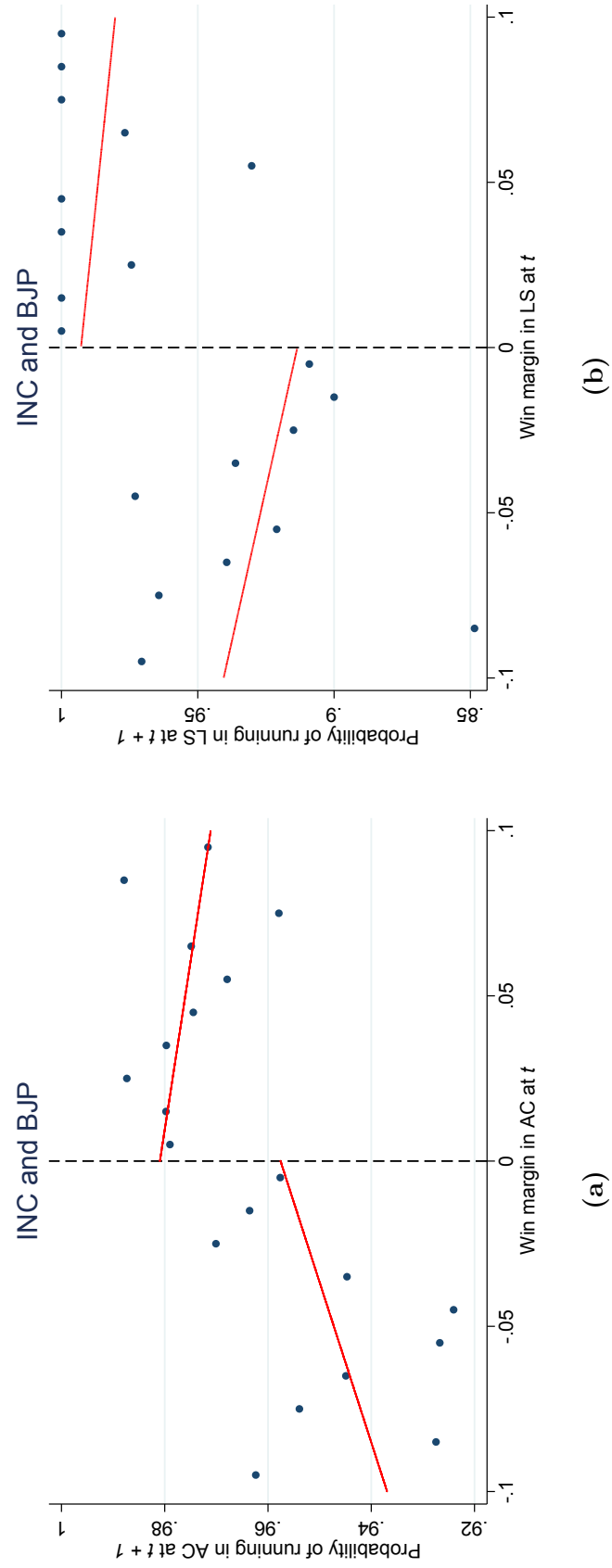


Figure 1.8: Decision to re-contest a constituency

1.B Tables

Table 1.1: Spillover effects

Bandwidth:	Optimal IK (1)	0.1 (2)	MSE-Optimal (3)
All parties	-0.0141** (0.0059) [$N = 9,429$]	-0.0143** (0.0060) [$N = 9,286$]	-0.0114 (0.0079) [$N = 7,003$]
All parties $\notin$ {BJP, INC}	-0.0021 (0.0089) [$N = 4,534$]	-0.0024 (0.0108) [$N = 3,445$]	-0.0058 (0.0136) [$N = 3,335$]
INC and BJP	-0.0212*** (0.0075) [$N = 5,006$]	-0.0228*** (0.0070) [$N = 5,841$]	-0.0191** (0.0090) [$N = 4,674$]

Notes— Each column reports an estimate of an RD discontinuity from a local linear polynomial regression. Column headings state the bandwidth used and row headings describe the relevant sample on which the regression is estimated. Standard errors are clustered at the level of PC-state election year and reported in parentheses. The number of observations for each regression is reported in brackets.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 1.2: Spillover effects – party incumbent in PC

Bandwidth:	Optimal IK (1)	0.1 (2)	MSE-Optimal (3)
INC and BJP, incumbent in PC	-0.0269*** (0.0105) [$N = 2,462$]	-0.0318*** (0.0116) [$N = 1,920$]	-0.0290* (0.0169) [$N = 1,638$]

Notes— Each column reports an estimate of an RD discontinuity from a local linear polynomial regression. Column headings state the bandwidth used and row headings describe the relevant sample on which the regression is estimated. Standard errors are clustered at the level of PC-state election year and reported in parentheses. The number of observations for each regression is reported in brackets.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 1.3: Spillover effects – “Modi Wave”

Bandwidth:	Optimal IK (1)	0.1 (2)	MSE-Optimal (3)
BJP, LS 2014	-0.0228* (0.0119) [$N = 1,065$]	-0.0347*** (0.0128) [$N = 756$]	-0.0320** (0.0129) [$N = 854$]
INC, LS 2014	0.0016 (0.0123) [$N = 1,447$]	-0.0085 (0.0139) [$N = 1,108$]	-0.0069 (0.0159) [$N = 1,164$]

Notes— Each column reports an estimate of an RD discontinuity from a local linear polynomial regression. Column headings state the bandwidth used and row headings describe the relevant sample on which the regression is estimated. The sample here consists of all state elections that took place (strictly) between the 2009 and 2014 national elections, matched to AC level vote shares in the 2014 national election. Standard errors are clustered at the level of PC-state election year and reported in parentheses. The number of observations for each regression is reported in brackets.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 1.4: Decision to run in PC

Bandwidth:	Optimal IK (1)	0.1 (2)	MSE-Optimal (3)
All parties	0.0152 (0.0121) [$N = 14,193$]	0.0096 (0.0137) [$N = 11,290$]	0.0027 (0.0195) [$N = 9,567$]
INC and BJP	-0.0009 (0.0119) [$N = 7,421$]	0.0010 (0.0129) [$N = 6,253$]	-0.0007 (0.0166) [$N = 7,199$]
BJP, LS 2014	-0.0021 (0.0225) [$N = 1,509$]	-0.0261 (0.0308) [$N = 794$]	-0.0259 (0.0306) [$N = 863$]
INC, LS 2014	-0.0281 (0.0232) [$N = 1,232$]	-0.0350 (0.0252) [$N = 1,177$]	-0.0350 ^a (0.0298) [$N = 1,177$]

Notes— Each column reports an estimate of an RD discontinuity from a local linear polynomial regression. Column headings state the bandwidth used and row headings describe the relevant sample on which the regression is estimated. The “LS 2014” sample consists of all state elections that took place (strictly) between the 2009 and 2014 national elections, matched to decisions to run in the 2014 national election. Standard errors are clustered at the level of PC-state election year and reported in parentheses. The number of observations for each regression is reported in brackets.

^a Incidentally, the MSE-optimal bandwidth in this case is also ≈ 0.1 , though the SE is different since it is computed differently.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 1.5: Distribution of baseline covariates across RD cutoff

Bandwidth:	Optimal IK (1)	0.1 (2)	MSE-Optimal (3)
Candidate age	0.6544 (0.8764) [$N = 2,074$]	0.6404 (0.8518) [$N = 2,140$]	0.5860 (0.9631) [$N = 1,868$]
$\mathbf{1}\{\text{candidate is female}\}$	0.0111 (0.0215) [$N = 2,772$]	0.0207 (0.0238) [$N = 2,140$]	0.0125 (0.0235) [$N = 2,284$]
$\mathbf{1}\{\text{candidate} \in \{\text{SC,ST}\}\}$	0.0203 (0.0266) [$N = 2,622$]	0.0090 (0.0299) [$N = 2,140$]	0.0141 (0.0434) [$N = 2,085$]
$\mathbf{1}\{\text{candidate from INC}\}$	0.0177 (0.0262) [$N = 8,385$]	0.0214 (0.0312) [$N = 5,841$]	0.0206 (0.0277) [$N = 5,713$]
Total eligible voters in AC	2121.2314 (2426.1859) [$N = 7,762$]	2932.4112 (2561.9021) [$N = 5,841$]	3325.7362 (4749.9579) [$N = 6,466$]
$\mathbf{1}\{\text{AC reserved}\}$	-0.0058 (0.0138) [$N = 7,281$]	-0.0111 (0.0150) [$N = 5,841$]	-0.0120 (0.0270) [$N = 5,725$]

Notes— Each column reports an estimate of an RD discontinuity from a local linear polynomial regression. Column headings state the bandwidth used and row headings state the baseline covariate used as the outcome variable for the regression. Standard errors are clustered at the level of PC-state election year and reported in parentheses. The number of observations for each regression is reported in brackets. The number of observations for the regression for a given baseline covariate may differ from the number in the third row of Table 1.1, since the data on the baseline covariate may only be available for a subset of state election years and the optimal IK and MSE bandwidths for the regression here may differ. The sample comprises the BJP and INC for all years in the data.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 1.6: Incumbency effects and running decisions in state constituencies

Bandwidth:	Optimal IK (1)	0.1 (2)	MSE-Optimal (3)
Vote share at $t + 1$	-0.0403*** (0.0070) [$N = 5,753$]	-0.0397*** (0.0085) [$N = 4,106$]	-0.0392*** (0.0090) [$N = 3,859$]
Probability of winning at $t + 1$	-0.1883*** (0.0335) [$N = 4,499$]	-0.1831*** (0.0346) [$N = 4,271$]	-0.2073*** (0.0254) [$N = 5,241$]
Probability of running at $t + 1^a$	0.0219** (0.0103) [$N = 4,292$]	0.0234** (0.0103) [$N = 4,271$]	0.0231** (0.0104) [$N = 4,261$]

Notes— Each column reports an estimate of an RD discontinuity from a local linear polynomial regression. Column headings state the bandwidth used. Row headings describe the outcome variable. The sample comprises all state elections that took place in the period 1998-2014. The parties in the sample are BJP and INC. The running variable is the margin of victory in the constituency at time t . Standard errors are clustered at the level of the state constituency (AC) and reported in parentheses. The number of observations for each regression is reported in brackets.

^a The optimal IK bandwidth and MSE-optimal bandwidth are both ≈ 0.1 for this outcome variable.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 1.7: Incumbency effects and running decisions in national constituencies

Bandwidth:	Optimal IK (1)	0.1 (2)	MSE-Optimal (3)
Vote share at $t + 1$	-0.0301 (0.0211) [$N = 657$]	-0.0296 (0.0194) [$N = 751$]	-0.0359** (0.0180) [$N = 860$]
Probability of winning at $t + 1$	-0.0083 (0.0827) [$N = 744$]	0.0321 (0.0802) [$N = 785$]	-0.0263 (0.0685) [$N = 719$]
Probability of running at $t + 1$	0.0721*** (0.0258) [$N = 851$]	0.0794*** (0.0269) [$N = 785$]	0.1054*** (0.0317) [$N = 637$]

Notes— Each column reports an estimate of an RD discontinuity from a local linear polynomial regression. Column headings state the bandwidth used. Row headings describe the outcome variable. The sample consists of four national elections – 1999, 2004, 2009 and 2014. The parties in the sample are BJP and INC. The running variable is the margin of victory in the constituency at time t . Standard errors are clustered at the level of the national constituency (PC) and reported in parentheses. The number of observations for each regression is reported in brackets.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

1.C Dealing with new states and delimitation

As discussed in Section 1.3, I describe below how I deal with two important events that are relevant to the period of analysis in this paper.

1. **New states created in 2000.** The boundaries of state assembly constituencies in the geographical area comprising the undivided states of Bihar and Madhya Pradesh were not changed. Prior to the creation of Chhattisgarh, Madhya Pradesh had 320 assembly constituencies. After the breakup, 90 constituencies were allotted to Chhattisgarh and the remaining 230 were left with Madhya Pradesh. Similarly, prior to its breakup, undivided Bihar had 324 assembly constituencies; of these, 81 were broken away to form the state of Jharkhand, leaving Bihar with 243. The earliest state assembly elections in the data for both Bihar and Madhya Pradesh were held at a time when the two states were still undivided – the year 2000 for Bihar and 1998 for Madhya Pradesh. However, since boundaries of state assembly constituencies did not change, I match the constituencies over time as usual, as if the states were partitioned throughout the sample period. Similarly, if the assembly constituencies comprising a Lok Sabha constituency in these states did not change, the Lok Sabha constituency was matched over time as usual; if the composition of the Lok Sabha constituency did change, then it was not matched to observations in the post-breakup period.

The treatment of the breakup of Uttar Pradesh is different. Prior to its breakup, Uttar Pradesh had 425 assembly constituencies; 22 of these were broken off to form Uttarakhand. Subsequently, the number of seats in the Uttarakhand assembly was increased to 70. Since the earliest state elections in the data for both Uttarakhand and Uttar Pradesh are those held in 2002, the redistricting of assembly constituencies is not relevant. However, Uttar Pradesh was undivided at the time of the 1999 Lok Sabha election. Thus, parliamentary constituencies in the Uttarakhand region of undivided Uttar Pradesh are dropped for the 1999 Lok Sabha election.

2. **Delimitation in 2008.** The delimitation exercise that was completed in 2008 was the first since the one completed in 1975. The purpose of the exercise was to redraw the boundaries of constituencies in accordance with changes in population figures. Delimitation was not carried out in six states – Arunachal Pradesh, Assam, Jammu and Kashmir, Jharkhand, Manipur and Nagaland. Therefore, the boundaries of assembly and parliamentary constituencies do not change in these six states for the entire sample period. For the rest of the states, constituencies are matched separately for the period before and the period after delimitation. For instance, there are four state election years for Haryana in the data – 2000, 2005, 2009 and 2014. Constituencies in 2000 are matched to those in 2005 and constituencies in 2009 to those in 2014. However, constituencies in 2005 are not matched to those in 2009.

Chapter 2

Whom are you doing a favor to?

Political alignment and the allocation
of public servants^{*}

2.1 Introduction

Decentralization in nation states has created governments at multiple tiers, from federal to state and further down to local districts and below. As a consequence, upper levels of government, such as federal and state, often need to decide how resources must be allocated to local governments for various purposes – development, administrative functions, law and order, and so forth. This is particularly the case in developing countries, where local governments lack the capacity to generate their own resources and, therefore, must rely heavily on the decisions and support of governments at higher levels. This creates an

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opportunity for the higher level governments to discriminate among local units for political gains. Several papers, in fact, do find that local governments are allocated more resources if they are politically aligned with the higher level government, i.e., if the same political party controls the governments at both levels (see, for example, Solé-Ollé and Sorribas-Navarro (2008) for evidence from Spain, Arulampalam et al. (2009) and Khemani (2003) for evidence from India, Worthington and Dollery (1998) for evidence from Australia, and Grossman (1994) and Levitt and Snyder (1995) for evidence from the US). All the papers in this literature on political alignment, however, share two common features – they focus on discrimination in the allocation of financial resources (e.g., tax revenues) and, in most cases, find that alignment leads to positive discrimination.¹

In this paper, we ask whether such positive discrimination creates differential rent-seeking incentives for politicians in aligned and non-aligned local units and whether the government at the higher tier is able to control or influence such incentives. The reason this is important is that if equilibrium rent-seeking turns out to be different in aligned and non-aligned units, then our understanding of the consequences of political alignment would be incomplete, if not incorrect, if we ignore such rent-seeking. To study this problem, we depart from the broad conceptual framework of the existing literature on political alignment in an important way. We argue that, apart from the allocation of financial resources, the allocation of *human resources*, e.g., police officers – our main focus – and also other administrative bureaucrats, across districts is a key means through which a higher level government can affect the welfare of local units. It is not enough to simply look at the fiscal advantages of aligned districts at the cost of ignoring how such advantages change the incentives of local politicians to seek rent. Moreover, we also study how the quality or efficiency of human resources may impose constraints on the government at the higher tier as it strategically allocates personnel across local units.

¹Arulampalam et al. (2009) make a distinction between swing and non-swing units, among aligned ones, to show that positive discrimination occurs only for the swing units. We discuss this point in our context later.

To formalize our ideas, we build a dynamic model and test its predictions in the context of state and district governments in India. We argue that, in response to the rent-seeking efforts of politicians in local districts, the state government deploys police officers of varying ability to check such rent-seeking. Any assignment of police officers across districts, however, must take into account differences in the incentives of local politicians in aligned and non-aligned districts. At the same time, local district politicians must not only think of the contemporaneous benefits of rent-seeking but also of how such rent-seeking may have a bearing on the reelection of the state government (e.g., by worsening the economic situation) and, thus, on the district's future alignment status and payoffs.

We incorporate the findings of the literature by assuming that aligned districts have an exogenous reelection advantage over non-aligned districts, perhaps due to higher fiscal transfers. Importantly, we do not model aligned and non-aligned districts as providing differential benefits to the state government. The state government would ideally not want anyone to seek any rent. This permits a transparent focus on the rent-seeking behavior of district politicians and the state government's efforts to check such behavior through the assignment of police officers. However, not all police officers at the disposal of the state government are equally skilled at checking rent-seeking behavior. Some are good and others are bad but each one must be assigned to some district. In every period, the state government assigns police officers across districts to maximize its reelection probability and local politicians choose rent-seeking efforts to maximize their lifetime payoffs. The number of districts and police officers are discrete, making this a discrete optimization problem. We look at mixed strategies of the state government to make this a continuous problem and solve it tractably. Our key finding is that, even though the state government does not treat rent-seeking in aligned and non-aligned districts differently, it assigns lower quality police officers to aligned districts and, consequently, rent-seeking in aligned districts is higher.

The reason we obtain this result is as follows. Suppose we begin with the assumption that the continuation payoff of an aligned district is higher than that of a non-aligned district.

One reason why this may be so is that the politician in an aligned district is reelected with higher probability and, therefore, has a higher effective discount factor (i.e., cares more about future payoff). In this situation, a politician in an aligned district prefers to get the incumbent state government reelected to maintain the district’s alignment status. On the other hand, a politician in a non-aligned district has exactly the opposite incentive and would prefer that the state government’s reelection bid be unsuccessful. Hence, *ceteris paribus*, politicians in non-aligned districts have *greater* incentives to seek rent. In response to the asymmetric incentives of politicians in the two types of districts, the state government assigns high quality police officers to non-aligned districts with a higher probability. In equilibrium, even though rent-seeking *efforts* are the same across districts, politicians in aligned districts enjoy higher rents – the marginal return to rent-seeking effort in aligned districts is higher due to the poorer quality police officers posted there. This is also what leads to a higher equilibrium continuation payoff for aligned districts, the assumption we made at the outset.

We argue that the higher level of rent-seeking in aligned districts likely undoes some of the welfare advantages of political alignment – aligned districts, even if assumed to have higher gross economic output, may have lower welfare if much of that output is taken away as rents (see Section 2.2.5). As such, our model also sheds some light on the possible distributional consequences of alignment – if there is indeed a larger pie, who gets it? Thus the title of our paper.

The Indian state of Rajasthan provides the context for our empirical work. We test our model’s predictions by looking at how the political alignment of the state Chief Minister and the chairpersons of district councils relates to police allocation across districts. We focus on the assignment of Superintendents of Police (SPs). An SP is in-charge of the police force of a district. Not only does the SP look after the overall law and order situation in the district but also oversees the registration and investigation of various complaints and criminal offenses,

many of which could potentially be related to rent-seeking behaviors.² Furthermore, as noted earlier, aligned districts tend to enjoy a better allocation of public funds. The key officer in a district responsible for the implementation of public works projects and the overall use of public funds is the District Magistrate (DM). We assume that the allocation of a high quality DM to a district is positively correlated with the quality and efficiency of public works projects. Thus, the pattern of assignment of DMs across districts should be the opposite of that for SPs. Aligned districts should have better quality DMs for the same reason they have higher fiscal transfers. Thus, in our empirical work, we also contrast the assignment patterns of SPs and DMs in relation to the political alignment of districts.

Rajasthan as the choice of state for our study is advantageous for two reasons. Firstly, the political competition in the state is primarily between two major national parties, the Indian National Congress (INC) and the *Bharatiya Janata Party* (BJP), effectively making the political structure a two-party system. This makes the definition of political alignment clear, since we do not have to attend to the potentially time-varying allegiances of smaller regional parties. Secondly, during the period of our study, i.e., 2001-2015, the political control of the state changed in each of the three state assembly elections, alternating between the INC and the BJP. Thus, in our data, we have four state government tenures and three “mechanical” switches in alignment, since the district council (also known as *zila parishad* or ZP) and state assembly elections happen in different years. This gives us many switches for the same district, helping us tease out the role of alignment.

For the purposes of our model and empirical work, we are interested in the alignment status, at every point in time, of each individual district and the state government. We then wish to see how this alignment status is related to outcomes of interest (e.g., personnel transfers). A change in a given alignment status may come about as a result of a state election or elections to district councils. It is possible that a change in alignment that results

²By “rent-seeking behaviors,” we broadly refer to activities that lead to extra-judicial redistribution of resources, either directly (extortion, embezzlement of public funds, theft) or indirectly (violence, intimidation).

from a state election is uncorrelated with conditions (e.g., performance of public servants) in a given local district and, thus, may be thought of as exogenous variation in alignment. However, in line with our model, we confirm in our empirical work that it is not the case that alignment status in state or ZP election years drives our results. As such, when we empirically test the predictions of our model, we do not separate alignment switches in state election years from those in district election years.

For this project, we compile a unique dataset containing local and state election results, complete career histories of administrative bureaucrats and police officers, and measures of crime across districts, spanning a period of 15 years. We find that political alignment *increases* transfers of SPs out of a district; these increased transfers, in turn, are related to an increase in the average crime rate in any district in aligned periods. This is in line with the prediction of our model that police allocations to aligned districts tend to be “worse,” in some sense.³ In the case of DMs, we find that political alignment across tiers reduces the frequency of transfers, making local administration more stable.

We then go on to make a distinction between officers native to Rajasthan and those who are natives of other states but are assigned to serve in Rajasthan. The two types of officers differ in two important ways. Firstly, those who are natives of Rajasthan likely have more and better knowledge of local politics, culture, language, social relations and so on. Secondly, most candidates taking the entrance exams to join the public services show a strong preference to be assigned to their home states. And, as discussed in Section 2.3.3, candidates who rank high in the entrance exams are much more likely to be assigned to their most preferred state.⁴ Therefore, a native of Rajasthan serving in Rajasthan is likely a “better quality” officer, both in terms of knowledge of local conditions and in terms

³In Section 2.2, even though we do not explicitly model differential transfer frequencies, we go on to discuss, as a possible extension of our model, how this could be done. In line with this suggested modeling extension, for our empirical work, we use transfer frequencies as an additional, somewhat indirect, measure of the overall “quality” of police administration in a district.

⁴As Iyer and Mani (2012, p. 725) note, “all else being equal, higher-ranked candidates are more likely to be assigned to their home state... the correlation between the home state dummy and the dummy for an officer being ranked in the top 20% of his cohort is 0.28, which is statistically significant at the 5% level.”

of performance in the qualifying exams, than a native of, say, Karnataka or West Bengal serving in Rajasthan. With this terminology of quality defined, we find that better quality SPs have shorter tenures in aligned districts while poorer quality SPs have longer tenures in aligned districts (the result is the opposite for DMs). This empirical finding is in line with the result of the model that the equilibrium mixed strategy of the higher tier government assigns poorer quality SPs to aligned districts with a higher probability.

In addition to making a contribution to the literature on political alignment discussed above, we also position our work in the emerging literature on the functions of public servants and their interactions with politicians. Iyer and Mani (2012) show that changes in the state chief minister lead to transfers of bureaucrats across posts. Nath (2015) shows that district bureaucrats approve of development projects recommended by a politician faster when the politician is likely to be in office at the time the bureaucrat comes up for promotion. Gulzar and Pasquale (2015) show that the implementation of local public works is better when the responsible bureaucrat answers to a single politician. Khan et al. (2016) and Rasul and Rogger (2016) discuss the role of bureaucratic autonomy and other incentives (e.g., transfers) in motivating performance. While all these papers discuss how politicians might try to control bureaucrats, they do not, as we do, make distinctions among different types of public servants or focus closely on the differing welfare implications of the nature of the allocation of public servants across space.

2.2 Model

We set up a model of a two-tiered governance structure (e.g., a center and a collection of local districts) to study the governance consequences of political alignment. The center and a local district are defined to be politically aligned if the same political party is in power in both. We model the incentives of politicians in local districts to engage in rent-seeking and the incentives of the center to assign police officers across districts to

control such rent-seeking. For the most part, the existing literature on political alignment looks empirically at the allocation of fiscal revenues as a function of political alignment. The model departs from the literature by looking at the allocation of public servants.

In the sections below, we first set up the model, then characterize the equilibria and, finally, discuss the welfare implications of the results for local districts.

2.2.1 Set up

Governance structure

Consider a setup with one central government (in our case, this would be the state government) and D local district governments (*zila parishads*). We denote districts by $d \in \mathcal{D} = \{1, 2, \dots, D\}$. We assume that each government unit has one politician who runs the office. There are two political parties and an infinitely large pool of politicians in each party. Time is discrete and infinite, $t \in \{1, 2, 3, \dots\}$. At the beginning of every period t , elections are held at the center and all local districts; this determines the identity of the party in power in all $D + 1$ units of government at time t . We assume that politicians are infinitely lived and if a politician loses office, then she will never again run for it. We also assume that incumbent politicians, at the center and in the districts, always go up for reelection.

A district d is said to be “aligned” (i.e., of type A) if the politician in power in d belongs to the same party as the politician in power at the center. If the parties to which the politicians belong differ, then d is said to be “non-aligned” (i.e., of type N). In particular, θ_{dt} denotes the type of any district d at time t , i.e., $\theta_{dt} \in \{A, N\}$. We denote an alignment profile for all local districts at time t by $\theta_t = (\theta_{1t}, \theta_{2t}, \dots, \theta_{Dt})$ and let Θ be the set of all possible alignment profiles.

We now make two observations. First, the alignment status (or type) of a district is time dependent, since we allow for the possibility that an incumbent party may lose an election. Second, since there can only be one party at a given time in any unit of government – state or district – each district in each period is either aligned or non-aligned. Therefore, letting

$\mathcal{A}_t$ denote the set of aligned districts at time t and $\mathcal{N}_t$ the set of non-aligned districts at time t , we have:⁵

$$\mathcal{A}_t \cup \mathcal{N}_t = \mathcal{D}.$$

Flow payoffs of central and district governments

The payoff of the incumbent politician in each district comes from rent-seeking activities. However, earning rents from office requires effort. Therefore, the politician must decide how much rent-seeking to engage in. Let such effort by the incumbent politician in district d at time t be denoted by e_{dt} . Thus, the flow payoff for the incumbent is:

$$u_{dt} = r_{dt}e_{dt} - \frac{e_{dt}^2}{2} \quad (2.2.1)$$

where r_{dt} is the marginal return to an additional unit of rent-seeking effort. We assume that $e_{dt}, r_{dt} \in [0, 1]$. Now, changes in e_{dt} not just affect the district's current payoff but may also have a bearing on its future payoffs. We discuss this in more detail when we specify the lifetime payoffs of politicians. We assume that the center gets an exogenous flow rent of R every period it remains in office.

Reelection of central and district governments

The incumbent politician in any district d in period t wins the election, and thus remains in power, with probability $\beta_t \in (0, 1)$. We assume that $\beta_t \in \{\beta_A, \beta_N\} \forall t$, where β_A is the probability of reelection of a politician in an aligned district and β_N is the probability of reelection of a politician in a non-aligned district. We further assume that $\beta_A > \beta_N$. This assumption is motivated by the empirical finding in the literature, as discussed in Section 2.1, that aligned districts tend to get more financial resources than non-aligned ones. If alignment

⁵Note that the agents in our model are the individual politicians and not the political parties. The party identity of politicians is only relevant to determine the alignment status of districts. This distinction between a politician and a party is important – a party may come back to power at a later date after losing an election but an individual politician may not. This motivates the payoffs that we specify later.

is, on average, financially beneficial for a district, then it may also improve the chances of reelection of the politician in the district.⁶

Before discussing the reelection probability of the center, we define the overall welfare of the economy. Let the income (or output) in the economy at time t , net of rent-seeking, be given by:

$$y_t = Y - r_0 - \sum_{d \in \mathcal{D}} r_{dt} e_{dt} \quad (2.2.2)$$

where Y , assumed to be time-invariant, is the gross income (or aggregate output) of the economy and $r_0 \in [0, 1]$ is the per-period aggregate rent-seeking by non-politicians. We do not model non-politicians in our model and r_0 is assumed to be a constant. Hence, it will not be directly relevant for the ensuing equilibrium analysis but will, however, be important when we later discuss the welfare of individual districts. We assume that the gross output of the economy, Y , is large compared to the aggregate rents that local actors can extract. This assumption is motivated by the observation that in India, as in many other countries, much economic activity is not directly controlled by local politicians and governments have sufficient capacity to limit rent-extraction by non-politicians. Formally, we make the assumption:

Assumption 1. $Y > 2(D + 1)$

The probability that the incumbent politician at the center remains in power in period t is given by $\pi_c(y_{t-1})$. For simplicity, we assume

$$\pi_c(y_{t-1}) = \frac{y_{t-1}}{Y}.$$

⁶Note that the reelection probabilities of politicians in aligned and non-aligned districts are time-invariant. As such, we are implicitly assuming that the central government has a Markov strategy for allocating resources to districts. Going forward, we will focus on Markov Perfect Equilibria of the game; therefore, this assumption is consistent with the equilibrium notion we later employ.

Therefore, when elections are held at the beginning of any period t , voters judge the center based on its performance in the previous period, where this performance is measured by income net of captured rents.

Lifetime payoffs of central and district governments

The center can assign police officers across districts to exert some measure of control over the rents that district politicians can extract. Police officers, however, vary in ability; some are more adept at checking rent-seeking effort than others. We assume, for simplicity, that there are officers of only two types of quality – good quality, denoted a_G , and bad quality, denoted a_B .⁷ Let a_{dt} denote the quality of the police officer (in our case, the Superintendent of Police of a district) assigned to district d at time t . Therefore, $a_{dt} \in \{a_G, a_B\}$. We assume that

$$r_{dt} = r(a_{dt}).$$

Therefore, $r_{dt} \in \{r_H, r_L\}$, where $r_H = r(a_B)$ and $r_L = r(a_G)$, with $r_H > r_L$. Since the assignment of police officers only matters insofar as it determines the marginal returns to rent-seeking effort, we shall, instead, focus directly on the assignment of marginal rents r_H and r_L across districts. In every period, the center assigns marginal rents across districts to maximize its lifetime payoff.

There is a pool D of police officers, exogenously given, of whom $D_H \geq 1$ are high marginal rent type, and thus of quality a_B , and $D_L \geq 1$ are low marginal rent type, and thus of quality a_G . Thus, $D_L + D_H = D$. The center's assignment rule for any period must respect this constraint.

⁷Note that we are not making a value judgment on the morality of police officers in India. A “bad” officer, in the context of our model, needn't necessarily be corrupt or incompetent, though it is possible he could be. He may simply be “bad” for the situation he finds himself in (e.g., ill-suited to local conditions, unaware of local social equations and so on). This, too, is important, since there is tremendous social and cultural diversity in India, and the police often has to work constructively with the local community, in addition to just mechanically enforcing the law.

Let $s_d = \mathbf{1}\{d \text{ has } a_B \text{ type officer}\}$ be an indicator for whether district d is assigned a high marginal rent. We denote the center's set of pure strategies by $S = \{(s_1, s_2, \dots, s_D) \in \{0, 1\}^D : \sum_d s_d = D_H\}$. The set of mixed strategies is the simplex defined over the set S , denoted by $\Delta(S)$.⁸ Let $\sigma = (\sigma_s)_{s \in S} \in \Delta(S)$ be a particular mixed strategy of the center. The optimization problem of the center can then be written as:

$$\max_{\{\sigma_t\}_{t=1}^{\infty}} R \left[1 + \sum_{t=2}^{\infty} \delta^{t-1} \left(\prod_{k=2}^t \mathbb{E}(\pi_c(y_{k-1})) \right) \right]$$

where $\delta \in (0, 1)$ is the discount factor of any politician in the model.

It is clear that, for a local district, the choice of a higher level of rent-seeking effort not only changes current payoff but, by changing the probability that the incumbent party at the center will remain in power, also possibly changes future payoff. This is the case since the continuation payoff of a district may depend on its future alignment status. This is evident from a district politician's optimization problem, which can be written as:

$$\max_{\{e_{dt}\}_{t=1}^{\infty}} \left[\sum_{t=1}^{\infty} \delta^{t-1} \left(\prod_{k=1}^t \beta_k \right) \mathbb{E} \left(\left(r_{dt} e_{dt} - \frac{e_{dt}^2}{2} \right) \right) \right]$$

where $\beta_1 = 1$.

Sequence of events

The timing of events in any period t is as follows:

1. Elections at both the center and the D districts take place, with probabilities of winning given by $\pi_c(\cdot)$ and β_d , as discussed above.
2. The following two events occur simultaneously:

⁸We can think of the mixed strategies of the center as capturing the residual uncertainty of an outside researcher. In particular, even after accounting for available information, an outside researcher cannot precisely know what allocation of police officers the center will decide upon.

- 2.1. The center decides the allocation of marginal return to rent-seeking effort for each d (i.e., the center decides the allocation of police officers).
- 2.2. All districts simultaneously choose level of rent-seeking effort.
3. Flow payoffs for the period are realized and the period ends.

2.2.2 Definition of equilibrium

We focus on the Markov Perfect Equilibria of the game. In any such equilibrium, the center and any district d condition their strategies in period t , σ_t and e_{dt} , respectively, on the alignment profile of districts, θ_t , determined as the outcome of the elections held at the beginning of period t . In particular, a Markov Perfect Equilibrium (MPE) $\{\sigma(\theta), e(\theta)\}$ specifies, as a function of the profile of alignments of districts $\theta \in \Theta$, the center's strategy $\sigma(\theta) \in \Delta(S)$, which gives the probability distribution over possible allocations of marginal rents across districts, and each district's strategy, $e(\theta) = (e_1(\theta), e_2(\theta), \dots, e_D(\theta))$, which gives the choice of rent-seeking effort by the district. The assignment strategy $\sigma(\cdot)$ induces, for each district d , a probability, denoted by p_d , that the district is assigned high rent r_H :

$$p_d(\theta) = \sum_{\{s \in S: s_d=1\}} \sigma_s(\theta)$$

We introduce this notation because we intend to focus on *type-symmetric* MPEs. This means that, for all districts that are of the same type, either aligned (A) or non-aligned (N), the equilibrium strategies must have the same implications:

$$\begin{aligned} p_d(\theta) &= p_A(\theta) \quad \text{and} \quad e_d(\theta) = e_A(\theta) \quad \forall d \in \mathcal{A} \\ p_d(\theta) &= p_N(\theta) \quad \text{and} \quad e_d(\theta) = e_N(\theta) \quad \forall d \in \mathcal{N} \end{aligned}$$

Therefore, $p_A(\theta)$ ($p_N(\theta)$) is the probability that, given the alignment profile θ , an aligned (non-aligned) district would be assigned a high rent. Likewise, $e_A(\theta)$ ($e_N(\theta)$) is the level of

rent-seeking effort chosen by an aligned (non-aligned) district, for a given alignment profile θ .

2.2.3 Reformulation of the problem

Focusing on type-symmetric MPE (or TSMPE) allows us to write value functions for just the two types of districts, instead of potentially writing one value function for each district, and a value function for the center. Let $V_c(\cdot)$ be the value function for the center. Let $V_A(\cdot)$ and $V_N(\cdot)$ be the value functions for aligned and non-aligned districts, respectively. Then, $(p_A(\cdot), p_N(\cdot))$ solves:

$$\begin{aligned}
V_c(\theta) &= \max_{(p_A, p_N)} [R + \delta \pi_c(y(\theta)) V_c] \\
\text{such that } y(\theta) &= Y - r_0 - \sum_{d \in \mathcal{A}(\theta)} r_A e_A(\theta) - \sum_{d \in \mathcal{N}(\theta)} r_N e_N(\theta) \\
r_A &= p_A r_H + (1 - p_A) r_L \\
r_N &= p_N r_H + (1 - p_N) r_L \\
p_A, p_N &\in [0, 1] \\
D_H &= |\mathcal{A}(\theta)| p_A + |\mathcal{N}(\theta)| p_N
\end{aligned} \tag{2.2.3}$$

where $V_c = \mathbb{E}_\theta(V_c(\theta))$ and $|X|$ is the cardinality of any set X . Condition (2.2.3) above specifies the relationship between the induced probabilities p_A and p_N and is derived as follows:

$$p_d(\theta) = \sum_{\{s \in S: s_d=1\}} \sigma_s(\theta) = \sum_{s \in S} \sigma_s(\theta) s_d$$

$$\begin{aligned}
\implies |\mathcal{A}(\theta)| p_A + |\mathcal{N}(\theta)| p_N &= \sum_{d \in \mathcal{A}(\theta)} p_d(\theta) + \sum_{d \in \mathcal{N}(\theta)} p_d(\theta) \\
&= \sum_{d \in \mathcal{D}} \sum_{s \in \mathcal{S}} \sigma_s(\theta) s_d \\
&= \left(\sum_{d \in \mathcal{D}} s_d \right) \left(\sum_{s \in \mathcal{S}} \sigma_s(\theta) \right) \\
&= D_H
\end{aligned}$$

It is now straightforward to see that condition (2.2.3) may place some constraints on the possible values of p_A and p_N :

$$\max \left\{ 0, \frac{D_H - |\mathcal{N}(\theta)|}{|\mathcal{A}(\theta)|} \right\} \leq p_A \leq \min \left\{ 1, \frac{D_H}{|\mathcal{A}(\theta)|} \right\} \quad (2.2.4)$$

$$\max \left\{ 0, \frac{D_H - |\mathcal{A}(\theta)|}{|\mathcal{N}(\theta)|} \right\} \leq p_N \leq \min \left\{ 1, \frac{D_H}{|\mathcal{N}(\theta)|} \right\} \quad (2.2.5)$$

Now, for any district government, $(e_A(\theta), e_N(\theta))$ solves:

$$V_A(\theta) = \max_{e_A} \left(r_A(\theta) e_A - \frac{e_A^2}{2} \right) + \delta \beta_A [\pi_c(y(\theta)) V_A + (1 - \pi_c(y(\theta))) V_N] \quad (2.2.6)$$

$$V_N(\theta) = \max_{e_N} \left(r_N(\theta) e_N - \frac{e_N^2}{2} \right) + \delta \beta_N [\pi_c(y(\theta)) V_N + (1 - \pi_c(y(\theta))) V_A] \quad (2.2.7)$$

where $V_S = \mathbb{E}_\theta V_S(\theta)$ and $r_S(\theta) = p_S(\theta) r_H + (1 - p_S(\theta)) r_L$ for $S \in \{A, N\}$ and $(p_A(\theta), p_N(\theta))$ is as defined previously.

2.2.4 Characterization of the equilibrium

In this section, we characterize the TSMPE by studying how rent assignments relate to the choices of rent-seeking efforts of aligned and non-aligned districts. Throughout this section, we focus on cases in which both aligned and non-aligned districts are present in the economy, i.e., we only consider alignment profiles that are in the set $\tilde{\Theta} \equiv \{\theta : |\mathcal{A}| > 0 \text{ and } |\mathcal{N}| > 0\}$; otherwise, the problem of assigning police officers is trivial. Now, for the purposes of the

results, we define the following constant:

$$\kappa \equiv \left[\frac{(1-\delta)Y - \beta_A \delta}{(1-\delta)Y + \beta_N \delta} \right] < 1$$

We use κ to make the following assumptions:

Assumption 2. $\frac{r_H}{r_L} \geq \max \left\{ \frac{D-D_H}{\kappa D - D_H}, \frac{(1-\kappa)D + \kappa D_H}{\kappa D_H} \right\}$

Assumption 3. $\frac{r_H}{r_L} \leq \kappa \left(\frac{1-\delta\beta_N}{1-\delta\beta_A} \right)$

Lemma 1. *Suppose Assumption 2 holds and $V_A \geq V_N$ in an equilibrium. Then, $\forall \theta \in \tilde{\Theta}$, we have $e_A(\theta) = e_N(\theta)$.*

Proof: See Appendix 2.C. ■

We now show that, in any equilibrium in which the expected continuation value for an aligned district is (strictly) greater than that for a non-aligned district, the probability that the center will assign a high marginal rent (i.e., a bad quality police officer) to an aligned district is (strictly) larger.

Lemma 2. *Suppose $V_A > V_N$ in equilibrium. Then, for all $\theta \in \tilde{\Theta}$, $p_A(\theta) > p_N(\theta)$.*

Proof: See Appendix 2.C. ■

We now prove the main result of our model.

Proposition 1. *Suppose Assumptions 1-3 hold. Then, the set of TSMPE is non-empty. Further, in all TSMPE, we have: (i) $V_A > V_N$ for all $\theta \in \tilde{\Theta}$, (ii) $e_A(\theta) = e_N(\theta)$, (iii) $p_A(\theta) > p_N(\theta)$, and (iv) $r_A(\theta) e_A(\theta) > r_N(\theta) e_N(\theta)$.*

Proof: See Appendix 2.C. ■

The main result of our paper thus shows that, under certain conditions, the state government assigns high-ability police officers (i.e., low marginal rent, r_L) to the non-aligned

districts more frequently. Even though rent-seeking efforts are equalized across all districts, total rent-seeking *payoff* is higher in aligned districts.

As mentioned in Section 2.1, we do not model the frequency of transfers of police officers. In our model, elections happen at the beginning of each period, determining the profile of aligned and non-aligned districts. Thus, transfers may only happen once a period in any district. However, we could extend our model to have elections every $k > 1$ periods, with different election dates for the central and district governments. The politician at the center would still have the job of assigning or reassigning police officers every period he is in office. This decision would be non-trivial – transferring officers may have a “transition cost,” since the new officer must quickly understand the local conditions and policing requirements of the district, and it is always possible that such switches in police leadership lead to discontinuities in the directives issued to the broader police force of the district. In such a scenario, the center would have to take into account that the frequency of transfers would also have a bearing on rent-seeking activities.

Setting up and solving this extended model would be significantly more complicated. However, broadly, the same arguments would go through. It would still be the case that low ability officers would be assigned to aligned districts more often. This almost immediately implies that low ability officers would, on average, have longer tenures in aligned districts and high ability officers in non-aligned districts, since that would minimize transition costs. Also, the center would choose its reassignment policy in a way that aligned districts, on average, experience more frequent transfers than non-aligned districts. The reason for this would be that such a policy would push the differential in marginal rents in the two types of districts in the same direction as in our current model. Therefore, in our empirical work, we also test if police officers, on average, are transferred more frequently in the aligned periods of any district and find that they indeed are.

Finally, we show that a symmetric police assignment strategy for the central government is part of an equilibrium if $\beta_A = \beta_N$.

Proposition 2. *Suppose Assumption 2 holds and $\beta_A = \beta_N$. Then the following is an equilibrium of the game: (i) $V_A = V_N$ for all $\theta \in \tilde{\Theta}$, (ii) $e_A(\theta) = e_N(\theta)$, (iii) $p_A(\theta) = p_N(\theta)$, and (iv) $r_A(\theta) e_A(\theta) = r_N(\theta) e_N(\theta)$.*

Proof: Suppose $V_A = V_N$ to begin with. Then, $e_A(\theta) = r_A(\theta)$ and $e_N(\theta) = r_N(\theta)$. Therefore, $v_A(\theta) = v_N(\theta) \forall \theta \in \tilde{\Theta}$ and $v_A = v_N$. Thus, $V_A = V_N$ in equilibrium. With Assumption 2, $e_A(\theta) = e_N(\theta)$, as in Lemma 1. This gives us that $r_A(\theta) = r_N(\theta)$, and the rest of the results follow. ■

2.2.5 District welfare

The key innovation of our model is that the government at the center can use police assignments to check rent-seeking activities of politicians in local districts. We now take a look at the welfare implications of this for local districts. We take as given that the center favors aligned districts in the allocation of financial resources and public projects. This is in line with the evidence in the literature, as discussed in Section 2.1. In our analytical framework in this paper, we take this preferential treatment of aligned districts to mean that the center assigns better administrative bureaucrats to aligned districts for better implementation of public projects; we show evidence in support of this in our empirical work. On the other hand, however, our model makes a striking prediction – for all the electoral benefits that aligned districts enjoy ($\beta_A > \beta_N$), they still receive worse police allocations. As a consequence, politicians in aligned districts engage in rent-seeking activities to a greater extent. Furthermore, it is likely that such police allocations are also conducive to higher rent-seeking by non-politicians in aligned districts: $\mathbb{E}_\theta r_{0A} > \mathbb{E}_\theta r_{0N}$. Now, suppose that Y_A is the economic output of an aligned district and Y_N is that of a non-aligned district, with

$Y_A > Y_N > 0$. We can then write the welfare W_T of a district of type $T \in \{A, N\}$ as follows:

$$W_A = Y_A - \mathbb{E}_\theta r_A e_A - \mathbb{E}_\theta r_{0A}$$

$$W_N = Y_N - \mathbb{E}_\theta r_N e_N - \mathbb{E}_\theta r_{0N}$$

Thus, even if $Y_A > Y_N$, higher rent-seeking by politicians (as per Proposition 1, (iv)) and non-politicians *may in fact* lead to $W_A < W_N$. Thus, simply focusing on the fiscal advantages of aligned districts, ignoring local incentives for rent-seeking, may lead us to overestimate the welfare benefits of political alignment for common people.

2.3 Background

2.3.1 Political structures

The setting for our study is the Indian state of Rajasthan. Each state in India is comprised of administrative units called districts. There are thirty-three such districts in Rajasthan. We now discuss the political institutions or entities we will focus on and how they relate to these administrative units.

1. **The *Zilla Parishad* (ZP) or District Council.** The key structure of governance in rural India is the three-tiered *Panchayati Raj* system, consisting of councils at the village, block (intermediate), and district levels in each state. This system of rural governance, in its current form, was established by the 73rd Amendment to the Constitution of India in 1992. The ZP is the highest tier of this three-tiered structure. Members of the ZP are elected directly by the people and then elect a chairperson from amongst themselves. In the case of Rajasthan, most members of a ZP belong to one of the two major national political parties in India, the Indian National Congress (INC) or the *Bharatiya Janata Party* (BJP). Therefore, in almost all districts and all years in the data, the chairperson of a ZP is from either the INC or the BJP. In some cases, the

chairperson may be listed as “independent,” or having no formal political affiliation. However, even in such cases, the chairperson likely holds office as a consequence of the political support of either the Congress or the BJP.

The chairperson of the ZP is also the *ex-officio* chairperson of the District Planning Committee, an organization responsible for drafting broad plans for developing infrastructure in the district as a whole.

2. The State Government. The state legislature or assembly in Rajasthan has two hundred members. Each member, called a Member of the Legislative Assembly (MLA), is elected from an electoral constituency, a precisely defined geographical region. The party or coalition with a majority of seats in the legislature forms the government, headed by a Chief Minister.

In all the Rajasthan assembly elections in our data set, there is no case of a coalition government – the BJP or the Congress win a clear majority or, when a few seats short, form the government with the outside support of a few MLAs.

There are two hundred MLA constituencies but, as mentioned previously, thirty-three districts. Therefore, an administrative district often has several MLAs. Note that each MLA constituency is entirely contained within a particular administrative district.

We define political alignment to be a function of the party affiliation at a given point in time of the entities discussed above. If the Chief Minister and ZP chairperson belong to the same party, then the ZP and state government are said to be politically aligned.

2.3.2 Elections

Elections for the state assembly and all the ZPs in the state happen every five years, though the five-year cycles are frequently different in most states. In the period that our election data on Rajasthan cover, state assembly elections in Rajasthan take place in 2003, 2008 and

2013. The state assembly elections happen in December of these years, so we have coded the *next* years (i.e., 2004, 2009 and 2014) to be the years of the assembly elections, since the new Chief Minister and government only effectively take charge in January. *Panchayati Raj* elections, i.e., elections for all ZPs in the state, take place in 2000, 2005 and 2010, at the beginning of the year. See Figure 2.1.

The electorate for a ZP election comprises all the residents of all the village councils, the lowest tier of the three-tiered structure discussed above, of that district. The electorate for an assembly election comprises all those with a voter ID card registered in the state of Rajasthan.

2.3.3 District public servants

We study the following key officials at the district level, focusing primarily on the Superintendents of Police.

1. **Superintendent of Police (SP).** The SP is the head of the police force of a district. SPs are officers of the Indian Police Service (IPS), one of the various All India Services, and are recruited through extremely competitive examinations and are not permitted to be members of any political party. On joining the IPS, an officer is assigned a cadre, the state in which the officer will serve. Most candidates express a preference to be assigned to their home states. However, higher ranked candidates are more likely to be assigned to their most preferred state. Thus, officers of a state who are also assigned that state cadre are likely to be higher-ranked in the examinations.

According to articles 310 and 311 of the Indian Constitution, IPS officers serve at the pleasure of the President of India and can only be removed or reduced in rank after a thorough inquiry. In particular, they cannot be dismissed by state-level elected representatives or politicians. Wages of the officers are set by independent pay commissions and are a function of rank. In practice, officers are rarely ever dismissed

or demoted.⁹ However, the Chief Minister of the state or, more generally, the state government can transfer police officers across posts.

2. **District Collector or District Magistrate (DM).** The DM is the highest-ranked administrative bureaucrat in a district. Almost all DMs are officers of the Indian Administrative Services (IAS) (some may belong to the State Civil Services). The IAS, like the IPS, is an All India Services, officers for which are recruited and assigned cadres through the same process. Candidates for the IAS take the same written examinations as those for the IPS. The All India Service a candidate qualifies for is both a function of preference and rank in the examinations. The rank needed to qualify for the IAS is usually higher than that needed to qualify for the IPS and, as in the case of the IPS, the cadre preferences of higher ranked candidates are more likely to be honored. Just like IPS officers, IAS officers cannot be dismissed or demoted by the state government but can be transferred across posts.

The DM is responsible for a host of matters in a district, such as development works, collection of land revenues and other taxes, and so on. DMs also often hold open office hours during the day, with people from all across the district coming with complaints and suggestions. Broadly, the DM is the administrative chief of a district, keeping track of and coordinating various activities related to development and governance.

SPs and DMs play an important role in governing and administering a district. Thus, it seems entirely plausible that these officers interact closely with elected representatives at different tiers of government. For instance, if the ZP wishes to push through a development project in a district, it may not only have to request the state government for funds but also discuss the technical feasibility of the project with the DM. Furthermore, politicians in the

⁹Prosecuting IPS officers is a tedious process. For instance, a law enforcement agency cannot press charges against an IPS officer under the Prevention of Corruption Act, 1988 without the prior prosecution sanction of the Central Government, as per Section 197 of the Code of Criminal Procedure, 1973.

ZP may press the state government to transfer and replace an SP or DM that they do not like.

2.4 Data

2.4.1 Sources

The data for this paper come from various publicly available sources. The data on ZP elections come from the website of the State Election Commission of Rajasthan. We use the ZP election results for the years 2000, 2005 and 2010. The data contain information on the party, social group (e.g. scheduled caste, scheduled tribe, other backward class or general) and sex of the elected chairperson, the reservation status (e.g., whether reserved for any social group or open to all) of the post of the chairperson and the number of ZP members elected from each political party and social group.

The data on the state assembly elections come from the website of the Election Commission of India. We use the assembly election results for 2003, 2008 and 2013. We have information on the number of MLA constituencies in each administrative district, the political party of the candidate elected from each such MLA constituency, the number of MLA constituencies in each district reserved for different social groups or left unreserved in a given election year, and so on. Note that each MLA constituency is entirely contained within a particular administrative district.

The data on the officials discussed in Section 2.3.3 is sourced from the civil list of the Department of Personnel of the Government of Rajasthan. We have the complete career histories (title and duration of each posting) of all officers who ever served as DMs in any district of Rajasthan over the period 2005-2015. We also have the complete career histories of all IPS officers who served as SPs in any district of Rajasthan over the period 2001-2013.

We use data on crime rates for the period 2001-2013, taken from the National Crime Records Bureau of India. For each year for each district in the data, we have the number

of crimes recorded by the police under various heads, such as robbery, burglary, grievous hurt, and so on. To compute crime rates, we use district population totals from the 2001 and 2011 Census of India, calculating the population figures for non-census years by linear interpolation. Lastly, we also use data on night lights from the National Oceanic and Atmospheric Administration (NOAA), to control for overall economic activity.

2.4.2 Descriptive statistics

In Table 2.1, we report means and standard deviations of several variables of interest. A little more than half of the district-year observations are aligned in our sample. We also find that “DM Change,” an indicator for whether a DM was changed in a given district-year, has a mean in the data of 0.55. This means that there is a 0.55 probability that the DM in a given district in a given year is transferred. The corresponding variable for SPs, “SP Change,” has a much higher mean of 0.81. This already suggests that assignment patterns may be different for the two types of public servants. For the period under study, the average number of postings of an SP is 3.2 while that of a DM is 2.7. Related to this, the average tenure of a DM is 20.5 months while that of an SP is 17.4 months. These summary statistics for frequency of transfers, tenure length and number of postings are thus consistent, and broadly paint the picture that SPs are shuffled across posts more often than DMs.

Figure 2.2 shows that an officer’s average tenure as an SP or DM is positively correlated with the officer’s average tenure in all positions. This suggests that some officers are likely more efficient or competent than others and, therefore, tend to stay longer in whatever position they are assigned to. However, the scatter plot makes it clear that there is enormous variation around the fitted line. Hence, ability is likely only one of the factors that determines the tenure of an officer.

2.5 Empirical methodology

In this section, we estimate various regression specifications to test if the relations in the data are in line with the theoretical predictions of our model in Section 2.2.

As mentioned briefly in Section 2.1 and discussed in more detail in Section 2.2, frequent transfers of police officers likely reduce the overall quality of police administration in a district and create conditions conducive to rent seeking. In addition, frequent transfers may also worsen the law and order situation in a district, a direct welfare cost. Thus, we begin this section by testing if the transfer rate of SPs is different across the aligned and non-aligned periods of a district. We therefore run the following specifications:

$$SP_{dt} = \delta_s alignment_{dt} + \phi_d + \psi_t + \epsilon_{dt} \quad (2.5.1)$$

$$C_{dt} = \delta_c alignment_{dt} + \phi_d + \psi_t + \epsilon_{dt} \quad (2.5.2)$$

where SP_{dt} is a dummy that indicates whether a Superintendent of Police is changed in district d in year t , C_{dt} measures crime per capita, $alignment_{dt}$ is a dummy indicating whether the chairperson of the *Zila Parishad* (ZP) is politically aligned with the Chief Minister, i.e., whether they belong to the same political party, ϕ_d and ψ_t are district and time fixed effects to control for time invariant district characteristics and state specific yearly shocks that may affect outcomes in all districts. In the case of crime, we also check if different categories of crime are heterogeneously related to political alignment.

We wish to emphasize here that, in looking at the pattern of crime rates across districts, we are not trying to claim that local politicians commit these crimes. Our motivation for looking at crime statistics is twofold. First, we use a proximate measure of public servant quality – whether or not the state in which the officer is serving is also his home state. This measure may be somewhat noisy. However, if this measure has some merit, then the pattern of crime rates should be in line with it. Second, as we argue in the model, better officers can check rent-seeking by both politicians and non-politicians. Hence, differences in crime rates

by the alignment status of districts suggest that differences in police allocations have direct welfare consequences for the districts, over and above the consequences for the rent-seeking behavior of politicians.

We then go on to check if differences in transfer or crime rates across aligned and non-aligned periods of a district are driven by election years. Notice that our model suggests that this should not be the case – systematic differences in transfers of SPs are a function of alignment status and should not depend upon the type of year (election or non-election) we happen to be looking at. To test this, we estimate the following specifications:

$$SP_{dt} = \delta_{s1}alignment_{dt} + \gamma_{s1}alignment_{dt} \times State_election_year_t + \phi_d + \psi_t + \epsilon_{dt} \quad (2.5.3)$$

$$SP_{dt} = \delta_{s2}alignment_{dt} + \gamma_{s2}alignment_{dt} \times ZP_election_year_t + \phi_d + \psi_t + \epsilon_{dt} \quad (2.5.4)$$

where $State_election_year_t$ and $ZP_election_year_t$ are indicators for whether there was a state or ZP election, respectively, in year t . We also run (2.5.3) and (2.5.4) with measures of crime as our dependent variables. Let $\delta_{c1}, \delta_{c2}, \gamma_{c1}$ and γ_{c2} be the corresponding coefficients of interest in the crime regressions. Then, according to our model, we have the following hypothesis:

Hypothesis 1.

$$(i) \delta_{si}, \delta_{ci} > 0 \quad \text{and} \quad (ii) \gamma_{si}, \gamma_{ci} = 0, \quad i = 1, 2.$$

We then check if our measure of “quality” of officers is differentially related to political alignment in a way that would be consistent with our model. Recall that, as discussed in Sections 2.1 and 2.3.3, natives of Rajasthan serving in Rajasthan are, in some sense, “better quality” officers than those from other states assigned to the Rajasthan cadre. To test this, we estimate:

$$SPtenure_{idt} = \lambda_{s1}alignment_{dt} + \lambda_{s2}alignment_{dt} \times Homestate_i + \zeta_s X_{dt} + \psi_i + \phi_t + \epsilon_{idt} \quad (2.5.5)$$

where $SPtenure_{idt}$ is the number of months that police officer i served as SP in district d during a period that intersects the year t (i.e., the tenure variable has the same value for all the years in which the officer was present in that district), $Homestate_i$ is a dummy indicating whether Rajasthan is the officer's home state, ψ_i and ϕ_t are officer and time fixed effects, respectively, and X_{dt} is a vector of time varying district characteristics, such as population and economic activity (as captured by per capita luminosity). Thus, we follow the same officer over time, through various SP appointments across districts in Rajasthan, and test if the political alignment of those districts, and its interaction with our quality measure, bears any relation to the officer's tenure.

Proposition 1, (iii) predicts that better quality officers will have shorter tenures in aligned districts, relative to worse quality officers. Thus, we have the following hypothesis:

Hypothesis 2.

$$(i) \lambda_{s1} > 0 \quad \text{and} \quad (ii) \lambda_{s2} < 0$$

We would further like to confirm that the tenure pattern we find in estimating (2.5.5) is specific to police officers. In particular, the tenure pattern for DMs should be the opposite of that for SPs. DMs are administrative bureaucrats responsible for the efficient utilization of public resources in a district. If it is indeed the case that aligned districts are allocated better financial resources, then they should also be assigned better quality DMs, so as to make the most of those resources. We therefore estimate:

$$DMtenure_{idt} = \lambda_{b1}alignment_{dt} + \lambda_{b2}alignment_{dt} \times Homestate_i + \zeta_b X_{dt} + \psi_i + \phi_t + \epsilon_{idt} \quad (2.5.6)$$

and test the following hypothesis:

Hypothesis 3.

$$(i) \lambda_{b1} < 0 \quad \text{and} \quad (ii) \lambda_{b2} > 0$$

We also estimate regressions of the form $Homestate_{dt} = \beta alignment_{dt} + \phi_d + \psi_t + \epsilon_{dt}$, where $Homestate_{dt}$ is an indicator for whether Rajasthan is the home state of the public servant posted in district d at time t . We do not report the results here but, in line with our model, we find that the estimate of β is negative for SPs and positive for DMs – on average, there are better quality DMs and worse quality SPs in the aligned as opposed to non-aligned periods of a district. However, the coefficients are imprecisely estimated and not statistically significant.

Finally, we formally test Proposition 2. We check if the relationship of political alignment to SP transfers and crime is different in districts in which reelection probabilities are close to one (in the language of the model, $\beta_A = \beta_N = 1$). Our model predicts that the state government would play a symmetric police assignment strategy and, thus, we would not observe differences in police assignments across aligned and non-aligned periods of districts that have $\beta_A = \beta_N = 1$. There are districts in the data in which the political party of the ZP chairperson does not change for the entire period of study. We mark such ZPs as politically “safe” and then test if the alignment relations are different across “safe” and “non-safe” ZPs by running the following regression specification:

$$SP_{dt} = \eta_{s1} alignment_{dt} + \eta_{s2} alignment_{dt} \times Safe_ZP_d + \phi_d + \psi_t + \epsilon_{dt} \quad (2.5.7)$$

Also, if our argument has merit, then the relationship between political alignment and crime should have similar patterns across “safe” and “unsafe” ZPs. We therefore further estimate the following specification:

$$C_{dt} = \eta_{c1} alignment_{dt} + \eta_{c2} alignment_{dt} \times Safe_ZP_d + \phi_d + \psi_t + \epsilon_{dt} \quad (2.5.8)$$

We can then test the following hypothesis:

Hypothesis 4.

$$\begin{aligned} (i) \quad & \eta_{s1} > 0, \quad \eta_{s2} < 0 \quad \text{and} \quad \eta_{s1} + \eta_{s2} = 0 \\ (ii) \quad & \eta_{c1} > 0, \quad \eta_{c2} < 0 \quad \text{and} \quad \eta_{c1} + \eta_{c2} = 0 \end{aligned}$$

One concern with our specification is that, right after coming to power in the state, a political party may reallocate officers before the ZP elections in order to influence the upcoming potential alignment switches. Moreover, the nature of such reallocation may differ by existing alignment patterns, since currently aligned districts may vote differently in the ZP elections than non-aligned districts. We assume away such possibilities in our model by making the reelection probabilities of district politicians exogenous. Moreover, in Rajasthan, there is only a year between the time the Chief Minister assumes office and the time that the subsequent ZP elections take place. Hence, the CM has limited time to influence the ZP elections and the alignment status of each ZP is given for most of the tenure of the CM. Also, the point estimate for specification (2.5.1) remains essentially the same if we remove the first years of all CM tenures.

2.6 Results

Table 2.2 shows the results for specifications (2.5.1), (2.5.3) and (2.5.4) for SP transfers. Table 2.3 shows the corresponding results for the crime rate. Column (1) of Table 2.2 shows that alignment of the ZP chairperson and state Chief Minister is related to increased transfers of SPs. Given the mean transfer rate of SPs, an SP in an aligned period of a district is around 10% more likely to be transferred than an SP in a non-aligned period. Thereafter, in columns (2) and (3) we check if there is any political cycle to this increased transfer rate of SPs. We do not find any such pattern. In column (2), though the coefficient $\hat{\delta}_{s1}$ from (2.5.3)

becomes statistically insignificant, its magnitude remains roughly the same as what it is in column (1). Table 2.3 looks at results for the crime rate. We measure the crime rate as the number of criminal cases reported per 100,000 population in police stations in a district in a year. Column (1) of Table 2.3 shows that the crime rate in a district is about 3.6% higher, relative to its mean, in aligned periods than in non-aligned periods. Columns (2) and (3) confirm that this uptick in crime is not driven by either the state or the local election years. We therefore find evidence in support of all components of Hypothesis 1. Moreover, we look at various categories of crime to check if the overall pattern in the relationship between political alignment and crime is driven by certain specific categories of crime. The results in Panel A of Table 2.4 show that this uptick in crime rates is spread across various crime categories, from property crime, such as robbery, burglary and theft, to violent crime, such as grievous hurt.¹⁰ The results for other violent crimes, such as murder and kidnapping, are not reported here but are also in the right direction, though statistically insignificant.

We next estimate (2.5.5) to test Hypothesis 2. Table 2.5 reports the results of this specification. Consistent with our hypothesis, we find that SPs from outside Rajasthan have longer tenures in aligned districts than in non-aligned districts. This is not so for home-state SPs. If anything, home-state SPs seem to have shorter tenures in aligned than in non-aligned districts, though not statistically significantly so (the F -test for $H_0 : \lambda_{s1} + \lambda_{s2} = 0$ in (2.5.5) yields a p -value of 0.442). The coefficients have fairly large magnitudes – an appointment in an aligned as opposed to a non-aligned district increases the tenure of an SP from another state by around 25%, relative to the mean tenure for all SPs.

We then turn to administrative bureaucrats, i.e., DMs, to estimate (2.5.6) and test Hypothesis 3. Consistent with our hypothesis, the pattern we find is the opposite of what we find for SPs. Specifically, as shown in Table 2.6, DMs who are not natives of Rajasthan have *shorter* tenures in aligned than in non-aligned districts. This is not so for home-state DMs. Home-state DMs spend longer periods in aligned than in non-aligned districts (though, again,

¹⁰Section 320 of the Indian Penal Code considers hurt to be “grievous” if it involves, for instance, permanent loss of sight or hearing or a bone fracture, among other things.

the F -test for $H_0 : \lambda_{b1} + \lambda_{b2} = 0$ in (2.5.6) yields a p -value of 0.242). The magnitudes of the coefficients are, again, fairly large – an appointment in an aligned district for a non-native DM is 23% shorter, given the mean tenure for all DMs.

Finally, we estimate (2.5.7) and (2.5.8) to test Hypothesis 4. Table 2.7 reports the relevant results. First, note that columns (1) and (3) reproduce, respectively, the results of Table 2.2, column (1) and Table 2.3, column (1). Comparing column (1) to (2), we see that the relationship of alignment to SP transfers is positive and statistically significant in ZPs in which the probability of reelection is less than one. Furthermore, as reported in column (2), the F -test for $H_0 : \eta_{s1} + \eta_{s2} = 0$, the relevant coefficients from (2.5.7), yields a p -value of 0.58. In other words, it is indeed the case that the transfer rate of SPs is not statistically different across aligned and non-aligned periods of electorally safe districts. The results for the crime rate lend further support to our hypothesis. Comparing columns (3) and (4), we find that the relationship of alignment and crime is mostly driven by the “unsafe” ZPs. Furthermore, as the result of the F -test reported in column (4) shows, for the safe ZPs, there is no difference in crime rates across aligned and non-aligned years. Thus, the evidence in Table 2.7 is consistent with Hypothesis 4.

2.7 Conclusion

In this paper, we critically reexamine the claim that the political alignment of a higher-tier government and local administrative units is beneficial for the local units. We contend that if asymmetrically higher fiscal transfers to aligned districts create a differential in the reelection probabilities of politicians in aligned and non-aligned districts, then local politicians in those districts will have asymmetric rent-seeking incentives. We build a dynamic model that studies such rent-seeking incentives of local politicians. Furthermore, we also model how the state government, in an attempt to control the rent-seeking activities of local politicians, may assign police officers of differing quality across districts. Our model predicts that the state

would assign better quality police officers to non-aligned districts more frequently and worse quality police officers to aligned districts more frequently. The model further predicts that, in equilibrium, aggregate rent-seeking payoff will be higher in aligned districts, even though rent-seeking effort will be equalized across districts.

We test the predictions of our model in the context of the assignment of police officers (Superintendents of Police) and administrative bureaucrats (District Magistrates) across districts in the state of Rajasthan in India. Consistent with the theory we lay out, we find that “better” quality SPs, as defined in Sections 2.1 and 2.3.3, have shorter tenures in aligned than in non-aligned districts; the result is the opposite for “poorer” quality SPs. We also show that this pattern in tenures is specific to police officers – the assignment of administrative bureaucrats is related to political alignment in a roughly opposite way.

As such, an important takeaway of our work is that, in order to understand the welfare consequences of political alignment, we cannot simply look at differences in the allocation of financial resources but must also look at differences in the rent-seeking incentives and behaviors of local politicians. In future work, with newer data, we hope to measure more directly the financial or fiscal benefits of political alignment and the extent of local rent-seeking activities.

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Appendix

2.A Figures

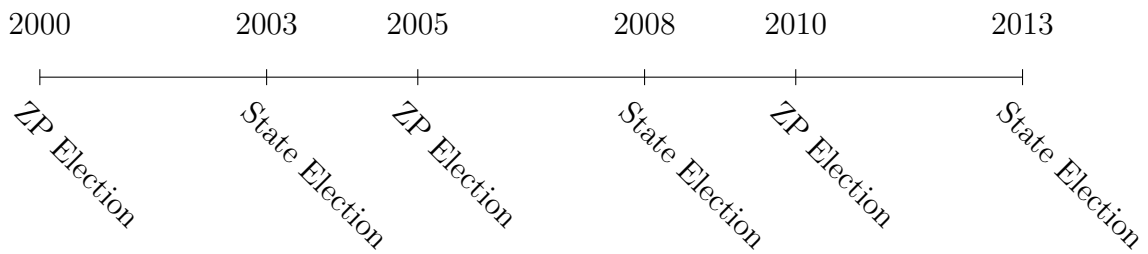
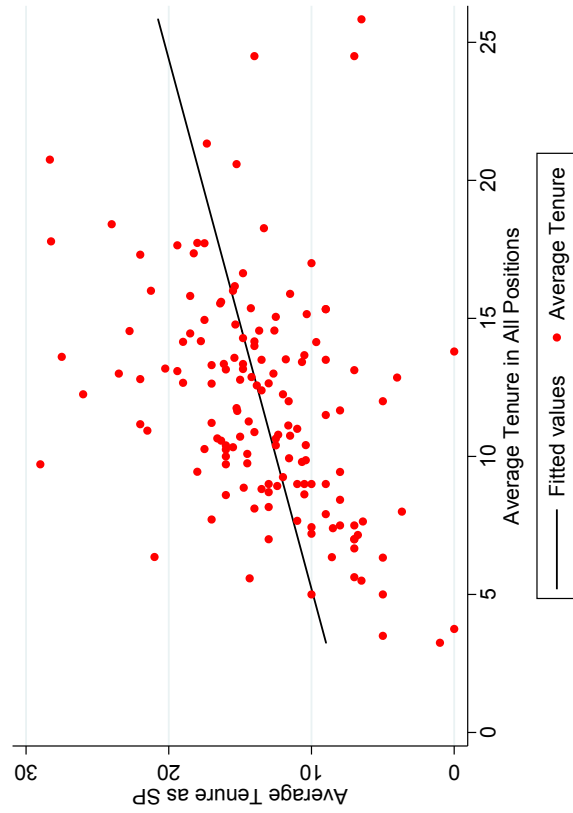
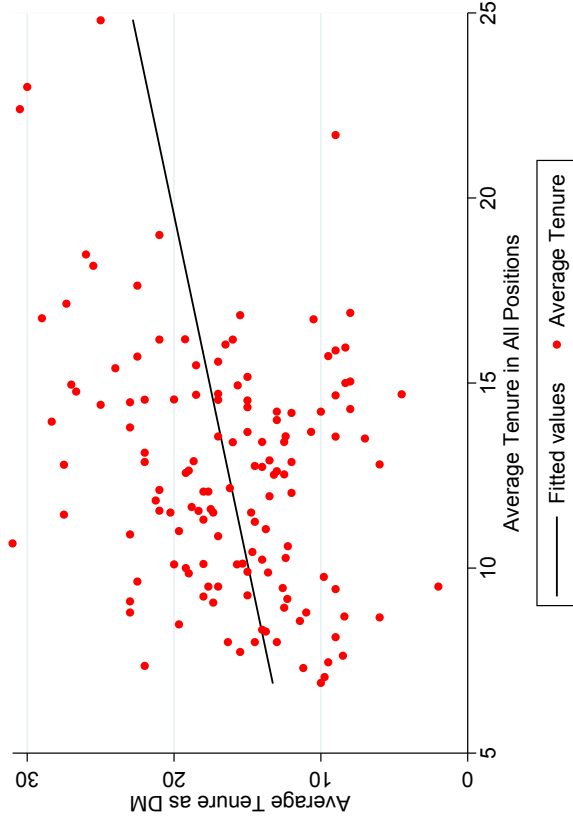


Figure 2.1: Election Timeline



(a) SPs



(b) DMs

Figure 2.2: Average tenure in all positions partially predicts tenure as DM or SP

2.B Tables

Table 2.1: Summary Statistics

	Mean	SD
Aligned district	0.51	0.5
Safe ZP	0.39	0.5
DM change	0.55	0.5
Average DM tenure (months)	20.51	7.60
Number of DM postings	2.71	1.62
SP change	0.81	0.39
Average SP tenure (months)	17.41	7.69
Number of SP postings	3.17	1.86
Total number of crimes (per 100,000 population)	242.16	74.12

Table 2.2: Relationship of political alignment of government tiers and police transfers

	SP Changed		
	(1)	(2)	(3)
ZP chairperson aligned with CM	0.0768* (0.0450)	0.0746 (0.0554)	0.0918** (0.0440)
ZP chairperson aligned with CM * State Election Year		0.00969 (0.0689)	
ZP chairperson aligned with CM * ZP Election Year			-0.102 (0.114)
Mean (sd) of Dep. Var.	0.81 (0.39)	0.81 (0.39)	0.81 (0.39)
Observations	293	293	293
R-squared	0.227	0.227	0.229
District FE	YES	YES	YES
Year FE	YES	YES	YES

Notes— The alignment variable is a dummy that takes value one if the chairperson of the ZP belongs to the same political party as the Chief Minister of the State. “SP Changed” is a dummy that takes value one whenever the SP of a district is changed in a given year, and zero otherwise. The data cover the time period 2001-2013. Standard errors are clustered at district level and reported in parentheses (unless otherwise noted).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 2.3: Relationship of political alignment of government tiers and crime

	Crime per 100,000 population		
	(1)	(2)	(3)
ZP chairperson aligned with CM	8.715** (4.161)	12.11* (6.391)	8.108* (4.271)
ZP chairperson aligned with CM * State Election Year		-15.88 (12.67)	
ZP chairperson aligned with CM * ZP Election Year			4.476 (5.659)
Mean (sd) of Dep. Var.	242.16 (74.12)	242.16 (74.12)	242.16 (74.12)
Observations	422	422	422
R-squared	0.882	0.884	0.882
District FE	YES	YES	YES
Year FE	YES	YES	YES

Notes— The alignment variable is a dummy that takes value one if the chairperson of the ZP belongs to the same political party as the Chief Minister of the State. The crime data include all IPC crimes reported in the police stations located in a district in a year. Population data come from the 2001 and 2011 censuses, interpolated for the rest of the years with the assumption of equal increments in each year. The data cover the time period 2001-2013. Standard errors are clustered at district level and reported in parentheses (unless otherwise noted).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 2.4: Relationship of political alignment of government tiers and types of crime

	Crime per 100,000 population				
	Robbery (1)	Burglary (2)	Theft (3)	Auto Theft (4)	Grievous Hurt (5)
<i>Panel A:</i>					
ZP chairperson aligned with CM	0.173** (0.0735)	0.854** (0.359)	3.010** (1.422)	2.381** (1.041)	3.595** (1.642)
<i>Panel B:</i>					
ZP chairperson aligned with CM	0.260** (0.122)	0.996** (0.463)	4.758** (2.226)	4.082** (1.678)	4.576* (2.398)
ZP chairperson aligned with CM * State Election Year	-0.408 (0.291)	-0.665 (0.757)	-8.187* (4.123)	-7.966** (3.285)	-4.591 (4.994)
<i>Panel C:</i>					
ZP chairperson aligned with CM	0.205** (0.0831)	0.815** (0.363)	2.984** (1.455)	2.531** (1.068)	3.515** (1.656)
ZP chairperson aligned with CM * ZP Election Year	-0.237* (0.140)	0.288 (0.520)	0.190 (1.380)	-1.108 (1.020)	0.588 (2.761)
Observations	422	422	422	422	422
District FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Notes— The alignment variable is a dummy that takes value one if the chairperson of the ZP belongs to the same political party as the Chief Minister of the State. The crime data include all IPC crimes reported in the police stations located in a district in a year. Population data come from the 2001 and 2011 censuses, interpolated for the rest of the years with the assumption of equal increments in each year. The data cover the time period 2001-2013. Standard errors are clustered at district level and reported in parentheses (unless otherwise noted).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 2.5: Relationship of political alignment and tenure of SPs: by home state

	Tenure	
	(1)	(2)
ZP chairperson aligned with CM	1.665 (1.743)	4.187** (2.031)
ZP chairperson aligned with CM * SP from Home State		-6.219* (3.279)
Mean (sd) of Dep. Var.	17.41 (7.69)	17.41 (7.69)
Observations	278	278
R-squared	0.624	0.646
Officer FE	YES	YES
Year FE	YES	YES
Population & Night light controls	YES	YES

Notes— The alignment variable is a dummy that takes value one if the chairperson of the ZP belongs to the same political party as the Chief Minister of the State. Tenure is the number of months a particular officer spends as an SP in a district. It takes the same value for all the years in which the officer was an SP in that district. “SP From Home State” is a dummy that takes value one if the officer’s hometown is in Rajasthan. The regressions control for population and economic activity (measured by luminosity per capita), for each district-year observation. Population data come from the 2001 and 2011 censuses, interpolated for the rest of the years with the assumption of equal increments in each year. Luminosity data come from the night lights dataset of the NOAA. The data cover the time period 2001-2013. Standard errors are clustered at officer level and reported in parentheses (unless otherwise noted).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 2.6: Relationship of political alignment and tenure of DMs: by home state

	Tenure	
	(1)	(2)
ZP chairperson aligned with CM	-2.719 (2.009)	-4.749** (2.287)
ZP chairperson aligned with CM * DM from Home State		7.307** (3.066)
Mean (sd) of Dep. Var.	20.51 (7.60)	20.51 (7.60)
Observations	179	179
R-squared	0.695	0.715
Officer FE	YES	YES
Year FE	YES	YES
Population & Night light controls	YES	YES

Notes— The alignment variable is a dummy that takes value one if the chairperson of the ZP belongs to the same political party as the Chief Minister of the State. Tenure is the number of months a particular officer spends as a DM in a district. It takes the same value for all the years in which the officer was a DM in that district. “DM From Home State” is a dummy that takes value one if the officer’s hometown is in Rajasthan. The regressions control for population and economic activity (measured by luminosity per capita), for each district-year observation. Population data come from the 2001 and 2011 censuses, interpolated for the rest of the years with the assumption of equal increments in each year. Luminosity data come from the night lights dataset of the NOAA. The data cover the time period 2001-2013. Standard errors are clustered at officer level and reported in parentheses (unless otherwise noted).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 2.7: Relationship of alignment to police appointments and crime: by political competition

	SP Changed		Crime Rate	
	(1)	(2)	(3)	(4)
ZP chairperson aligned with CM	0.0768*	0.105**	8.715**	15.07**
	(0.0450)	(0.0504)	(4.161)	(6.206)
ZP chairperson aligned with CM * Safe ZP		-0.0654		-15.28*
		(0.0866)		(8.169)
Mean (sd) of Dep. Var.	0.81	0.81	242.16	242.16
	(0.39)	(0.39)	(74.12)	(74.12)
Observations	293	293	422	422
R-squared	0.227	0.229	0.882	0.884
F -test of $H_0 : \sum \text{coef} = 0$		$p = 0.58$		$p = 0.97$
District FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Notes— The alignment variable is a dummy that takes value one if the chairperson of the ZP belongs to the same political party as the Chief Minister of the State. The variable “Safe ZP” is a dummy that takes value one if a district never experienced a change in the identity of the political party of the chairperson of the Zila Parishad (ZP) during the period of study, and zero otherwise. The crime data include all IPC crimes reported in the police stations located in a district in a year. Population data come from the 2001 and 2011 censuses, interpolated for the rest of the years with the assumption of equal increments in each year. The data cover the time period 2001-2013. Standard errors are clustered at district level and reported in parentheses (unless otherwise noted).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

2.C Proofs

Proof of Lemma 1: We can rewrite equations (2.2.6) and (2.2.7) as follows:

$$\begin{aligned} V_A(\theta) &= \max_{e_A} \left(r_A(\theta) e_A - \frac{e_A^2}{2} \right) + \delta\beta_A [V_N + \pi_c(y(\theta)) (V_A - V_N)] \\ V_N(\theta) &= \max_{e_N} \left(r_N(\theta) e_N - \frac{e_N^2}{2} \right) + \delta\beta_N [V_N + (1 - \pi_c(y(\theta))) (V_A - V_N)] \end{aligned}$$

For given, feasible values of V_A and V_N , such that $V_A \geq V_N$,

$$e_A(\theta) = r_A(\theta) \left[1 - \frac{\delta\beta_A}{Y} (V_A - V_N) \right] \quad (2.C.1)$$

$$e_N(\theta) = r_N(\theta) \left[1 + \frac{\delta\beta_N}{Y} (V_A - V_N) \right] \quad (2.C.2)$$

Therefore, we can write $y(\theta)$ as:

$$y(\theta) = Y - r_0 - H(\theta)$$

where

$$\begin{aligned} H(\theta) &= |\mathcal{A}(\theta)| r_A(\theta)^2 \left[1 - \frac{\delta\beta_A}{Y} (V_A - V_N) \right] + \\ &\quad |\mathcal{N}(\theta)| r_N(\theta)^2 \left[1 + \frac{\delta\beta_N}{Y} (V_A - V_N) \right] \end{aligned}$$

The center chooses p_A and p_N to maximize $y(\theta)$. Furthermore, condition (2.2.3) must be satisfied. Therefore, we can substitute $p_N = \frac{D_H - |\mathcal{A}(\theta)| p_A}{|\mathcal{N}(\theta)|}$. Taking the derivative of $y(\theta)$ with respect to p_A and setting it equal to 0 yields:

$$e_A(\theta) = e_N(\theta) \quad (2.C.3)$$

The result in (2.C.3) may be written out as:

$$\begin{aligned} \left[1 - \frac{\delta\beta_A}{Y} (V_A - V_N)\right] r_A(\theta) &= \left[1 + \frac{\delta\beta_N}{Y} (V_A - V_N)\right] r_N(\theta) \\ \implies \frac{r_A(\theta)}{r_N(\theta)} &= \frac{\left[1 + \frac{\delta\beta_N}{Y} (V_A - V_N)\right]}{\left[1 - \frac{\delta\beta_A}{Y} (V_A - V_N)\right]} \end{aligned} \quad (2.C.4)$$

As such, we need to make sure that the values of p_A and p_N that allow the equality in (2.C.4) to hold are indeed feasible. Note that the ratio r_A/r_N is continuous in p_A . Furthermore, the domain of r_A/r_N , thought of as a function of p_A , is a connected subset of $\mathbb{R}_+$. Therefore, if we can show that there exists a value of p_A such that the ratio is less than the constant on the right-hand side of (2.C.4) and a value of p_A such that the ratio is greater than this constant, then, by the Intermediate Value Theorem, there must exist a value of p_A such that the equality in (2.C.4) is satisfied. We proceed now to show a sufficient condition:

$$\min \frac{r_A(\theta)}{r_N(\theta)} \leq \frac{\left[1 + \frac{\delta\beta_N}{Y} (V_A - V_N)\right]}{\left[1 - \frac{\delta\beta_A}{Y} (V_A - V_N)\right]} \leq \max \frac{r_A(\theta)}{r_N(\theta)} \quad (2.C.5)$$

Now, the center can always choose $r_A(\theta) = r_N(\theta)$ by choosing $p_A = p_N = \frac{D_H}{D}$. Given $V_A \geq V_N$, as assumed in the statement of this lemma, the constant on the right-hand side of (2.C.4) is ≥ 1 . Therefore,

$$\min \frac{r_A(\theta)}{r_N(\theta)} \leq 1 \leq \frac{\left[1 + \frac{\delta\beta_N}{Y} (V_A - V_N)\right]}{\left[1 - \frac{\delta\beta_A}{Y} (V_A - V_N)\right]}.$$

Now suppose $\theta \in \left\{ \theta' \in \tilde{\Theta} : |\mathcal{A}(\theta)| \geq D_H \right\}$. Then,

$$\begin{aligned}
\max \frac{r_A(\theta)}{r_N(\theta)} &= \frac{r_L + \max p_A(r_H - r_L)}{r_L + \min p_N(r_H - r_L)} \\
&= \frac{r_L + \frac{D_H}{|\mathcal{A}(\theta)|} (r_H - r_L)}{r_L} && \text{(due to (2.2.4) and (2.2.5))} \\
&= \frac{(|\mathcal{A}(\theta)| - D_H) r_L + D_H r_H}{|\mathcal{A}(\theta)| r_L} \\
&\geq \frac{(D - D_H) r_L + D_H r_H}{D r_L} \\
&= \left(\frac{D - D_H}{D} \right) + \left(\frac{D_H}{D} \cdot \frac{r_H}{r_L} \right) \\
&\geq \frac{1}{\kappa} && \text{(due to Assumption 2)}
\end{aligned}$$

Therefore,

$$\begin{aligned}
\max \frac{r_A(\theta)}{r_N(\theta)} &\geq \left[\frac{(1 - \delta) Y + \beta_N \delta}{(1 - \delta) Y - \beta_A \delta} \right] \\
&= \left[\frac{1 + \frac{\delta \beta_N}{Y} \left(\frac{1}{1 - \delta} \right)}{1 - \frac{\delta \beta_A}{Y} \left(\frac{1}{1 - \delta} \right)} \right] \\
&\geq \left[\frac{1 + \frac{\delta \beta_N}{Y} (V_A - V_N)}{1 - \frac{\delta \beta_A}{Y} (V_A - V_N)} \right]
\end{aligned}$$

since

$$\frac{1}{1 - \delta} \geq V_S \geq 0 \quad \text{for } S \in \{A, N\}.$$

Similarly, it can be shown that for any $\theta \in \left\{ \theta' \in \tilde{\Theta} : |\mathcal{A}(\theta)| < D_H \right\}$:

$$\max \frac{r_A(\theta)}{r_N(\theta)} \geq \frac{1}{\kappa}$$

using the implication of Assumption 2 that $r_H/r_L \geq (D - D_H)/(\kappa D - D_H)$.

Thus, we have shown that (2.C.5) holds $\forall \theta \in \tilde{\Theta}$. Thus, it is indeed feasible for the center to choose $(p_A(\theta), p_N(\theta))$ such that $e_A(\theta) = e_N(\theta)$. ■

Proof of Lemma 2: As in the proof of Lemma 1, for given, feasible values of V_A and V_N , such that $V_A > V_N$, we have that:

$$e_A(\theta) = r_A(\theta) - r_A(\theta) \frac{\delta\beta_A}{Y} (V_A - V_N) \quad (2.C.6)$$

$$e_N(\theta) = r_N(\theta) + r_N(\theta) \frac{\delta\beta_N}{Y} (V_A - V_N) \quad (2.C.7)$$

Now, consider the expressions on the right-hand side of (2.C.6) and (2.C.7). Since it is assumed in the statement of this lemma that $V_A > V_N$, we have that $V_A - V_N > 0$. Furthermore, $\frac{\delta\beta_S}{Y} > 0$ for $S \in \{A, N\}$. Lastly, since $r_A(\theta)$ and $r_N(\theta)$ are simply convex combinations of r_H and r_L , we have that $r_A(\theta), r_N(\theta) \in [0, 1]$. Therefore, suppose $r_A(\theta) \leq r_N(\theta)$. Then:

$$\begin{aligned} & r_A(\theta) \leq r_N(\theta) \\ \implies & r_A(\theta) - \left[r_A(\theta) \frac{\delta\beta_A}{Y} (V_A - V_N) \right] < r_N(\theta) + \left[r_N(\theta) \frac{\delta\beta_N}{Y} (V_A - V_N) \right] \end{aligned} \quad (2.C.8)$$

The reason (2.C.8) holds is as follows. Note that both $r_A(\theta)$ and $r_N(\theta)$ cannot be equal to 0. Firstly, $r_H, r_L \in [0, 1]$ with $r_H > r_L$. Therefore, $r_H > 0$. Furthermore, $p_A(\theta) = p_N(\theta) = 0$ is not possible, due to (2.2.4), (2.2.5) and the assumption that $D_H, D_L \geq 1$. As such, if $r_A(\theta) \leq r_N(\theta)$, then (2.C.8) holds and contradicts the result of Lemma 1. Thus, if $V_A > V_N$ in equilibrium, then it must be the case that:

$$\begin{aligned} & r_A(\theta) > r_N(\theta) \\ \implies & p_A(\theta) r_H + (1 - p_A(\theta)) r_L > p_N(\theta) r_H + (1 - p_N(\theta)) r_L \\ \implies & r_H (p_A(\theta) - p_N(\theta)) > r_L (p_A(\theta) - p_N(\theta)) \\ \implies & p_A(\theta) > p_N(\theta) \end{aligned}$$

■

Proof of Proposition 1: We prove this proposition in three steps. First, we show that there exists a TSMPE with $V_A \geq V_N$. Second, we show that $V_A = V_N$ is not possible in equilibrium. Finally, we show that there is no equilibrium with $V_A < V_N$.

For the first part of the proof, consider an allocation of continuation payoffs such that $V_A \geq V_N$. Let $v_A(\theta)$ and $v_N(\theta)$ denote the flow payoffs to districts of type A and N , respectively. By Lemma 1, if $V_A \geq V_N$, then $e_A(\theta) = e_N(\theta)$ for all θ . Thus, $r_A(\theta) \geq r_N(\theta) \implies r_A(\theta) e_A(\theta) \geq r_N(\theta) e_N(\theta)$. So, we have that:

$$v_A \geq v_N$$

where $v_A = \mathbb{E}_\theta v_A(\theta)$ and $v_N = \mathbb{E}_\theta v_N(\theta)$. Now, given continuation payoffs V_A and V_N , define $V'_A = \mathbb{E}_\theta V_A(\theta)$ and $V'_N = \mathbb{E}_\theta V_N(\theta)$. Then,

$$\begin{aligned} V'_A &= v_A + \delta \beta_A \left[V_N + \frac{Y - r_0 - |\mathcal{A}| \mathbb{E}_\theta r_A(\theta) e_A(\theta) - |\mathcal{N}| \mathbb{E}_\theta r_N(\theta) e_N(\theta)}{Y} (V_A - V_N) \right] \\ V'_N &= v_N + \delta \beta_N \left[V_N + \frac{r_0 + |\mathcal{A}| \mathbb{E}_\theta r_A(\theta) e_A(\theta) + |\mathcal{N}| \mathbb{E}_\theta r_N(\theta) e_N(\theta)}{Y} (V_A - V_N) \right] \end{aligned}$$

Since, $Y > 2(D+1)$ (Assumption 1) and $\beta_A > \beta_N$, $V_A \geq V_N \implies V'_A \geq V'_N$. Therefore, the expressions for V'_A and V'_N above define a continuous function $f : M \rightarrow M$ with $M = \{(x_1, x_2) \in \mathbb{R}^2 : x_1 \geq x_2\}$. M is a compact and convex set. Therefore, by the Brouwer fixed point theorem, $\exists x_0 \in M$ such that $f(x_0) = x_0$. Thus, there exists a TSMPE with $V_A \geq V_N$.

We now show that it *cannot* be the case that $V_A = V_N$ in equilibrium. If $V_A = V_N$, then by (2.C.1) and (2.C.2), $e_A(\theta) = r_A(\theta)$ and $e_N(\theta) = r_N(\theta)$. Thus, the optimal decision of the center would be to set $r_A(\theta) = r_N(\theta)$, with $p_A(\theta) = p_N(\theta) = D_H/D$. Thus, $v_A = v_N$. But then $V'_A > V'_N$ due to the fact that $\beta_A > \beta_N$. This is a contradiction. Therefore, in any equilibrium in which $V_A \geq V_N$, we must have $V_A > V_N$.

Finally, we show that there is no equilibrium with $V_A < V_N$. First, note that:

$$\begin{aligned}
\max_{p_A(\cdot)} \frac{v_N}{v_A} &= \max_{p_A(\cdot)} \frac{r_N e_N - \frac{e_N^2}{2}}{r_A e_A - \frac{e_A^2}{2}} \\
&\leq \left(\frac{r_H}{r_L} \right) \cdot \left(\frac{1}{\kappa} \right) \\
\Rightarrow \left(\frac{1 - \delta\beta_A}{1 - \delta\beta_N} \right) \max_{p_A(\cdot)} \frac{v_N}{v_A} &\leq \left(\frac{1 - \delta\beta_A}{1 - \delta\beta_N} \right) \left(\frac{r_H}{r_L} \right) \cdot \left(\frac{1}{\kappa} \right) \\
&\leq 1 \quad \text{(by Assumption 3)} \\
\Rightarrow \frac{v_N}{1 - \delta\beta_N} &\leq \frac{v_A}{1 - \delta\beta_A} \quad (2.C.9)
\end{aligned}$$

Furthermore, note that since $V_A < V_N$, the highest possible expected lifetime payoff of a non-aligned district is to receive v_N in every period. On the other hand, the lowest possible expected lifetime payoff of an aligned district is to receive v_A in every period. Therefore:

$$V'_A \geq \frac{v_A}{1 - \delta\beta_A} \quad \text{and} \quad V'_N \leq \frac{v_N}{1 - \delta\beta_N} \quad (2.C.10)$$

Putting (2.C.9) and (2.C.10) together, we get:

$$V'_N \leq \frac{v_N}{1 - \delta\beta_N} \leq \frac{v_A}{1 - \delta\beta_A} \leq V'_A$$

Therefore, we have shown that $V'_A \geq V'_N$, so long as Assumption 3 is satisfied. But this is a contradiction, since $V_A < V_N$. Therefore, it is not possible to have an equilibrium with $V_A < V_N$. Thus, in any *TSMPE*, we must have $V_A > V_N$. This completes the proof of part (i) of this proposition. Parts (ii) and (iii) follow, respectively, from Lemmas 1 and 2. Part (iv) follows from the fact that $p_A(\theta) > p_N(\theta) \implies r_A(\theta) > r_N(\theta)$. ■

Chapter 3

Globalization and Child Health

Outcomes: Evidence from Indian Districts*

3.1 Introduction

The question of whether economic liberalization spurs economic growth has been much debated. John Williamson, in detailing the ideas that collectively came to be known as the Washington Consensus, mentioned trade liberalization, and its accompanying tariff reductions, to be important for promoting economic growth (Williamson, 2004). Other commentators, notably Stiglitz, have been critical of the use of wholesale liberalization as a solution to economic problems (Serra and Stiglitz, 2008, Ch. 4). Furthermore, how closely changes in income poverty correspond to changes in other measures of well being, such as the quality of nutrition, heights, mortality, and so forth is also unclear (Cutler et al., 2006). Nonetheless, to the extent that income is often considered to have instrumental value for

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improving quality of life, it is important to investigate whether reforms that seem to impact income also impact other well being measures.

As discussed in Topalova (2007), theoretical predictions regarding the impact of trade liberalization on factor returns vary widely. In particular, while the Heckscher-Ohlin model predicts that gains from trade flow to abundant factors (primarily unskilled labor in the case of India), recent theoretical work, departing from the assumptions of perfect factor mobility and of the absence of other labor market frictions, has challenged this claim.¹

In this paper, we study the impact of tariff changes in India over the period 1987-1997 on infant and child mortality.² As discussed in more detail below, we construct a rich data set, combining data from Rounds 1 and 2 of the NFHS with the tariff data that Petia Topalova kindly made available to us. We demonstrate that most of the variation in infant mortality over the period under study can be attributed to trends at the national and district level, leaving little room for tariffs to have any explanatory power.

The identification strategy of this paper follows that in various other papers in the literature, such as Topalova (2007, 2010) and Anukriti and Kumler (2014). However, in addition to performing our analysis using regression specifications similar to those used in these papers, we also estimate an event-study in an attempt to carefully break down the marginal impact of tariff changes by each year in our data. The results from the event-study provide further evidence to support the interpretation of the results of our other regression specifications as null results. The event-study also accounts, in a flexible way, for the possibility of an impact of tariffs occurring with a lag (see T.N. Srinivasan's comments on Hasan et al. (2007)).

Our paper is related to the literature in international trade and development that looks at the impact of trade liberalization on wage inequality. This literature has largely dealt with Latin American countries, and focused mostly on the manufacturing sector (Revenge

¹See Topalova (2007) for a more detailed overview of this literature.

²We will mostly focus on infant mortality in our regressions, since the results for child mortality are very similar.

(1997), Hanson and Harrison (1999), Feliciano (2001) and Attanasio et al. (2004), to list some examples). There are very few papers that look at the impact on poverty, per se (Porto (2003), Goldberg and Pavcnik (2007a,b), and Topalova (2007, 2010)). We add to this literature, and to the debate on the impact of trade reforms on other socio-economic variables (e.g., Edmonds et al. (2010) study the impact on school enrollment). Our paper is most closely related to Anukriti and Kumler (2014), which looks at the impact of trade liberalization on fertility and child health outcomes. We, however, differ in technique and data, and, in fact, obtain results to the contrary.

The remainder of the paper is organized as follows. Section 3.2 describes the Indian reforms of 1991. Section 3.3 describes the two data sets that we have used, and also provides a note on how we link the two. Section 3.4 outlines the empirical framework. Section 3.5 presents the results and Section 3.6 concludes.

3.2 Indian trade liberalization

India's foreign debt has climbed to about \$72 billion, making it the world's third largest debtor... At the moment, ... India has only \$1.1 billion in its hard-currency reserves, enough for two weeks of imports.

– *The New York Times*, June 29, 1991³

Faced with an impending currency crisis, and on the verge of defaulting on loans for the first time since independence, the Government of India (GOI) carried out major economic reforms in mid-1991. These reforms were prerequisite conditions of the IMF bailout package. The GOI was required to unilaterally reduce the overall level and dispersion of import tariffs and also to remove non-tariff barriers (NTBs), such as import licensing.

This marked a sharp change in Indian trade policy, with the maximum tariff falling from 400 percent to 150 percent. By 1997, the maximum tariff had fallen to 45 percent (Hasan

³<http://www.nytimes.com/1991/06/29/world/economic-crisis-forcing-once-self-reliant-india-to-seek-aid.html>

et al. (2007)). Average tariffs fell from 80 percent in 1990 to 37 percent in 1996 (See Figure 1 in Topalova (2010, p. 6)). The proportion of goods subject to quantitative restrictions was reduced from 87 percent in 1987 to 45 percent in 1994 (Topalova (2010)).

Several features of the tariff reform help allay the usual endogeneity concerns. First, it was unanticipated, sudden and not part of a planned strategy. Hence, it could not have given households time to adjust key economic decisions in anticipation. In fact, economists such as Jagdish Bhagwati have called it “shock-therapy” (Bhagwati (1993)). Political scientists such as Ashutosh Varshney have recognized the pace of reforms to have been too fast to have appeared on the political radar (Varshney (1998)).

Second, Topalova has argued that, until 1997, the tariff reductions across products did not vary in any systematic way to confound analysis (Topalova (2010)). In particular, in the 1987-1997 time period, future tariffs were not correlated with present productivity of different industries (Topalova and Khandelwal (2011)). Neither were future tariffs found to be correlated with present industry characteristics, such as the number of employees, industrial concentration, share of skilled workers, consumption, (log) wage or poverty of workers (Topalova (2007)).

3.3 Data

3.3.1 Infant and child mortality from the Demographic and Health Surveys

Our primary outcomes of interest are infant and child mortality, defined, respectively, as the number of deaths among children less than one year old and less than five years old, measured per 1,000 live births. The data come from pooling the National Family and Health Surveys Rounds 1 and 2, conducted in 1992/93 and in 1998/99, respectively.⁴ The NFHS

⁴A potential concern of bias due to incorrect weighting of observations from two different surveys is legitimate. Some years have observations that come from both rounds 1 and 2 of the NFHS, and in other

(India’s version of the Demographic and Health Survey) is a large, nationally representative sample of reproductive age (defined as 15-49 years of age) ever-married women. Each round samples approximately 90,000 women who report birth histories, including deaths and still births, maternal characteristics, household characteristics, and information on health and health investments of each of their children. Women report this information regardless of the survival of their children till the time of the survey, with the exception of child health histories, which are reported only for children born within 5 years of the survey.

Our unit of observation is a birth, and we construct mortality rates from birth history information over the two waves of the survey. We include every birth since 1975, so that all districts in our sample have at least 1 birth in all subsequent years. We focus on the district as the geographical unit of interest, and ideally we would want information on the district of birth of each child. However, the NFHS only provides information on place of residence. Therefore, unless we assume that mothers do not migrate to a different district after initiating child-bearing, our estimates will not be reliable. On the face of it, this seems unreasonable; however, in practice, home-leaving for women in India is mostly a result of marriage (Vogl (2013)). Moreover, Topalova (2010) shows that only three to five percent of women moved across districts in the relevant time period.

Unfortunately, we could not use NFHS Round 3, conducted in 2005/06, since it does not contain district identifiers, which are critical for us to be able to match the mortality data with district exposure to tariff changes.

3.3.2 Tariff data

The tariff data come directly from Topalova (2010), and we direct the reader to her paper for further details. Like others in the literature (Edmonds et al. (2010) and Anukriti and Kumler (2014)), we ignore non-tariff barriers (NTBs) owing to data availability problems.

years (e.g., 1994 onward), we have observations from only one of the two surveys. However, in practice, with the DHS, such weighting is not known to have any significant impact on estimates. Hence, in this paper, we do not weight observations at all.

Our results will be biased to the extent that some of the impact of tariff changes may actually be due to removal of NTBs. We therefore step back and interpret our coefficients as the impact of trade liberalization in general, and not just of tariff cuts.⁵

3.3.3 Note on merging mortality and tariff data

Given national tariffs for industries and 1991 employment shares across industries for each district, Topalova (2010) constructs a district level measure of exposure to tariff changes. Note that we do not have industry-wise tariff data or employment shares, but only (employment share weighted) district-wise annual tariff measures. The district information is coded according to the National Sample Survey Round 43 (conducted in 1987/88). We then match the unique district tariffs to the district-child observations. Therefore, all observations in a district in a given year are assigned the same tariff measure. In doing so, we lose a small number of districts that were sampled by the NSS but not by the NFHS. Since the NFHS district information is from a later date than the NSS, we use publicly available information on each district to correct for the possibility that certain districts may have split from a larger district or had a change of official name in the interim. In case a district was carved out of a larger district, we assign the same level of tariff to both the new and the parent district.

Furthermore, the tariff information is available only for a subset of years (1987-1997) for which we have information on fertility and mortality (1975-1999). In this paper, we will truncate our analysis at 1996, the last year for which we have complete information on all districts. Also, for our analysis, we focus only on the rural districts – in urban areas, the changes in tariffs were very highly correlated with preexisting trends in poverty and other

⁵Another possible concern is that for some products protected by both tariffs and NTBs, only one of the two may be binding – changes in one may impact trade decisions while changes in the other, within a certain range, have no effect. See T.N. Srinivasan’s comments for more details (Hasan et al. (2007)). The data we have cannot be used to account for this problem.

reforms; even controlling for trends, the possibility of correlation with other time varying regional shocks is substantial (Topalova (2010, p. 20)).

3.4 Empirical strategy

3.4.1 Framework

For our initial set of results, we follow the identification strategy first introduced in Topalova (2007) and later used in many other papers (Anukriti and Kumler (2014), Edmonds et al. (2010) and Topalova (2010)). It is a difference-in-difference regression design, which compares the evolution of infant mortality, before and after the reform, in districts that faced greater tariff cuts to districts that remained relatively protected. Our baseline specification takes the following form:

$$\text{mortality}_{imdt} = \alpha + \beta \text{Tariff}_{dt} + \delta_d + \gamma \text{Post}_t + \epsilon_{imdt} \quad (3.4.1)$$

where i indexes children, m mothers, d districts and t time. The dependent variable is an individual level mortality indicator – 0 if the child survived to the specified age and 1000 if she did not. This construction scales mortality rates and coefficients to match the standard of expressing rates in “per 1000” terms. Tariff_{dt} is the level of protection for district d at time t (defined in more detail below). The coefficient of interest is β , which captures the average effect of trade protection on district mortality rates. The inclusion of district fixed effects, δ_d , controls for time-invariant heterogeneity at the district level. The Post_t dummy, which is 1 for years 1992 and after, controls for macroeconomic shocks that affect India as a whole, and vary only as we cross the threshold of 1991. In all regressions in this paper, we cluster standard errors at the district level to allow for an arbitrary correlation structure within districts for the error term.

Using our granular data, we also run a more flexible regression of the following form:

$$\text{mortality}_{imdt} = \alpha + \beta \text{Tariff}_{dt} + \delta_k + \lambda_g t + \tau_t + \epsilon_{imdt} \quad (3.4.2)$$

where $g \in \{d(\text{district}), s(\text{state})\}$, $k \in \{d(\text{district}), m(\text{mother})\}$ and τ_t are time fixed effects that control for time-varying macroeconomic shocks in a more flexible manner. We can also control for state (s) or district (d) specific trends, $\lambda_g t$.

The literature on income shocks and mortality rates has been particularly concerned with selection into child-bearing following an income shock. For example, if adverse shocks induce women to defer fertility, and this is more pronounced among women prone to higher fertility risks, then births in a recession will be selectively low-risk (Dehejia and Lleras-Muney (2004)). Moreover, in developing economies, where the state is less adept at providing insurance during macroeconomic shocks, households may resort to other, costlier sources of insurance (Morduch (1995)). Of particular concern are adjustments to fertility and maternal labor supply, as these adjustments may directly impact the health and survival of infants (Bhalotra (2010)). We introduce mother fixed effects in specification (3.4.2) to address these issues. Note that since we observe mothers only once, the mother fixed effect subsumes the district fixed effect, under the assumption that mothers do not migrate across districts between births.

Next, we estimate the following event study specification that, to the best of our knowledge, has not so far been analyzed in the literature relevant to our work here.

$$\text{mortality}_{imdt} = \delta_k + \tau_t + \beta_{\text{pre}} \mathbf{1}\{t < 1980\} |\Delta \text{Tariff}_d| + \sum_{s \in S} \beta_s \mathbf{1}\{t = s\} |\Delta \text{Tariff}_d| + \epsilon_{imdt}, \quad (3.4.3)$$

where

$$\begin{aligned}\Delta\text{Tariff}_d &= \text{Tariff}_{d,1987} - \text{Tariff}_{d,1997} \\ k &\in \{d(\text{district}), m(\text{mother})\} \\ \mathcal{S} &= \{\{1980, \dots, 1996\} \setminus 1992\}\end{aligned}$$

The event study approach has at least two distinct advantages. The bulk of the tariff reductions took place in two “shock-like” episodes in 1992 and 1996. Our regressor of interest here, $|\Delta\text{Tariff}_d|$, treats that shock as a “once and for all” change. This allows us to extend the “control” group to the period before 1991. This is the first advantage. In principle, mortality rates should not have been impacted in years prior to the reform in 1991. However, including district data from the period before 1991 in our regression allows us to graphically look for preexisting trends. Note that for our event study specification, we will treat the year of liberalization as 1992 rather than 1991. This is because although reforms were announced in August 1991, the changes in tariffs appear in the data only in 1992, making it the relevant baseline year for comparisons. This is clear from Figure 1 in Topalova (2010, p. 6).

We interpret our coefficients of interest, $\{\beta_s\}_{s \in \mathcal{S}}$, as the impact of tariff shocks in the year s on mortality, relative to 1992. Here lies the second advantage of the event-study. The concern with estimating a single, time-invariant β is that tariff changes may have been associated with other time-varying factors that affect mortality but are not accounted for by the district/mother and year fixed effects. We discuss reasons for this in sections 3.4.2 and 3.4.3. The literature has dealt with this problem by using an IV approach, which itself may be problematic for reasons discussed in section 3.4.4.

In this more flexible approach, we estimate the treatment effect in 12 years leading up to the tariff “shock,” and in 4 years after. This allows us to test for any potential trends or leads in the run-up to the 1991 reforms. Further, it is possible to see if there were any temporary impacts of tariffs change, and if the effects occurred with a lag. As mentioned

in the introduction, it is plausible that infant mortality responds more slowly to income changes; this is not captured in the regression specifications in the literature. It is also possible that there were temporary impacts that were netted out over time, such that the average effect may be null or negative. We also use this strategy to look at more vulnerable sub-groups (such as uneducated mothers and teenage mothers, for instance) to examine if they were hit harder than others.

3.4.2 Identifying assumption

The key identifying assumption is that Tariff_{dt} (or $|\Delta\text{Tariff}_d|$) is uncorrelated with any preexisting time-varying trends not captured by the fixed effects. This assumption would hold, for instance, if districts with different industrial compositions had, barring the tariff shock, similar mortality trends. Further, note that this strategy does not identify the overall effect of trade liberalization on India as a whole but rather measures whether some districts benefited more than others as a consequence of differences in tariff changes.

3.4.3 Measurement of regional exposure to trade liberalization

Tariffs are set by the central government and vary only across industries and over time. Following Topalova (2010) and others, the measure of trade exposure is the tariff that a district faces, calculated as the average of the nominal ad-valorem tariffs at time t , weighted by 1991 employment shares:

$$\text{Tariff}_{dt} = \frac{\sum_i \text{Worker}_{d,i,1991} \text{tariff}_{i,t}}{\sum_i \text{Worker}_{d,i,1991}} \quad (i \text{ indexes industries})$$

In this calculation, non-traded industries are assigned a zero tariff for the entire period. For a detailed discussion of why this might induce a correlation between Tariff_{dt} and initial poverty levels, see Topalova (2010, pp. 12-13).

Another problem is that the Tariff_{dt} measure implicitly assumes that the impact of tariff changes on local prices is uniform across districts, regardless of the geographical location of the districts and, thus, of the transportation costs and local or state-level tariffs that the districts might face. Theoretically, local prices are a sufficient measure of any district's exposure to trade. Now suppose that, for some inland district d , the cost of importing a good from some district d' near a port is, both before and after the tariff change, greater than the local cost of producing the good. In this case, the change in the national tariff would have no impact on the local prices in district d . Nonetheless, given how the tariff measures are defined, the non-zero employment share in district d in the industrial sector to which the product in question belongs would make the national tariff change show up as a change in the composite Tariff_{dt} measure for d , even though, economically, this national tariff change is irrelevant for district d . This point is discussed in further detail in T.N. Srinivasan's comments on Hasan et al. (2007).

3.4.4 Concerns with the IV

Owing to concerns discussed above regarding the endogeneity of the Tariff_{dt} variable, Topalova (2010) proposes using TrTariff_{dt} , a measure of tariff exposure that ignores workers in the non-traded sector, as an instrument for Tariff_{dt} . She defines the instrument as follows:

$$\text{TrTariff}_{dt} = \frac{\sum_{i \in \{\text{Traded Sector}\}} \text{Worker}_{d,i,1991} \text{tariff}_{i,t}}{\sum_{i \in \{\text{Traded Sector}\}} \text{Worker}_{d,i,1991}}.$$

The key argument in defense of this choice of instrument is that it is independent of the size of the traded sector (or, equivalently, of the proportion of the total workforce employed in the non-traded sector), and is, thus, uncorrelated with initial district poverty levels (Topalova (2010); Anukriti and Kumler (2014)). However, this may not be the case. It is entirely possible that the proportion of the total workforce employed in the non-traded sector impacts, and is thus correlated with, the composition of employment in the traded

sector. In other words, the employment levels in different traded industries, as a percentage of the total employment in the *traded sector*, may well be correlated to the percentage of the *total* workforce employed in the non-traded sector (mostly agriculture). For instance, in a district that is mostly agrarian, of all the workers employed in the traded sector, a greater proportion may in fact be working in certain specific traded industries, compared to a district that is *not* mostly agrarian. The extent of agricultural activity in a district may be correlated with transportation and communication infrastructure, which, in turn, may impact the mix of traded industries operational in the district. We could also think of how the share of agriculture may interact with the productivity or costs of certain traded industries (e.g., employment in the food processing industry may be higher for districts with a larger agriculture sector). Given that variation across districts in the employment shares of traded industries (as a percentage of total *traded sector* employment) may create precisely the sort of problems that variation in initial poverty levels do, such as an induced correlation with preexisting trends in mortality, TrTariff_{dt} may fail to be a valid instrument for Tariff_{dt} .

As such, the identification strategy must assume, in spite of the above argument, that variation in the size and mix of the non-traded sector does not directly impact the composition of employment in the traded sector. Nonetheless, given our concerns, we try to control for pre-reform trends as best we can, using district-specific linear time trends. However, controlling for trends does not entirely correct the problem, since there is no way to precisely control for post-reform trend variation attributable to preexisting district characteristics. Trend controls would, however, be more effective if district mortality trends had a persistent (i.e., mostly time-invariant) linear form.

3.4.5 Regional variation in exposure to trade

The maps in Figures 3.4(a) and 3.4(b) plot, for each district, the absolute change in the Tariff_{dt} and TrTariff_{dt} measure over 1987-1997. These are thus measures of the total tariff shock that each district was exposed to over 1987-1997. Darker colors correspond to greater

changes in tariff. The maps graphically illustrate that we have a large dispersion across districts in the magnitude of exposure to trade reform.

3.5 Results

3.5.1 OLS and IV specifications

In Table 3.1, we report results from regression specifications of the forms given in (3.4.1) and (3.4.2). These are estimated using tariff and infant mortality data from the period 1987-1997. In column (1) of Table 3.1, we regress our measure of infant mortality on tariffs, in column (2) we regress it on traded tariffs and in column (3) we report estimates from an instrumental variables estimation, using traded tariffs as an instrument for tariffs. Columns (1) - (3) show a statistically significant *positive* impact of trade liberalization on infant health. Infant mortality *declined* in districts that faced reduced exposure to tariff barriers (i.e., a lower tariff level), *relative* to districts that faced greater tariff barriers. If income is a key determinant of infant health outcomes, then, on the face of it, this result seems to contradict Topalova's finding that a "cut in tariffs caused a relative poverty increase" (Topalova (2010, p. 14)). At the same time, the results in columns (1) - (3) may also indicate that income is not the key determinant of infant health outcomes in rural India. Availability of physical infrastructure, such as government dispensaries, and qualified doctors may be far more important, especially since the government provides most health services in rural India, and most such services are free. As such, while we do not provide evidence here to this effect, it may be the case that trade liberalization improved the capacity of local governments to provide health care services, even though it may have slowed the pace of poverty reduction.

However, in columns (4) - (6) of Table 3.1, we incorporate time fixed effects, a more flexible way of capturing time-varying national trends than the Post_t variable, and find that the results of columns (1) - (3) are undone. Now, tariffs seem to have no impact on infant

mortality. As such, it seems that national level trends can explain most of the variation in infant mortality across all districts.

In Tables 3.2, 3.3 and 3.4, we study regression specifications of the form (3.4.2). In Table 3.2, we report estimates from regressions that control for state-specific linear trends, in 3.3 we examine the impact of district-specific linear trends, and in 3.4 we use our most comprehensive set of controls, mother fixed effects with district-specific linear trends.

As is clear from the estimates reported in these tables, in none of the specifications is the tariff variable significant. If the tariff variable were to become, say, significantly negative in going from Table 3.1, column (6) to Table 3.3, column (3), then it would be evidence of a possible correlation between tariff reductions and IMR trends across districts.

Our results here also stand in contrast to the results in Table 4 in Anukriti and Kumler (2014). Controlling for district and year fixed effects, as we do in columns (4) - (6) of Table 3.1, Anukriti and Kumler find a statistically significant *negative* coefficient on tariffs (i.e., higher tariff cuts are associated with *increased* infant mortality). On the other hand, even if, like Anukriti and Kumler, we restrict the sample of mothers to only those who were between 13 and 40 years of age at the time of giving birth, we obtain a null result; once district and time specific factors are controlled for, tariffs have no role to play in explaining IMR variation. The most likely reason why our results differ is that our data on infant mortality come from a different source (we use NFHS-1 and NFHS-2, and not DLHS-2). At the same time, however, in line with our results, Anukriti and Kumler (2014) find no effect of tariffs on infant mortality once they control for district-specific linear trends.

3.5.2 Event study specification

Next, we present results from the event study specifications. Figure 3.1 graphically illustrates results from (3.4.3) with district fixed effects. The dependent variable is either infant or child mortality, as described above. We choose 1992 as the base year in these specifications, thus normalizing the coefficient for 1992 to be 0. Our treatment variable now is the tariff

“shock” between 1987-1997 and not the tariff in a particular year. Therefore, the coefficients should be interpreted in the broadest sense, i.e., the impact of the 1991 tariff reforms in any particular year.

It is clear that none of the point estimates for the impact on infant mortality are significantly different from 0, either before or after the reform. For child mortality, tariff reforms do not show any impact in the years leading up to the reform. There is a significant negative impact on child mortality in 1993, the year after the reform. However, the impact fades away immediately in the following year. Furthermore, a test that the coefficients for all years in the period 1987-1996 are jointly 0 yields a p -value of 0.2452. A test of the hypothesis that the *sum* of the coefficients on post-reform years 1993-1996 is 0 yields a p -value of 0.9495, suggesting that there was effectively no cumulative impact of tariff changes in the post-1991 period, relative to the impact in 1992.

Figure 3.2 presents results from a similar regression where we replace district fixed effects with mother fixed effects. We can immediately see that the negative impact in 1993 is not robust. Our inference from Figures 3.1 and 3.2 is that there was no significant differential impact of tariff reforms on infant or child mortality across districts that were more or less exposed to tariff changes. We must also note that we do not observe any trends in the years leading up to the reform and, hence, we do not find evidence that the tariff measure may be correlated with unobservables.

We also run all the event study regressions calculating the tariff shock using the TrTariff_{dt} measure, which excludes the non-traded sector. However, since our qualitative results do not change, we do not report these results here.

Next, we look at various sub-groups that have been argued to be more vulnerable than others. We run regressions of the form (3.4.3) with district fixed effects. Separate regressions are run for every subgroup. In developing countries, girls are usually at a greater risk than boys because families tend to have a preference for the male child. Boys are also seen as a form of old age insurance by parents, since girls tend to move to their husband’s house after

getting married. It is thus likely that greater resources are spent on taking care of a boy as opposed to a girl. So it may be argued that boys tend to be (relatively more) protected against household income shocks. Similarly, teenage mothers are seen as more vulnerable than women who bear children at a later age. This could probably be due to their bargaining power in the family or just experience in raising a child. Figure 3.3 presents these results. In the top panel, we compare boys with girls. The point estimates for girls and boys do not appear to be statistically different from each other, suggesting that the tariff reforms may not have had a differential impact on their infant mortality rates. In the lower panel, we compare young mothers, defined as those less than 18 years old at child birth, to older mothers. Here, again, there seems to be no differential effect whatsoever.

We also compared other categories, such as uneducated and educated parents, unemployed and working mothers, and low income households and high income households (determined by asset ownership). The results look similar to those in the lower panel of Figure 3.3, and hence we do not report them separately. Moreover, information on assets and employment was reported at the time of the survey and, hence, may not be exogenous to the trade shock.

3.6 Conclusion

This paper asks whether India's trade liberalization, beginning in 1991, had an impact on infant and child mortality, widely considered key measures of health and well being. To identify a potential effect, we follow the literature and compare individuals born in districts that were exposed to greater tariff cuts to individuals born in districts that remained relatively protected. In addition to the difference-in-difference approach, we also perform a more flexible event study analysis that not only allows us to look for temporary and lagged impacts of trade liberalization but also to transparently explore preexisting trends.

Previous research, using the same tariff data and the difference-in-difference empirical strategy, finds that districts exposed to greater tariff cuts experience slower declines in income poverty (Topalova (2010)) and slower increase in school enrollment (Edmonds et al. (2010)). Anukriti and Kumler (2014), using mortality data from the 2002-2004 round of the District Level Household Survey, find that low (high) status women exposed to a relatively higher tariff cut experience an increase (decline) in fertility. Girls born to such women are also more likely to die. In contrast, Hasan et al. (2007) find no impact of tariff changes on poverty after including non-tariff barriers.

Our results are in line with those of Hasan et al. (2007), albeit our dependent variable is mortality and not income. Using two rounds of the Demographic and Health Survey, and doing the analysis at the individual level and employing a more flexible event-study approach, we find no differential impact of trade liberalization on infant mortality. We should note that we do not capture the aggregate, national impact of trade liberalization on poverty.

With access to better, more granular data, such as industry-level tariffs, the employment distribution in each district, local prices, transportation costs and information on local trade, we could do a more precise analysis. We leave this as our agenda for future work.

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Appendix

3.A Figures

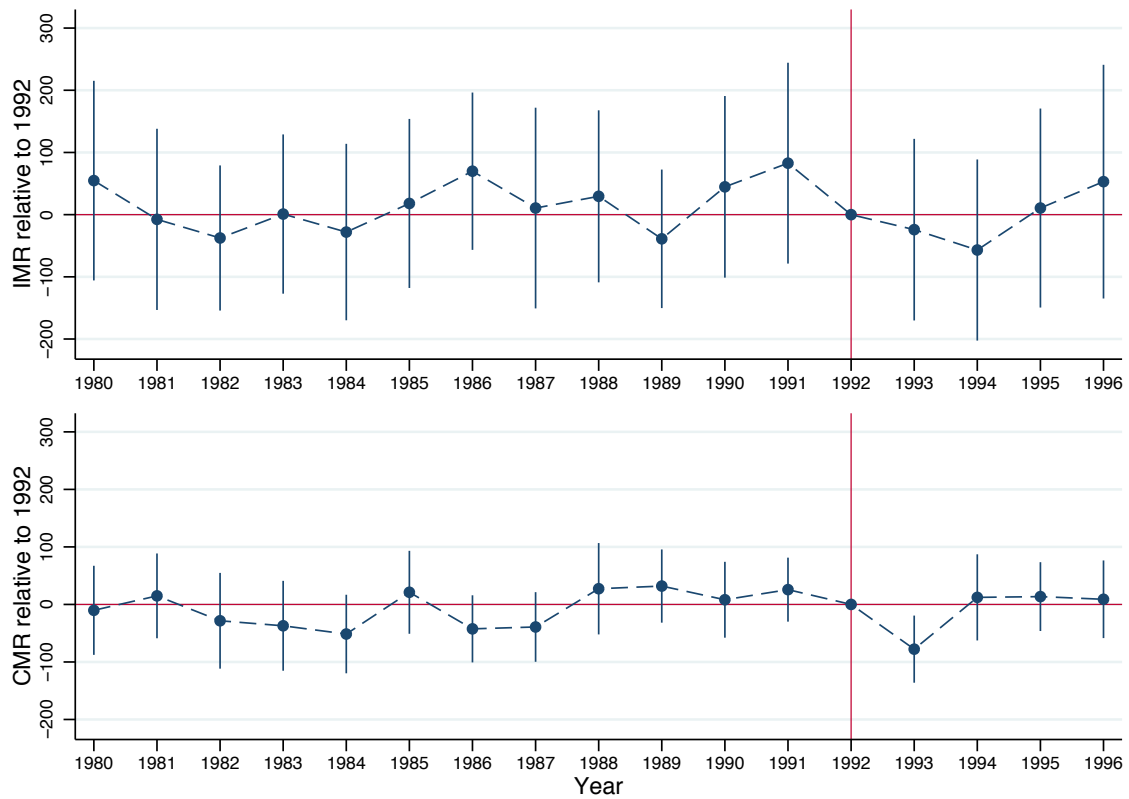


Figure 3.1: Impact of tariff reform on mortality (district fixed effects)

Notes— Point estimates are based on a regression of the form (3.4.3) with district fixed effects. When the dependent variable is infant mortality, the sample consists of 291,881 individual births and, when it is child mortality, of 262,048 individual births. The reference category for the year fixed effects and the treatment is 1992, as shown by the vertical red line. The graph depicts 95% confidence intervals, with standard errors clustered at the district level.

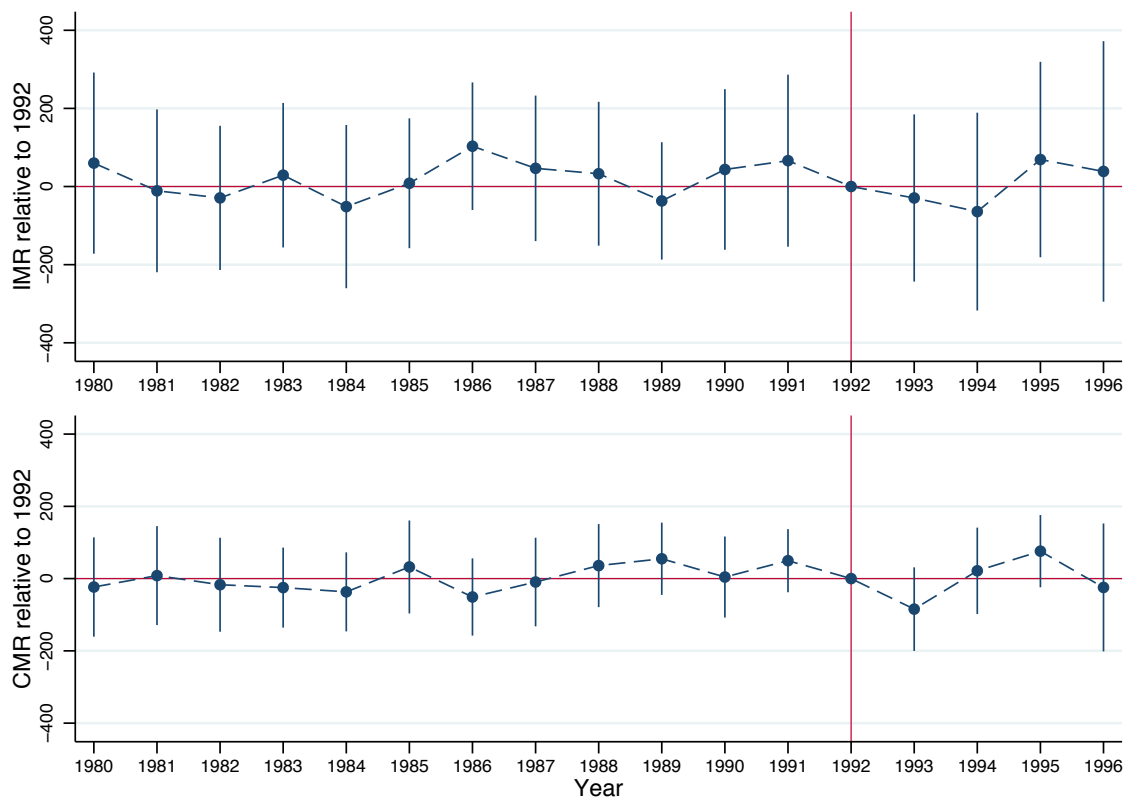


Figure 3.2: Impact of tariff reform on mortality (mother fixed effects)

Notes— Point estimates are based on a regression of the form (3.4.3) with mother fixed effects. When the dependent variable is infant mortality, the sample consists of 291,881 individual births and, when it is child mortality, of 262,048 individual births. The reference category for the year fixed effects and the treatment is 1992, as shown by the vertical red line. The graph depicts 95% confidence intervals, with standard errors clustered at the district level.

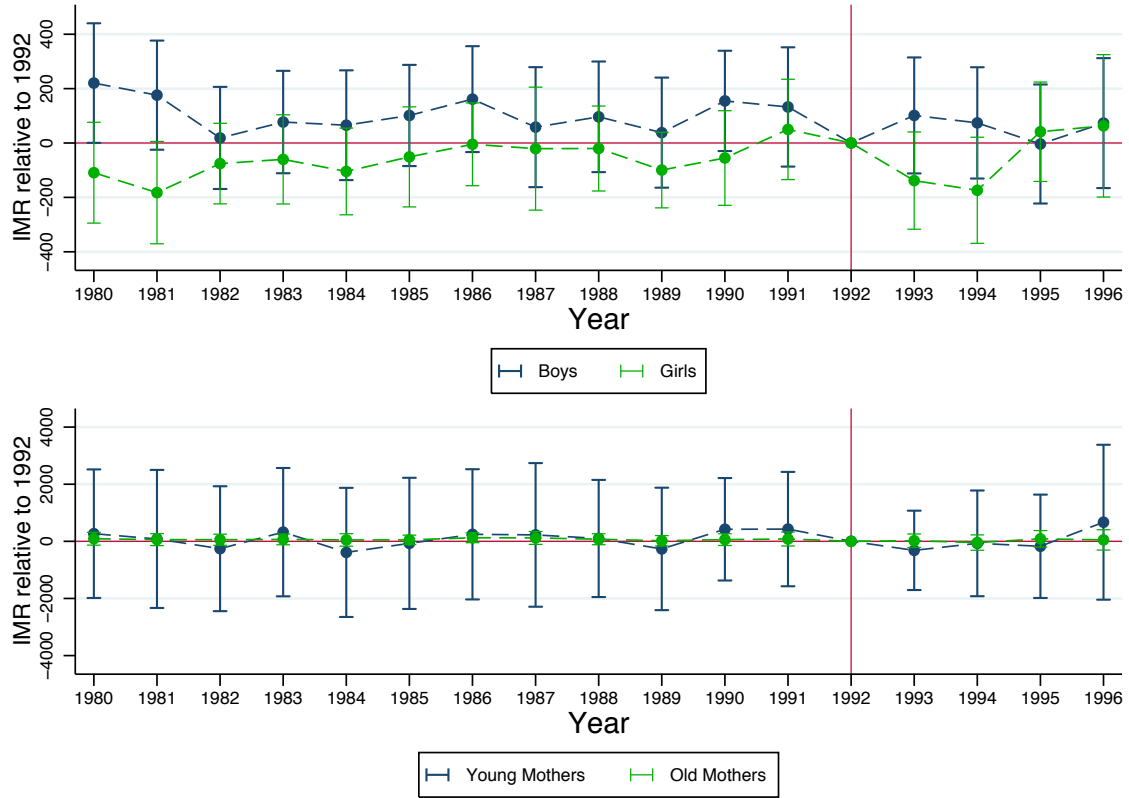
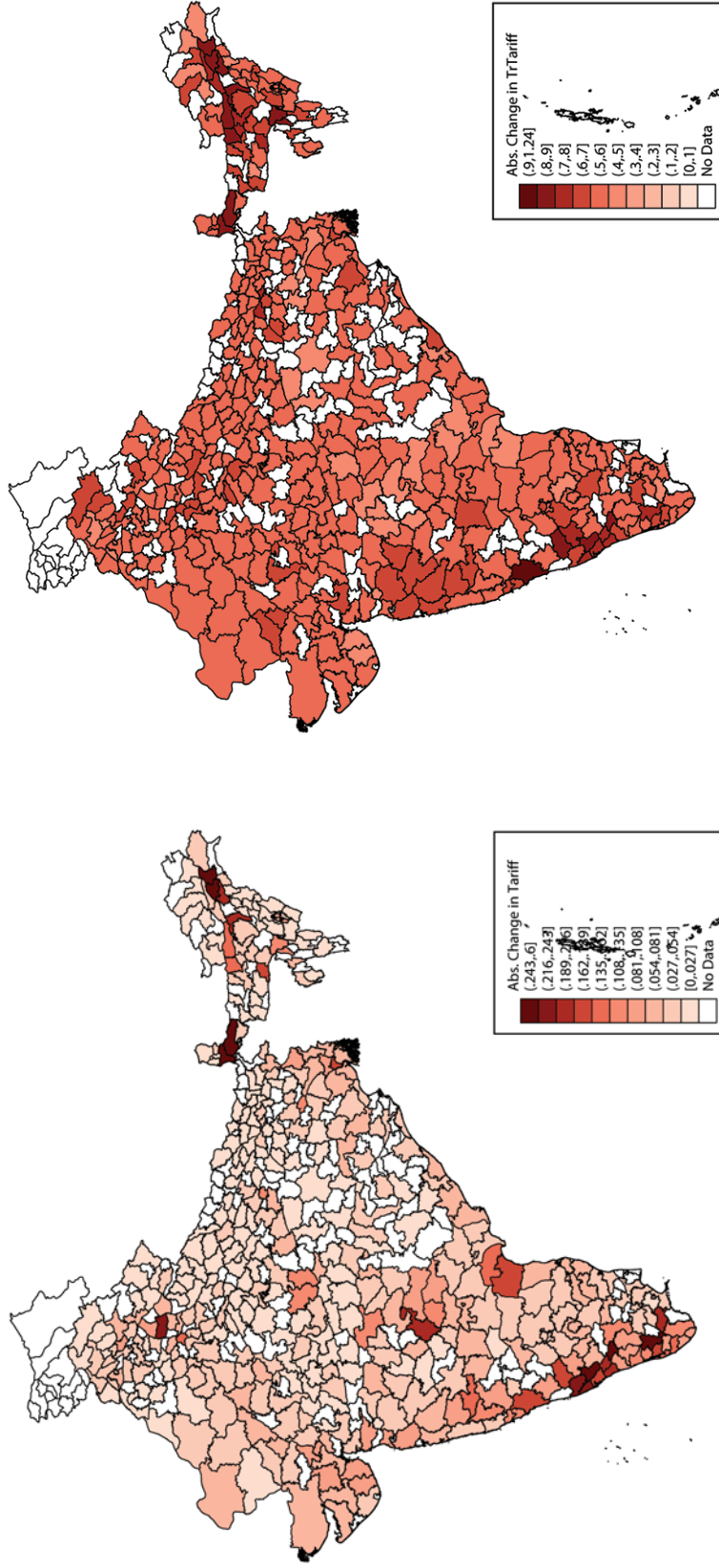


Figure 3.3: Impact of tariff reform on mortality (sub-group analysis)

Notes— Point estimates are based on a regression of the form (3.4.3) with district fixed effects. Separate regressions are run for each sub-group. Standard errors are clustered at the district level. The top panel compares boys to girls. The bottom panel compares young mothers to older mothers. Young mothers are defined as those who were less than 18 years old when they gave birth. The complement set is that of older mothers.



(a) Change in Tariff_{dt} measure

(b) Change in TrTariff_{dt} measure

Figure 3.4: Absolute changes in Tariff_{dt} and TrTariff_{dt} computed over 1987-1997. This is a measure of total tariff shock to each district over 1987-1997.

3.B Tables

Table 3.1: Impact of liberalization on infant mortality

	IMR (1)	IMR (Reduced Form) (2)	IMR (IV) (3)	IMR (4)	IMR (Reduced Form) (5)	IMR (IV) (6)
Tariff	92.16*** (34.37)		363.3*** (80.15)	11.92 (28.74)		34.14 (55.68)
Post Reform	-4.988*** (1.820)	7.355*** (2.827)	3.748 (2.479)			
Traded Tariff		43.62*** (7.315)			7.283 (12.24)	
Constant	69.55*** (2.616)	39.79*** (6.116)		56.11*** (2.564)	54.17*** (4.641)	
Observations	180,765	180,765	180,765	180,765	180,765	180,765
Dist FE	YES	YES	YES	YES	YES	YES
Time FE	NO	NO	NO	YES	YES	YES

Notes— Robust standard errors, clustered at the district level, are reported in parentheses. The regressions are estimated using tariff and infant mortality data from the period 1987-1997.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 3.2: Impact of tariffs on infant mortality: controlling for state trends

	IMR (1)	IMR (Reduced Form) (2)	IMR (IV) (3)
Tariff	32.55 (33.62)		57.76 (67.36)
Traded Tariff		11.09 (13.80)	
Constant	6,520*** (701.2)	5,563*** (1,687)	
Observations	180,765	180,765	180,765
Dist FE	YES	YES	YES
Time FE	YES	YES	YES
State-specific Linear Trend	YES	YES	YES

Notes— Robust standard errors, clustered at the district level, are reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 3.3: Impact of tariffs on infant mortality: controlling for district trends

	IMR (1)	IMR (Reduced Form) (2)	IMR (IV) (3)
Tariff	47.90 (59.69)		61.52 (86.21)
Traded Tariff		9.707 (14.24)	
Constant	8,325 (6,979)	7,561 (7,042)	
Observations	180,765	180,765	180,765
Dist FE	YES	YES	YES
Time FE	YES	YES	YES
District-specific Linear Trend	YES	YES	YES

Notes— Robust standard errors, clustered at the district level, are reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 3.4: Impact of tariffs on infant mortality: controlling for district trends and mother fixed effects

	IMR (1)	IMR (Reduced Form) (2)	IMR (IV) (3)
Tariff	77.85 (103.3)		-36.09 (136.3)
Traded Tariff		-5.545 (29.51)	
Constant	25,533 (15,733)	27,289* (16,191)	
Observations	180,765	180,765	140,331
Mother FE	YES	YES	YES
Time FE	YES	YES	YES
District-specific Linear Trend	YES	YES	YES

Notes— Robust standard errors, clustered at the district level, are reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.