

# Secession with Natural Resources\*

Amrita Dhillon<sup>†</sup>   Pramila Krishnan<sup>‡</sup>   Manasa Patnam<sup>§</sup>   Carlo Perroni<sup>¶</sup>

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## ABSTRACT

We look at the formation of new Indian states in 2001 to uncover the effects of political secession on the comparative economic performance of natural resource rich and natural resource poor areas. We show that resource rich constituencies fared comparatively worse within those new states that inherited a relatively larger proportion of natural resources. Since the management and the control of extraction rights in the Indian context resides with state-level institutions, we argue that these patterns reflect how political reorganisation affected the quality of state governance of natural resources. We describe a model of collusion between state politicians and local natural resource rent recipients that can account for the relationships we see in the data between natural resource abundance and post-breakup local outcomes.

KEYWORDS: Natural Resources and Economic Performance, Political Secession, Fiscal Federalism

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<sup>†</sup>Dept. of Political Economy, Kings College, London, and CAGE, University of Warwick. Email: amrita.dhillon@kcl.ac.uk.

<sup>‡</sup>University of Oxford and CEPR, pramila.krishnan@qeh.ox.ac.uk

<sup>§</sup>CREST-ENSAE, mpatnam1@gmail.com

<sup>¶</sup>University of Warwick, CAGE and CESifo, c.perroni@warwick.ac.uk

# 1 INTRODUCTION

Does political secession yield economic dividends? Evidence on this question is mixed.<sup>1</sup> Secessionist movements are often motivated by economic incentives; and in several cases these incentives relate to the ownership of natural resources (Collier and Hoeffler 2006).<sup>2</sup> But some of the effects of political secession come from its effects on governance, effects that may be shaped by the re-allocation of natural resources. Indeed, political secession provides a natural test-bed for investigating whether the widely-documented adverse influence of natural resources on economic performance (the “curse” of natural resources) flows through a political channel.

In this paper, we exploit the formation of three new Indian states in 2001 to examine how post-secession outcomes for local economies vary according to the local distribution of mineral deposits. A key feature of the 2001 Indian secession is that two of the original states contained a significant share of India’s natural resources, and these were concentrated within specific geographical areas. Figure 1 shows the states that were involved: the states that seceded are Jharkhand, Chhattisgarh and Uttarakhand; the associated rump states are Bihar, Madhya Pradesh and Uttar Pradesh. Figure 2 illustrates the dramatic shift in control of mineral deposits from the original state to the new states.<sup>3</sup> Table 1 gives a summary of the spatial distribution of natural resource rich (NRR) constituencies pre and post break up, in Columns 1 and 2. The Bihar-Jharkhand state pair witnessed a large change in the distribution of natural resources upon breakup, with Jharkhand (the new state) obtaining almost all of the mineral deposits relative to Bihar. The breakup of Madhya Pradesh did mean that a substantial part of its natural resources accrued to the new state of Chhattisgarh, though Madhya Pradesh remains one of the states that are richer in natural resources. Finally, the Uttar Pradesh-Uttarakhand state pair saw a high proportion of mineral deposits go to Uttarakhand.<sup>4</sup> The secession episode thus provides a quasi-natural experimental setting for examining how natural resource endowments interact with political competition.

Using a combined spatial discontinuity with difference-in-difference design, we examine the differential effects of the breakup across new (seceding) and old (rump) states by examining the evolution of economic activity, proxied by luminosity, for 1,124 constituencies in the three pairs of states, comparing outcomes across the new state borders for 186 constituencies that are natural resource rich and for 938 constituencies that are not, over the period 1992-2010. This allows us to study how seceding natural resource rich (NRR) constituencies perform relative to rump NRR units and how seceding natural resource poor (NRP) constituencies perform relative to rump NRP units. The borders of the assembly constituencies remained the same after secession making meaningful comparisons possible. Focusing on longitudinal, within-country comparisons allows us to circumvent some of the

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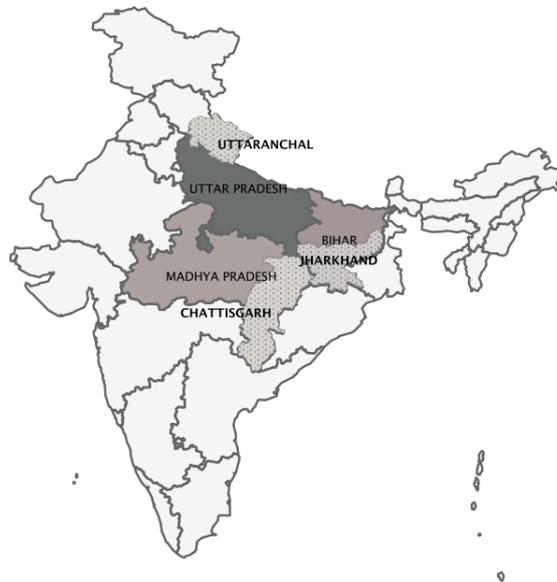
<sup>1</sup>Rodríguez-Pose and Stermšek (2015), examine successive secession movements in the former Yugoslavia and find no evidence of an independence premium. Rose (2006), on the other hand finds no evidence that a larger size is beneficial. Theoretical analyses of the question (e.g. Boffa et al. 2016) have also pointed to a trade-off in decentralisation between the gains from policies that are better matched to local preferences and the potential loss of political accountability that can occur in smaller jurisdictions.

<sup>2</sup>E.g., the secession of South Sudan, rich in oil, from the rest of Sudan; or the case of Scotland, where the slogan “It’s Scotland’s Oil” was used to promote the cause of independence. Sablik 2015 offers a useful summary.

<sup>3</sup>We use the location of mineral *deposits* rather than active mines to capture natural resource wealth.

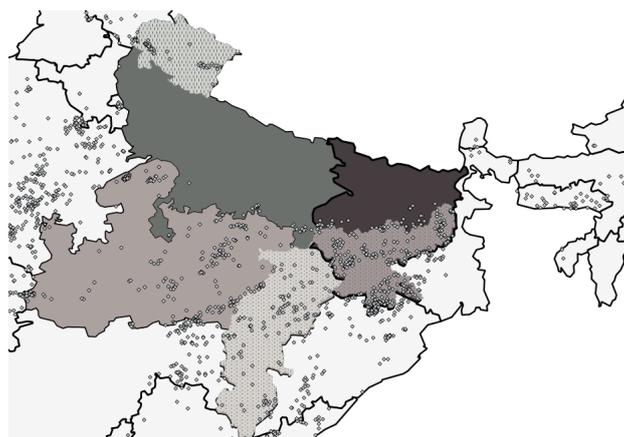
<sup>4</sup>One can find parallel examples at the cross country level elsewhere. Norway seceded from Sweden in 1905, but oil was discovered much later in the 1970s. Norway’s growth rate went down from 6.3% to 1.1% from 1961 to 2016 while Sweden went from 5.7% to 3.2% over the same period (World Bank). More recent cases include the secession of South Sudan in 2011 with extensive oil resources but facing conflict and negative rates of growth (World Bank). On the other hand we have the case of Bangladesh, with no significant natural resources: it seceded from Pakistan and subsequently has had higher growth rates (7.1 vs 5.7 in 2016).

Figure 1: Reorganisation of states in 2001



The figure shows the breakup of states in 2001. Areas shaded by dots represent newly created states; these are the states of Jharkhand, Chhattisgarh and Uttarakhand, which broke away from Bihar, Madhya Pradesh and Uttar Pradesh respectively.

Figure 2: Distribution of mineral deposits across the reorganised states



The figure shows the distribution of mineral deposits in India, across the states that were reorganised in 2002. Mineral deposits are indicated by small circles.

Table 1: Endowment of natural resources and growth across states

	Proportion of Mines		Average Growth Rate (Planning Commission)	
	Pre-breakup	Post-breakup	Pre-breakup	Post-breakup
<u>State Pair 1:</u>				
Bihar	0.2	0.05	4.9	11.4
Jharkhand (New state)		0.65	3.6	6.3
<u>State Pair 2:</u>				
Madhya Pradesh	0.4	0.35	4.7	7.6
Chhattisgarh (New State)		0.54	3.1	8.6
<u>State Pair 3:</u>				
Uttar Pradesh	0.05	0.02	4	6.8
Uttarakhand (New State)		0.23	4.6	12.3

This table reports the level and change in the proportion of natural resource rich constituencies (i.e. those with mining deposits) after state reorganisation, as well as the level and change in growth rate (measured by gross state domestic product), for each state. Figures for the annual growth rate of each state were obtained from the Planning Commission of India's figures for state-wise growth.

problems inherent in cross-country analyses.<sup>5</sup>

To identify the effect of state breakup on development outcomes, we make use of the geographic discontinuity at the boundaries of each pre-breakup state. We additionally exploit the time dimension of our data as a further source of identification. Essentially, we use the observed *changes* in outcomes to difference out *fixed*, initial differences between units on either side of the border. Our identifying assumption is, therefore, that the other (initial) underlying discontinuities at the cutoff (for example, due to pre-defined administrative boundaries, like districting, or language differences) are not changing over time, so that the differenced estimates should be unbiased for the local average treatment effect.

The results we obtain are striking. Specifically, NRR constituencies perform comparatively worse in the seceding (new) states; economic outcomes for NRP constituencies, on the other hand, are less affected by secession. Moreover, we find suggestive evidence of an interaction effect with natural resource density at state level: NRR ACs in seceding states that inherit a higher proportion of NRR ACs perform worse relative to NRRACs in the rump states. Our findings are supported at the aggregate level by figures from the Planning Commission (Table 1, columns 3 and 4), which show that although on average new states do better relative to rump states, post break up, we see heterogeneity in outcomes: areas in new states that end up with a much larger abundance of natural resources (Jharkhand) do worse than the rump state, while others perform better. The heterogeneity in outcomes at the local and state level is mirrored in the distribution of natural resources across the newly-formed states. Ta-

<sup>5</sup>Cust and Poelhekke (2015) discuss these advantages and document other related studies on natural resources in a within-country context.

ble 1 shows that the proportion of assembly constituencies which are rich in mineral deposits, is much higher post break up in Jharkhand (65%) compared to Chhattisgarh (54%) and Uttarakhand (23%).

A natural candidate explanation for this pattern is the change in state-level political institutions that followed from secession. And indeed our main finding of the *interaction* effect between natural resource abundance created by secession at the state level together with natural resource abundance at the assembly constituencies (AC) level is strongly suggestive of a channel flowing through a change in the political relationship between states and natural resource rich ACs following secession. In the case of India, this relationship is shaped by a number of features that are peculiar to the Indian context: (i) property rights to natural resources belong to states rather than to ACs; (ii) power is concentrated at the state level in terms of policing and public goods; (iii) royalty rates on minerals were very low in the period we consider;<sup>6</sup> (iv) there is a well-documented association between rent seeking, criminal activity and the abundance of natural resources (Vaishnav 2017; Aidt et al. 2011).

Building on this picture, Section 3 models the differential effects of secession on NRR and NRP districts as arising from a political bargain struck in NRR constituencies between state-level politicians and local rent recipients who control local votes and exchange them for natural resource rents. The greater is the proportion of NRR constituencies in the state, the greater is the state government's comparative dependence on votes that are delivered by local-level patrons in return for rents, and the lower is political accountability in the state. State secession leads to a change in the proportion of NRR districts within a state and thus in the comparative importance of votes from NRR constituencies. As a result, states that inherit a comparatively large fraction of NRR districts can experience a loss of political accountability following secession, which in turn can lead to more intense rent grabbing and worse economic outcomes in those areas. This is similar in spirit to the "preference dilution effect" described in the literature on lobbying, whereby more centralised decision making can reduce the power of lobbies to influence policies because of increased preference heterogeneity (e.g. de Melo et al. 1993). Our theoretical framework suggests that, when resource endowments are particularly high, they are more likely to lead to perverse outcomes.

The three instances of state breakup that we study translate into only six observed changes in the proportion of NRR districts within the new states by comparison with the original state. Nevertheless, the patterns that we see in the data are in line with our interpretation that the effects we see come from the interplay of politics and natural resources. We see differential effects for NRR districts varying according to their political leanings. Further corroboration comes from investigating how the comparative performance of NRP and NRR districts varies with the election cycle: secession changes how the comparative performance of NRP and NRR districts vary over the cycle. These additional findings provides suggestive evidence that this performance gap is shaped by a political channel and that this channel is affected by political secession. It is also consistent with our interpretation of the effects of state breakup on the relationship between actors in NRR districts and state-level politicians. As we discuss later, these changes in performance between NRR and NRP areas are hard to reconcile with alternative explanations.

The remainder of the paper is organized as follows. Section 2 describes the institutional context. Section 3 presents a theoretical model that links political structure with the governance of natural resources. Section 4 presents the data used for analysis and lays out the identification strategy for estimating the effect of breakup. Section 5 reports the empirical results. Section 6 concludes.

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<sup>6</sup>Royalty rates here are not directly comparable to other international rates since they are based on weight rather than value. Shortly after the breakup, in 2004-05, royalty revenues as percentage of total revenue varied from 3.7% in Madhya Pradesh to about 12.5% in natural resource rich Jharkhand.

## 2 THE INSTITUTIONAL CONTEXT

### 2.1 THE GOVERNANCE OF NATURAL RESOURCES IN INDIA

India has a federal structure, with both national and state assemblies. Members of the twenty-nine state assemblies are elected in a first past-the-post system. The leader of the majority party or coalition is responsible for forming the state government. States have executive, fiscal and regulatory powers over a range of subjects that include education, health, infrastructure and law and order.

There is an overlap in authority between the federal government and state governments in the governance of natural resource extraction, with both exerting regulatory authority: major minerals such as coal and iron ore are regulated by the central government, while minor minerals are entirely under state control as laid down in the Mines and Minerals Development and Regulation (MMDR) Act of 1957. Royalty revenues accrue to state budgets, but rates are set by the central government, which controls rates on output as well as any “dead rent” that accrues in the absence of extraction, and also decides on environmental clearances for mining. Property rights to land reside in the states, which are the legal owners of all major mineral resources (except uranium), and claim all royalties. The main power of the states derives from the legal authority to grant licenses. However, until recently, there was no requirement for the royalties and returns from mining to accrue to local areas and the entire proceeds accrue to the state budget.<sup>7</sup> There are thus three players involved in royalty on minerals: the Central Government which fixes the royalty rate, mode and frequency of revision; the State Government, which collects and appropriates royalty; and the lessee who might be in either the public or private sector and who pays the royalty according to the rates and terms fixed by the centre to the State.

The split of authority between federal and state agencies with respect to the governance of natural resources means that the effects of policy decisions at each level are not fully internalised. The royalty rates set by the central government are widely seen as being inefficiently low,<sup>8</sup> lowering incentives for states to allocate extraction rights to efficient operators and to police illegal mining, since royalties from mining contribute so little to their budgets: royalty revenues in these states, as a percentage of total revenue, averaged to two percent in 2009, while the mining sector’s share of state domestic product is an average of 10-11 percent for Jharkhand and Chhattisgarh over the period 2004-2011 (Chakraborty and Garg 2015). Low royalty rates also mean that there is little scope for state politicians to translate their control rights over natural resources directly into “political rents” for themselves (e.g. by using royalty revenues to finance popular public projects or transfers), which in turn means that in order to do so they must use indirect channels to do so (e.g. using allocating natural resource rights to buttress political support). The fact that the authority for policing resides with the state governments while the federal government decides on which areas can host mining activity produces incentives to evade environmental regulations by operating outside the areas given clearance by the federal government. All of this has led to conflict between Centre and State about the weak policing and monitoring by state governments.<sup>9</sup> Given this institutional context, the politics of resource extraction in India takes on a different flavour from that seen in some other federal states. Natural resource rents are controlled

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<sup>7</sup>The recent Mines and Minerals (Development and Regulation) Amendment Ordinance, 2015 provides for the creation of a District Mineral Foundation (DMF) and a National Mineral Exploration Trust (NMET), funded by a percentage of royalties paid by lessees and in principle, affording some re-distribution to local communities.

<sup>8</sup>It is difficult to compare royalty rates with international rates as the latter are mostly ad valorem while in India royalty rates have been based on weight until recently. A switch to ad valorem rates in 2009 increased revenues on iron ore ten times (Vanden Eynde 2015).

<sup>9</sup>For an article which discusses the difficulties of Centre/State coordination in policing, see <http://bit.ly/1OHFIRM>.

by local operators but power resides at the state level- in particular, as mentioned before, the provision of education, health, law and order and rural electrification is firmly under state control. This institutional setting creates the conditions for state-level politicians and local leaders to strike a political bargain where they trade “subterranean rents” for loyalty and votes.<sup>10</sup> This link between state-level politicians and local rent-seekers is incontrovertible: the political scientist Milan Vaishnav documents this in detail in his account of the criminality of politicians (Vaishnav 2017). He argues that the rising cost of elections and a shadowy election financing system where parties and candidates under-report collections and expenses means that parties prefer “self-financing candidates who do not represent a drain on the finite party coffers but instead contribute ‘rents’ to the party”; and tells of how, in the state of Jharkhand, the minister in charge of mines (Koda) once disposed of 48 cases in one hour. Indeed, the corruption is so institutionalised that one of the chairmen of Coal India in West Bengal says that ministers would fix monthly payment targets with senior executives of Coal India and this was one of the main sources of funding for political parties. According to some reports almost 15-20% of mining revenues are creamed off every month (see Spectator Magazine, 2009).

At the local level, natural resource rents give rise to widely documented forms of “rent grabbing”, both legal and illegal. Legalised rent grabbing consists of comparatively less efficient but politically connected producers successfully securing resource extraction rights.<sup>11</sup> Illegal rent grabbing mainly consists of illegal mining. Collusion of local “rent grabbing entrepreneurs” with corrupt state-level politicians is required to sustain either form of rent grabbing.<sup>12</sup> Not only do states grant licenses and leases, but the Mines and Minerals Development and Regulation Act 1957 empowers state and central government officers to enter and inspect any mine at any time. Thus, illegally extracting minerals from these areas requires a degree of endorsement from the state – e.g. the police turning a blind eye to illegal activity, or favouritism in allocating leases. These rent grabbing activities generate visible economic costs for local economies, ranging from losses in production efficiency and a deterioration of law and order, to environmental degradation, displacement of local residents, disruption of local infrastructure — all leading to a crowding out of other economic activities (Baland and Francois 2000, Mehlum et al. 2006).<sup>13</sup>

The lack of response by state-level governments to such rent-grabbing, despite the fact that they have jurisdiction over all mining matters, suggests that there is a bargain being struck, in NRR ACs, between state-level politicians and the local-level political entrepreneurs/patrons, with payments for

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<sup>10</sup>Indeed, many times the local rent grabbing entrepreneurs become politicians themselves. Asher and Novosad (2016) documents how local mineral rent shocks cause both adverse selection and worse behaviour of politicians in office. They describe how local politicians have direct control over mining operations from which they derive rents. Aidt et al. (2011) shows how stiff competition between parties in India creates an inherent advantage for criminal politicians who can buy votes or intimidate voters.

<sup>11</sup> The allocation process itself, however, is often fraught with irregularities: in 2014 the Supreme court ruled that more than 214 out of 218 coal licences awarded by governments between 1993-2010 were illegal (see BBC News).

<sup>12</sup> The Shah Commission Report available at <http://www.mines.nic.in> provides an ongoing saga of the types of excesses that go on in mining areas.

<sup>13</sup>As a specific example, take the case of coal: “It is a murky subculture that entwines the coal mafia, police, poor villagers, politicians, unions and Coal India officials. Coal workers pay a cut to crime bosses to join their unions, which control access to jobs, according to law-enforcement and industry officials. Unions demand a ‘goon tax’ from buyers, a fixed fee per tonne, before loading their coal. Buyers must bribe mining companies to get decent-quality coal. The mafia pays off company officials, police, politicians and bureaucrats to mine or transport coal illegally... Corruption is largely local: “The rackets include controlling unions and transport, manipulating coal auctions, extortion, bribery and outright theft of coal. Popularly known as the ‘coal mafia’, their tentacles even reach into state-run Coal India, the world’s largest coal miner, its chairman told Reuters.” (from Reuters Special Report 2013). For other accounts, see <http://www.firstpost.com/india/sukma-maoist-attack-malaise-of-naxal-violence-lies-deep-in-illegal-mining-and-political-funding-3408728.html>. Also see <https://www.spectator.co.uk/2009/09/the-dark-heart-of-indias-economic-rise/> and <http://www.scottcarney.com/article/fire-in-the-hole/>.

concessions made by politicians in relation to natural resource rents – directly, through the allocation of mining rights, and indirectly, through lax controls on how those rights are managed at the local level – taking the form of either bribes or increased political support from local constituencies. The latter relies on local rent recipients being able, through either persuasion or coercion of local voters, to deliver a certain volume of votes to whichever candidate or party they choose.

Vote buying is pervasive in India, not only in NRR constituencies (see, e.g., Mitra et al. 2017); and it often involves handing out gifts or money prior to elections. Nevertheless, there are reasons to expect that this exchange of votes for favours to happen comparatively more in NRR ACs. This is because the state-level government controls the allocation of rights for the exploitation of natural resources as well as the enforcement of exploitation rights, but, as discussed earlier, due to the low royalty rates that are set by the federal government, the implications of these decisions for state-level revenues are negligible. State-level politicians thus have control over something that is very valuable to local operators but involves little economic opportunity cost for state budgets, making it a natural currency to be spent in a votes-for-favours transaction. Natural-resource poor (NRP) constituencies lack such currency.<sup>14</sup>

A symptom of the high prevalence of patronage politics in NRR areas is the higher likelihood of criminal politicians being elected in mineral rich constituencies. Table 8 shows that, in a sample of 179 Parliamentary Constituencies (electing federal level MPs), the likelihood of a politician with a criminal record being elected is increasing in the density of mines in that constituency (the coefficient from a simple OLS specification is positive and significant at the 5% level). There is also evidence, as shown in Table 8, that vote buying and electoral fraud takes place relatively more in the mineral rich areas: using survey responses from the State Election Survey for Jharkhand in 2005, which posed questions to individual voters about perceptions of voting malpractices, and running a logit specification of perceived voting malpractice within a district against the number of mines within that district, including district fixed effects and controls for household characteristics, gives a coefficient of 0.28 that is significant at the 1% level.

## **2.2 EXOGENEITY OF BORDERS AND THE TIMING OF STATE BREAKUP**

Tillin (2013) explores how the breakup of existing states in 2001 came about. She suggests four possible explanations. The first explanation proffered is that of distinct cultural identities in the breakaway areas that have consistently made demands for secession, demands that have progressively gained prominence since 1947. The basis on which state borders were originally drawn by the State Reorganisation Act of 1956 was along linguistic boundaries, but this criterion tended to ignore other ethnic and social boundaries, leading to large tribal populations in some states seeing themselves as ethnically distinct and socially neglected. It should be noted, however, that the sharp distinctions along ethnic, social and linguistic lines, in pre-independence have been reduced in time, since migration and changing demographics have meant more homogeneity particularly along existing sub-regional or district borders – this point is explored in further detail below when we examine the balancing of characteristics along the border between states (see Table 2). Furthermore, not all these demands were centred around statehood, but they did involve claims for more local representation and local management of natural resources, both mines and forestries.<sup>15</sup> Second, and tied closely to our expla-

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<sup>14</sup>This can be viewed as an extreme case of a more general scenario where vote trading can take place in all constituencies but comparatively more so in natural-resource rich ones.

<sup>15</sup>Tillin (2013) writes “All three of the regions that became states in 2000 saw the emergence of distinctive types of social movement in the early 1970s: Chipko, the people’s forestry movement in the Uttarakhand hills; the trade union movement

nation here, Tillin suggests that natural resources were a factor: private interests might have considered it easier to increase resource extraction and intensify production in a smaller jurisdiction, which she terms “extension of capitalist interests”.<sup>16</sup> The third explanation relates to the changing federal election context since 1989, when the leading coalition partner, the Bharatiya Janata Party (BJP), first favoured granting statehood to boost their popularity in the areas concerned. This is plausible but as we explain below, a decade later all political parties had reached a consensus on agreeing secession in these states (Kumar 2010). A final explanation is that the sheer size of the old states made them difficult to govern and that the breakup was attractive to the central government because it meant better governance and more ease of administration – as well as an acknowledgement of local identities.

The list of explanations Tillin (2013) offers for the 2001 breakup flags two potential difficulties in looking at secession as a true natural experiment. The first relates to how borders between the rump state and the breakaway state were determined. This turns out not to be an issue at all because the boundaries of these three new entities have never been in dispute; the areas comprising the new states were separate entities before independence from British rule in 1947. For instance, Sharma (1976) discusses a memorandum to the State reorganisation commission in 1955 asking for a separate state of Jharkhand, naming the six districts in Bihar that were eventually separated from Bihar in 2000 (Hazariabagh, Ranchi, Palamu, Singhbhum, Santhal Parganas and Dhanbad, then Manbhum).<sup>17</sup> The Uttarakhand Kranti Dal, the regional party formed in 1979 for a separate hill state was determined to unite the eight hill districts in a separate entity. The borders of Uttarakhand were thus determined by the borders of the eight hill districts that maintained their separate identity on the basis of geography and cultural distinctiveness; again, these borders were not in dispute. The borders of Chhattisgarh comprised the eighteen districts where Chhattisgarhi was spoken, and, again, these district borders have remained the same since independence.<sup>18</sup> However, a key challenge for identification is that despite the fact that the demarcation was determined in the past, differences across the borders might have evolved over time; this is examined further in Table 2 and in Section 5.1.

The second potential difficulty pertains to the timing of the breakup. This timing was determined by the success of the BJP at the National elections in 1998. The BJP had led a minority government in 1996 and had promised to grant statehood to the three new states if it was returned to power. It was returned again at the head of a coalition government, but by this time there was a general consensus both at national and state levels: the other leading party of the Congress supported the change, as did the state assemblies of the original states before breakup. While there might have been an initial spurt of political activity by the BJP,<sup>19</sup> by this time there was little political opposition anywhere to

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among miners, the Chhattisgarh Mines Shramik Sangh; and the worker-peasantry movement in Jharkhand led by the Jharkhand Mukti Morcha (JMM). In all three cases, the issues raised by social movements related primarily to the role of the state in the management of natural resources and the rights of local communities to substantive economic inclusion.”

<sup>16</sup>Tillin (2013) summarises the views, both pre and post breakup, of Tata Steel, the major investor in Jharkhand, and that of other industrialists. Tata Steel was happier with a larger state where “politicians were farther away in Bihar” and less likely to meddle, while others favoured a smaller state where they hoped there would be better law and order and less corruption. However, seven years after secession, things were perhaps even worse in the new state according to them. In brief, there were clearly mixed views and, far from the urge to expand resource extraction, issues of infrastructure, electricity provision and law and order loomed large in favouring breakup and evaluating its success.

<sup>17</sup>It was the case that the borders were formally decided so as to include the districts that consisted of ‘Scheduled Areas’ as defined in the Constitution, which in turn may have followed the Simon commission of 1930 that defined certain ‘partially excluded areas’. The list of scheduled areas (which are still mentioned as part of the old states) is available at the Ministry of Tribal affairs website here <http://tribal.nic.in/Content/StatewiseListofScheduleAreasProfiles.aspx>.

<sup>18</sup>Since 2012 these borders have been redrawn to give nine new districts.

<sup>19</sup>The BJP and its previous incarnation, the Bharatiya Jan Sangh had always opposed any state breakup until the 1990s, and therefore their agreement was perhaps of note only because of the change; other leading parties had by then allowed that this was desirable (Mawdsley 2002).

the demands for statehood. In fact, these demands had grown less vociferous since the early 1990s because it was clear that all the major parties were in accord. Part of this unanimity lay in the fact that all three new states lie well within the external boundaries of India and thus posed little threat to the Union of India, and, equally important, it was clear that there was no political gain to any of the parties in opposing secession. It might be thought that the timing of breakup was related to particular advantages of the party in power at the Centre; however, given the consensus across parties and the fact that state assemblies pre breakup gave their willing assent to the breakup without much dissent, this also turns out to be a non-issue (Kumar 2010).

Finally, given that we concentrate on the role of resources, it should be emphasised that the prices of minerals played little part in the timing: mineral prices worldwide see a surge only after 2004, four years after breakup. In summary, neither the borders of the states nor the timing of breakup can be traced to any particular economic or political advantage for the breakaway states.

### 2.3 POLITICAL REORGANISATION AND NATURAL RESOURCES

In our empirical analysis, we ask how the relative economic performance of natural resource rich and natural resource poor areas was affected by secession. Unlike in the Brazilian case studied by Brollo et al. (2013) and by Caselli and Michaels (2013), state breakup in the Indian case could not have produced windfall revenues at the local level that could have directly encouraged direct appropriation of rents.<sup>20</sup> As we have discussed in Section 2, the political bargain between local and state level leaders might be mediated through bribes or votes. In the Indian case, however, there is no clear reason to expect bribery incentives to be much affected by secession, given that state breakup does not change the economic value of mining concessions and that the influence of state politicians on the allocation of rents remains unchanged.

On the other hand, political reorganisation might directly affect incentives to exchange natural resource rents for local political support. A direct, mechanical effect of secession is a change in the structure of political competition within states: each new state features fewer districts, each accounting for a larger share of the total votes. Then, if control over natural resources is used by state politicians as a means of securing political support in relevant districts, it is plausible that secession, by changing the relative political weight of NRR constituencies within the new states, would change the calculation of the political costs and benefits involved. And indeed, if we look at how secession has affected the comparative density of natural resource districts across states, we see that the change in some cases has been dramatic: in the case of Bihar, for example, about 65% of all districts in the newly formed state of Jharkhand are natural resource rich, whereas the corresponding proportion pre-breakup was 20% (see Column 2, Table 1). In contrast, the state pair 3 (Uttar Pradesh and Uttarakhand) begins with a very small endowment of resources and while the split benefited the new state, it should be emphasised that a larger share of a small endowment did not benefit it greatly.

We formalise this idea in the next section.

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<sup>20</sup>Anecdotal evidence suggests that most corruption takes place at the stage of the allocation of licences, and that only a fraction of actual production of minerals is officially reported – see, e.g., <https://www.spectator.co.uk/2009/09/the-dark-heart-of-indias-economic-rise/> and <http://www.scottcarney.com/article/fire-in-the-hole/>.

### 3 POLITICAL SECESSION, NATURAL RESOURCES AND VOTE TRADING

This section presents a stylised theoretical political-economy framework that derives predictions on how the changes in the concentration of natural resources brought about by secession can translate into changes in economic outcomes at the local level. The key idea underlying our modelling exercise is that the adverse effects of the political influence exerted by special interest groups grows stronger the smaller is the proportion of competing interests that might act to mitigate them.

The specific mechanism we model relates to an electoral accountability channel that operates at the state level, which arises from a bargaining game in NRR ACs involving vote sellers/patrons at the local level and vote buyers or parties at the state level (above and beyond the kind of vote buying that might occur in any constituency independently of its natural resource endowments). The more valuable the votes are, the higher will be the concessions (the “price” paid for votes) to local level intermediaries. These concessions generate negative economic spillovers on the rest of the economy, which erode political support in the electorate, translating into political costs that must be balanced against the political gains that directly come from securing votes through patronage politics in the NRR ACs. State secession changes the distribution of NRR and NRP ACs within the newly formed states and thus alters the political tradeoffs involved in vote buying, which in turn affects economic outcomes in NRR and NRP ACs.

We begin our discussion by presenting a single-state model of vote selling in political equilibrium and then extend it to characterise effects of secession.

#### 3.1 VOTES FOR SALE AND NATURAL RESOURCE DENSITY

##### *Policy Preferences*

Consider first a single state with a continuum of mass one of constituencies with populations of identical size. A fraction  $q \in (0, 1)$  of all constituencies are natural resource rich (NRR) constituencies; the remaining fraction,  $1 - q$ , of constituencies are natural resource poor (NRP) and have no natural resources.

Each voter in each constituency has an ex-ante ideal point,  $i$ , in ideology/policy space  $[-1/2, 1/2] \equiv I$ , with  $i$  being uniformly distributed over the support  $I$  in each constituency. A voter’s utility is quadratically decreasing in the distance between her ideal policy,  $i$ , and the actual policy,  $i'$ : the payoff levels a voter  $i$  obtains from policy  $i'$  is  $-(i - i')^2$ .

Two parties,  $L$  (the incumbent) and  $R$  (the challenger), compete in state-level elections. The winning party,  $j \in \{L, R\}$ , obtains political rents,  $W$ , which we assume to be unity without loss of generality. The incumbent party thus aims at maximising expected political rents,  $P_j^W W = P_j^W$ , where  $P_j^W$  is the probability of party  $j$  winning.

Party  $L$  has an exogenously specified platform located at  $-1/2$  in ideology space, while party  $R$  has an exogenously specified platform located at  $1/2$ . The payoff levels a voter  $i$  obtains if  $L$  and  $R$  win the election are thus respectively  $U_i^L = -(-1/2 - i)^2$ , and  $U_i^R = -(1/2 - i)^2$ , with the median ideology voter ( $i = 0$ ) being indifferent between the two parties. Additionally, there is a stochastic ideology shock,  $s$ , the same in all constituencies and uniformly distributed in  $[-1/2, 1/2]$ , that shifts the ex-post ideology of voter  $i$  to  $i + s$ .<sup>21</sup>

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<sup>21</sup>This incumbency related shock could be thought of, for example, as being linked to a common but unpredictable assessment by voters of the incumbent’s performance while in office.  $s$  is a shock in favour of the  $R$  party.

Voters vote sincerely. For a given ideology shock,  $s$ , the shares of votes that are cast respectively for  $L$  and  $R$  are therefore equal to  $1/2 - s$  and  $1/2 + s$ ; and so, in the absence of any vote trading, the probability of party  $L$  party winning coincides with the probability of  $s$  being negative and the probability of party  $R$  winning is the probability of  $s$  being positive, both of which are equal to  $1/2$ , given the assumed distribution of ideology shocks.<sup>22</sup>

### *The Price of Votes*

In each NRR constituency, a local leader controls, through intimidation or persuasion, a fraction,  $v \in (0, 1/2)$ , of the total votes.<sup>23</sup> (In Appendix B we discuss an extension in which there is a continuous distribution of natural resources across jurisdictions and where the proportion,  $q$ , of ACs where vote sales take place is endogenised on the basis of an economic calculation linking the value of natural resource rents with the cost of procuring votes.) The given tranche of votes,  $v$ , can only be delivered to a single party for a price,  $x$ . This price is a payment in kind consisting of targeted, natural resource related concessions that translate into rents for the sellers, such as, for example, granting exploitation rights, as well as relaxing restrictions and policing of abuses by those exploiting the natural resources illegally. The net economic value of these concessions to the sellers is  $z x$  ( $z > 0$ ). The price can be delivered to the seller only if the vote buyer wins the election: the seller's expected payoff if votes are sold to party  $j$  for a price  $x$  is therefore  $P_j^W z x$ .

The rent grabbing activities associated with the payment generate a loss of  $\lambda x$  for those voters in the constituency who do not partake in them, as well as negative spillovers of  $\rho x$  for voters in other constituencies. What we have in mind here are all the negative effects from unregulated mining – such as environmental degradation, underground coal fires that can interfere with other economic activities, intimidation by criminal gangs that enable rent extraction (Asher and Novosad 2016) – as well as the economic costs associated with extraction rights being allocated to less efficient operators or granted on deposits that should not be exploited on the basis of an economic calculation of social costs and benefits.<sup>24</sup>

Because of these adverse effects, the favours that are delivered in exchange for votes entail a political opportunity cost for the buyer: since the losses associated with the exchange only occur upon delivery of the promised payment if the party that buys the votes is elected, they have the same effect as that of an ideology shift of corresponding magnitude amongst independent voters against the party that buys the votes. Specifically, suppose that all the votes that are available for sale in all constituencies are purchased by a single party, and that the transaction can be observed by voters;<sup>25</sup> independent voters in NRR constituencies would then anticipate an overall loss  $(\lambda + \rho q) x$  from a win by that party, whereas the prospective loss for voters in NRP constituencies is  $\rho q x$ .

The buyer, in its calculation, must balance off this loss of political support amongst independent voters against the electoral advantage of being able to secure a fraction of the votes directly through

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<sup>22</sup>We can assume that if  $s = 0$  each of the two parties wins with equal probability; but since this is a measure zero event, it makes no difference to the analysis.

<sup>23</sup>These local leaders are often union bosses who control how much mining can be carried out via control over transport and workers.

<sup>24</sup>For example, blasting and drilling around the coal mines lead to water aquifers drying up, air and noise pollution leading to a shortage of clean drinking water and water borne diseases to increase, loss of forest reserves, loss of agricultural land, disruption of economic activity by Maoist insurgents (Chauhan 2010). These effects would not be limited only to mining regions but would spill over to neighbouring NRP ACs – particularly SO<sub>2</sub> emissions, pollution of surface water, spillovers from criminal activities and insurgency.

<sup>25</sup>Indian voters are well aware of which parties or politicians receive the support of NR lobbies (Arjjumend 2004).

vote buying. In NRR constituencies the political cost arising from the promised delivery of the payment is offset by the political gain from buying votes, but in NRP constituencies it is not. Because of this asymmetry, an increase in the proportion,  $q$ , of NRR constituencies makes vote buying more attractive, raising the equilibrium price of the votes that are available for sale:

**Proposition 1:** *Consider the a single (collusive) vote seller making a take-it-or-leave-it offer to a single buyer. The unique payoff maximising price for the seller is  $\bar{x} = \frac{v}{\lambda(1-v) + \rho(1-qv)}$ . This price is decreasing in  $\rho$  and increasing in  $q$ , and its elasticity with respect to changes in  $q$  is also increasing in  $q$ . The corresponding equilibrium values of  $P_L^W$  are also decreasing in  $\rho$  and increasing in  $q$ .*

(The proof is in Appendix B.)

Allowing for multiple buyers or sellers does not change conclusions (we show this in Appendix B). The results of Proposition 1 carry over to a scenario where neither party has all the bargaining power – e.g., under sequential bargaining with alternating offers (Rubinstein 1982):<sup>26</sup>

**Proposition 2:** *The equilibrium level of  $x$  under sequential bargaining is decreasing in  $\rho$  and increasing in  $q$ . The corresponding equilibrium values of  $P_L^W$  are also decreasing in  $\rho$  and increasing in  $q$ .*

(The proof is in Appendix B.)

An increase in the density of natural resources, via a political channel, raises  $x$  and thus lowers welfare for individuals in NRR constituencies (other than the vote sellers), as well as for individuals in NRP constituencies, albeit to a lesser extent. The intuition for this result is as follows. In its choice of  $x$ , the incumbent party balances the net gain in vote share from raising  $x$  in NRR constituencies with the net loss in NRP constituencies. As the proportion of NRR constituencies ( $q$ ) becomes larger – and the proportion of NRP constituencies ( $1 - q$ ) becomes smaller – the positive vote gains from vote buying in NRR constituencies increasingly come to dominate the political “dilution” effect that comes from the purely negative political spillovers in NRP constituencies, and so the net political value of vote buying (and hence the maximum price that can be paid for it) increases.

Proposition 1 also implies that the dilution effect fades progressively faster as  $q$  increases: intuitively, the strength of the diluting influence of NRP constituencies is related to the ratio  $(1 - q)/q$ , which decreases with  $q$  at an increasing rate (in absolute value). As a result, the adverse effects of an increase in the proportion of NRR ACs become progressively larger.

### 3.2 EFFECTS OF STATE BREAKUP

State breakup can produce a change in the proportion of NRR districts within the new states relative to the original state. The predictions we have derived in the previous section for a single-state scenario thus translate into predictions on the effects of state breakup on governance outcomes – predictions that in principle could be tested empirically in longitudinal evidence on pre- and post-secession outcomes.

Consider a unified state,  $U$ , with a unit mass of constituencies, a fraction  $q_U$  of which are NRR constituencies; and suppose that the unified state breaks up into two new equally-sized states,  $A$  and  $B$ ,

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<sup>26</sup>Qualitatively analogous results obtain under Nash bargaining.

each with a mass of  $1/2$  constituencies and proportions  $q_A$  and  $q_B$  of NRR constituencies. Then, focusing only on the component of utility that depends on  $x$ , welfare for a citizen  $i$  in a NRP constituency in state  $H \in \{A, B\}$  can be expressed as

$$U_H^{NRP} = -\rho \frac{q_H x_H + \gamma q_{-H} x_{-H}}{2}, \quad H \in \{A, B\}; \quad (1)$$

while that for the citizen in a NRR constituency is

$$U_H^{NRR} = U_H^{NRP} - \lambda x_H, \quad H \in \{A, B\}, \quad (2)$$

where  $\gamma < 1$  reflects a reduction in transboundary spillovers coming from the separation of state institutions, and  $(q_A + q_B)/2 = q_U$ .<sup>27</sup>

Votes in  $H$  only affect  $x_H$ , and so only the terms that involve  $x_H$  in (1) and (2) are relevant for characterising voting choices in  $H$ . In turn,  $x_H$  depends on  $q_H$  via the equilibrium condition described in Proposition 1.

We are then in a position to draw conclusions concerning how secession affects welfare via the political channel described in 3.1 (i.e. abstracting for the time being from effects directly associated with the redistribution of revenues from natural resources):

**Proposition 3:** *The ratio  $U_A^{NRP}/U_B^{NRP}$  and  $U_A^{NRR}/U_A^{NRP}$  are both increasing in  $q_A/q_B$ . As levels of utility are normalized in the model to be negative, this means that, following secession:*

- (i) *comparing across states,  $U_A^{NRP}$  is smaller, relative to  $U_B^{NRP}$ , the larger is  $q_A$  relative to  $q_B$ ;*
- (ii) *within state A,  $U_A^{NRR}$  is smaller, relative to  $U_A^{NRP}$ , the larger is  $q_A$  relative to  $q_B$ .*

(The proof is in Appendix B.)

This result follows immediately from our analysis of a single-state scenario. A higher proportion of natural resource rich districts within a state worsens the quality of governance in that state. To the extent that spillover effects across states are weaker than those within states, this implies that, when we consider only those effects of natural resources that flow through a governance channel, an unequal allocation of NRR districts following secession penalises the state that receives the larger share (prediction 3.(i)); and, more specifically, worsens the comparative economic performance of NRR areas relative to that of NRP areas (prediction 3.(ii)). As explained in the introduction, this is similar to a “preference dilution effect” whereby more centralised decision making reduces the power of lobbies to influence policies. In our particular context, secession has similar effects to decentralisation where the power of local rent seeking lobbies in NRR ACs increases relative to other interest groups when their relative weight increases.

Proposition 3 isolates those effects of secession that flow through the political channel we have described in 3.1, but secession also produces effects that flow directly through the redistribution of natural resource revenues. These effect relate to the change in the natural resource tax base base,  $(q_A - q_U)r$ , where  $r$  is total income from natural resources in a representative NRR ACs. An increase in  $q$  relative to its pre-secession level produces an increase in the tax base (relative to the size of the new state), which may either translate into more provision of public goods, either state-wide or at the

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<sup>27</sup>We abstract from any idiosyncratic component of utility stemming both from ideology and from other factors that do not depend on  $x_H$ .

NRR AC level, or, alternatively, into a lower level of taxation holding the level of public goods provision constant, leaving more disposable income within NRR ACs.<sup>28</sup> Through this effect, an increase in  $q$  can potentially raise welfare in the new state, and, more specifically, in NRR ACs; and indeed, as discussed, the reallocation of revenues from natural resources is often a primary motivation for secession demands.

Proposition 1 says that the effects of an increase in  $q$  on  $x$  increase with  $q$  – as the diluting influence of the remaining fraction,  $1 - q$ , of NRP ACs becomes progressively smaller, the elasticity of  $x$  with respect to changes in 1 becomes larger, (i.e. the cost associated with a higher  $q$  is convex in  $q$ ). And so, if the post-secession level of  $q^A$  is large enough, the adverse governance effects of an increase in  $q^A$ , as described by Proposition 3, are more likely to dominate any other positive effects (such as those effects that are associated with an increase in the tax base, which is linear in  $q$ ), leading to NRR ACs doing comparatively worse than NRP ACs in state  $A$  post secession (result 3.(ii)):

**Proposition 4:** *Political secession is more likely to lead to a deterioration in the comparative economic performance of NRR ACs relative to that of NRP ACs of the breakaway state the larger is the density of natural resources in the breakaway state post secession.*

The predictions of the theory in relation to the effects of political secession can be summarized as follows:

- an increase in the proportion of NRR ( $q$ ) in a breakaway state following secession will weaken the diluting effect that NRP areas exert on the political influence of natural resource rents recipients in NRR areas and lower the quality of governance;
- this effect is more likely to dominate other positive effects associated with increased ownership of natural resources in the breakaway state (and result in a comparative worsening in the economic performance of NRR ACs relative to that of NRP ACs) the larger is  $q$  in the breakaway state post secession.

## 4 DATA

To study how differences in local outcomes (assembly constituency level) relate to natural resources we rely on two main data sources.

First, we rely on luminosity data to proxy for the evolution of economic activity (Henderson et al. 2011; Chen and Nordhaus 2011; Kulkarni et al. 2011; Alesina et al. 2016), over the period 1992-2010, thus covering the pre-breakup period 1992-2001, and the post-breakup period 2002-2010.<sup>29</sup> The data consist of imaging of stable lights obtained as a global annual cloud free composite where the ephemeral lights from fires and other sources are removed and the data are averaged and quantified in six bits, which in turn might result in saturation for urban settings but does mean that dimmer lights in rural settings are captured. Each grid (one sq. km) is assigned a digital number (DN) ranging from

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<sup>28</sup>There may be other effects of the breakup on welfare that are independent of the endowment of natural resources – effects that our analysis abstracts from. For example, the smaller size of each state post breakup might make administration easier, as well as allowing a better representation of the electorate.

<sup>29</sup>The night time image data is obtained from the Defense Meteorological Satellite Program Operational Linescan System (DMS P-OLS). The DMSP satellites collect a complete set of earth images twice a day at a nominal resolution of 0.56 km, smoothed to blocks of 2.8 km (30 arc-seconds). The data, in 30 arc-second resolution (1km grid interval), covers 180° West to 180° East longitude and 65° North to 65° South latitude.

0 to 63 and luminosity is measured as the  $DN3/2$ . Luminosity is thus obtained as a sum of lights over the gridded area which in our case is defined as the Assembly Constituency (AC), using GIS data on the administrative boundaries of states and ACs.<sup>30</sup>

There are three main reasons why we rely on luminosity data. The first is that panel data on households, by assembly constituencies<sup>31</sup> that could capture the evolution of incomes or consumption pre and post breakup does not exist. The second reason is that, despite the measurement difficulties inherent in the use of such a proxy, there is convincing evidence to suggest that luminosity is strongly correlated with standard socio-economic outcomes. We offer corroborative evidence for this by looking at the relationship between luminosity and these measures; in brief, we use data on income, wealth and education from the National Election Survey in the year 2004, which surveys voters at the constituency level to examine the correlation of standard economic indicators with luminosity. The correlation with wealth is about 0.6, while that with income and education lies between 0.4 and 0.45.<sup>32</sup> This relationship also holds at the more aggregate level of the district: Chaturvedi et al. (2011) and Bhandari and Roychowdhury (2011) examine this correlation at the district level in India and find similar effects. We restrict our analysis to the years 1992-2010 because constituency borders have since been re-drawn.<sup>33</sup> The third (and most important) reason for relying on luminosity evidence is that our identification strategy focuses on *changes* in outcomes rather than levels. This means that sources of persistent heterogeneity across ACs in the relationship between luminosity levels and levels of economic activity are not a concern.

To corroborate our measure of night-time lights, we use data from two waves (1992 and 2004) of the India Human Development Survey (IHDS). Finally we also use data from the Census of India, state election results (obtained from the Election Commission of India) and state electricity prices (obtained from India Stat) to support our identification strategy, described in the next subsection. Appendix A provides further details on these data sources.

The second type of data we use are data on the location, type and size of mineral deposits from the Mineral Atlas of India (Geological Survey of India, 2001).<sup>34</sup> Minerals are grouped into nine categories, and each commodity is classified by size, which is proportional to the estimated reserve of the deposit. The definition of the size categories for each commodity is in terms of metric tons of the substances of reserves contained before exploitation or actual output. This provides comprehensive information about the mineral resource potential of the deposits.<sup>35</sup>

We use data on location specific mineral resources or deposits, rather than their value, to avoid issues of endogeneity: the price of minerals found in these deposits is time-varying and can be affected

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<sup>30</sup>We are grateful to Sam Asher and Paul Novosad who provided the geographic data necessary for matching electoral constituencies to mineral deposits which in turn comes from the MLInfomap Pollmap dataset, which contains digitised GIS data based on maps published by the Election Commission of India.

<sup>31</sup>Districts are at a higher level of aggregation than assembly constituencies.

<sup>32</sup>The National Election Survey collects information from voters in each parliamentary constituency. To obtain the correlations, we aggregate the night-time lights data to the parliamentary constituency level.

<sup>33</sup>The boundaries for constituencies were fixed in 1976 but new boundaries based on the 2001 census figures were meant to be re-drawn. This was mandated by the Delimitation Act of 2002, which constituted a delimitation commission to redraw the constituency boundaries. However, there was substantial delay in compiling the necessary data and in creating the new boundaries, the first election with redrawn boundaries was only held in Karnataka in 2008. Consequently, the period between 1976 and 2009 in these states had fixed constituencies boundaries allowing for the comparison of luminosity across time.

<sup>34</sup>Resources are usually classified as point resources and dispersed resources, the former being the most easily appropriated. Our focus in this paper is on minerals that are point source resources.

<sup>35</sup>We are particularly grateful to Sam Asher for sharing his data obtained from the Mineral Atlas and to officials at the Geological Survey of India, Bangalore for clarifying the observations on size.

by various unobservables such as election cycles, and other demand and supply factors that tend to be correlated with growth and inequality. Also, our empirical strategy relies on a spatial discontinuity design with comparisons across borders over time where deposit types are similar, obviating the need to examine values. Furthermore, as will be clear below, our fixed-effects strategy allows us to net out the fixed location specific unobservables associated with deposit coverage. Further, the location of deposits is strictly of geological origin, and the location was mapped before 1975 and hence its exploration cannot be thought to be controlled by subsequent political and economic incentives or institutional factors.

#### 4.1 IDENTIFICATION AND ESTIMATION

In what follows, we conventionally define ACs in the states that have broken away as those that are “treated” by the act of secession. Admittedly, the rump state is also a new creation and is thus affected by the treatment; so, what we are actually picking up are the differential effects of the treatment (secession) between old and new states.<sup>36</sup> As evidenced by Table 1, the new states are those that inherit a disproportionate number of NRR ACs, and so “treatment” for an AC can also be interpreted as belonging to a state that experiences an increase in the proportion of its NRR districts (corresponding to an increase in  $q$  in our theoretical model). To identify the effect of state breakup on development outcomes, we make use of the geographic discontinuity at the boundaries of each pre-breakup state and employ a Regression Discontinuity Design (RDD). For each geographic location, assignment to “treatment” (or new state) was determined entirely on the basis of their location. This key feature of the state breakup allows us to employ a sharp regression discontinuity design to estimate the causal effect of secession on growth. Such a discontinuity is clearly supported by Figure 3, where local polynomial estimates of the *growth in light intensity* – the variable relevant for our difference-in-difference combined with RDD identification strategy described below – around the distance to the threshold before and after breakup are displayed. Figure 4 assesses the validity of the identifying assumption with the McCrory (2008) test for breaks in the density of the forcing variable at the treatment border with negative distances to state border for old states and positive distances for new states. The figure clearly shows that the density does not change discontinuously across the border, suggesting that for the window around the coverage border there seems to be no manipulation. This is to be expected given the firm exogeneity of the borders, but it is reassuring all the same.

We define a variable,  $D_i$ , as constituency  $i$ 's distance to the geographic border  $d$  that splits each of these geographic location between old and new states. We then define an indicator for each AC for belonging to the new state as

$$T_i = \mathbb{1}_{[D_i \geq d]}. \quad (3)$$

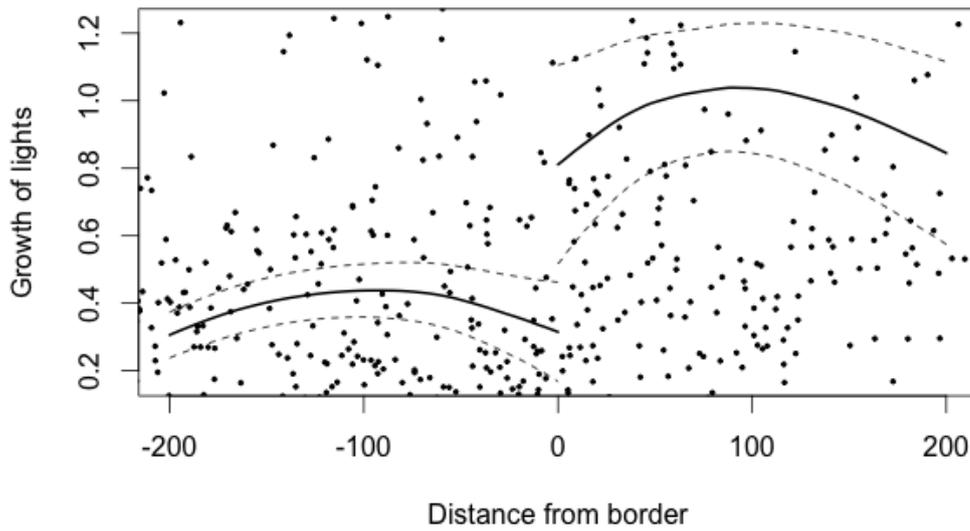
The discontinuity in the treatment status implies that local average treatment effects (*LATE*) are non-parametrically identified (Hahn et al. 2001). Effectively we compare outcomes for constituencies on either side of the geographic border that determined treatment assignment or being in a New State. Formally, the average causal effect of the treatment at the discontinuity point is then given by (Imbens and Lemieux 2008):

$$\tau_a = \lim_{g \rightarrow d^+} \mathbb{E}[Y_{it} | D_i = g] - \lim_{g \rightarrow d^-} \mathbb{E}[Y_{it} | D_i = g] = \mathbb{E}[Y_{it}(1) - Y_{it}(0) | D_i = d], \quad (4)$$

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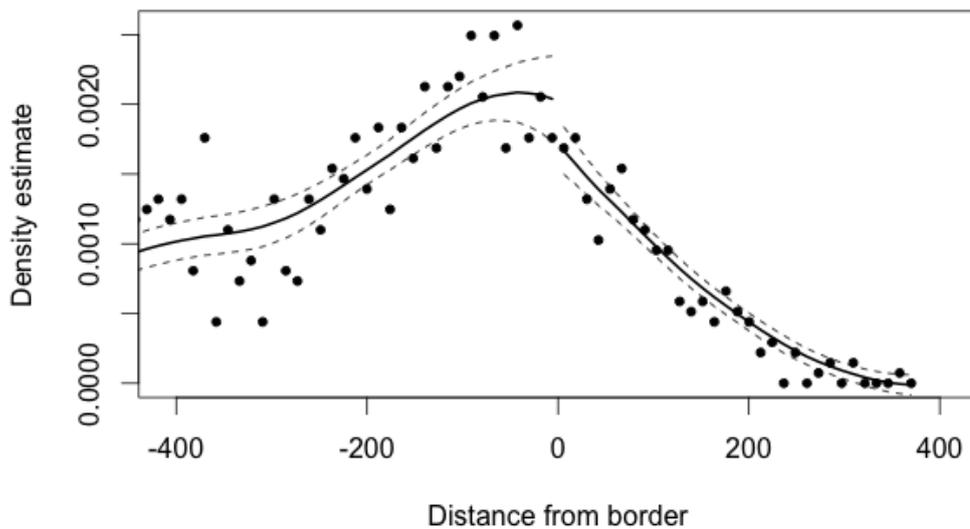
<sup>36</sup>This convention is also consistent with the idea that the rump state retains the old institutions and government structures while the new state must create new structures, even if similar to those in the rump state. Rump states saw no reorganisation apart from the loss of territories and thus a lower population and smaller administration.

Figure 3: Growth in light intensity after secession



The figure plots the local polynomial estimates of the growth in light intensity, defined as the difference in average light intensity post (2001-2009) and pre (1992-2000) the secession, around the threshold distance.

Figure 4: RD validity: density smoothness test for distance to state border



The figure plots test for density smoothness proposed by (McCrary 2008). The distances are normalised, such that positive values indicate distances for new states while negative values indicate distances for old states.

where  $Y_{it}$  is the satellite light density of constituency  $i$  in year  $t$ .

An important feature to note in the above-mentioned design is that the discontinuity is geographical, i.e., it separates individuals (ACs) in different locations based on a threshold along a given *distance-based border*. Using (4) to estimate the causal effect would ignore the two-dimensional spatial aspect of the discontinuity. This is because the *border line* can be viewed as a collection of many points over the entire distance spanned by the border. For example, an individual located north-west of the border is not directly comparable to an individual located south-east of the border. For the comparison to be accurate, each “treatment” individual must be matched with “control” individuals who are in close proximity to their own location *and* to the border line. We address this issue as follows. We divide the border for each state into a collection of points defined by latitude and longitude spaced at equal intervals of 15 kilometers. We then measure the distance of each grid or AC to the border and include polynomials of distance and its interactions with the treatment variable. We then condition on the post-breakup interacted, border segment fixed effects in all the specifications, so that only ACs within close proximity of each other are compared.<sup>37</sup>

The local average treatment effect can be estimated using local linear regression by including polynomials of distance to the border (controlling for border segment fixed effects) to a sample of units contained within a bandwidth distance  $h$  on either side of the discontinuity.

We additionally exploit the time dimension of our data as a further source of identification. The identification strategy described so far exploits differences across nearby bordering units, post state breakup to investigate the effect of breakup. Even then, it is possible that there is an underlying administrative discontinuity at the border cutoff in the absence of breakup, since the geographical border was laid around existing districts. To address this issue, we use the observed *jump* in outcomes to difference out such *fixed*, initial differences between units on either side of the border. Our identifying assumption is, therefore, that the jumps at the cutoff are not changing over time in the absence of treatment, so that the differenced local Wald estimators will be unbiased for the local average treatment effect.

Our overall identification strategy effectively combines the RDD design with a difference-in-difference approach. A key identifying assumption of this empirical strategy is that of conditional common trends before the secession for areas close to the border. We discuss this assumption further and examine its empirical validity in Section 5.4.

With this in mind, the specification we estimate is

$$Y_{it} = \alpha_i + \beta_t + \gamma T_i \times Post_t + \delta' V_{it} + \zeta_s \times Post_t + \varepsilon_{it}, \quad (5)$$

where  $Y_{it}$  is the satellite light density of grid  $i$  in year  $t$ .  $\alpha_i$  is the fixed effect for each AC. The variable of interest, the new state effect, is denoted by the interaction of  $T_i$ , being located in the new state, and  $Post_t = \mathbb{1}_{[t \geq 2001]}$ . We control for border segment fixed effects,  $\zeta_s$  (interacted with  $Post_t$  to account for the panel dimension). The terms  $\alpha_i$  and  $\beta_t$  represent constituency and time fixed effects respectively. The  $V_{it}$ 's are defined as

$$V_{it} = \begin{pmatrix} \mathbb{1}_{[D_i < d]} \times Post_t \times (D_i - d) \\ \mathbb{1}_{[D_i \geq d]} \times Post_t \times (D_i - d) \end{pmatrix}. \quad (6)$$

The regressors  $V_{it}$  are introduced to avoid asymptotic bias in the estimates (Hahn et al. 2001, Imbens

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<sup>37</sup>See Black (1999), who first discussed the use of the border segments in a regression discontinuity framework. For a recent application, see Dell (2010), who extends the approach to incorporate a semi-parametric regression discontinuity design.

and Lemieux 2008). Standard tests remain asymptotically valid when these regressors are added.

A panel fixed-effects estimator around the distance thresholds,  $h$ , is equivalent to using a uniform kernel for local linear regression, as suggested by Hahn et al. (2001). We consider several bandwidths, based on the optimal bandwidth calculations of Imbens and Kalyanaraman (2011), and for each we derive OLS-FE estimates using observations lying within the respective distance thresholds.

## 5 ESTIMATION RESULTS

### 5.1 BORDER EXOGENEITY AND BALANCING TESTS OF COVARIATES

Our spatial discontinuity design compares ACs across borders, with the basic notion that differences in patterns of local activity, controlling for time-invariant characteristics before breakup can only be attributed to the secession rather than differences due to other factors. This in turn depends on the variation in observable attributes including human and physical geography. The demarcation of the borders here are historically determined, based on ethno-linguistic differences as they were present in 1947 at independence, or even earlier. If the historical demarcation implies a different settlement by these groups today, this in turn might pose a threat to identification.

To examine this we check how observed characteristics vary at different levels of aggregation across borders, paying particular attention to differences within a narrow radius of the new-state border (see for e.g., Lowes et al. 2017, for a discussion of a similar strategy). In Table 2, we present balancing tests for each covariate based on both the full and restricted sample of observations. In our restricted sample, we limit the set of observations to a distance bandwidth of 200 km around the border (at the AC level) or directly bordering districts (at the district level). For each type of sample-set we first report the mean (in parenthesis the standard deviation) of the entire sample and then report the mean differences between rump and new states (in parenthesis the standard error of the differences). In the first panel, we report the differences across AC-specific characteristics, our preferred unit of analysis. For our main outcome variable, luminosity, we find that while there were significant differences between the rump and new state before breakup in the full sample, these differences disappear in the restricted border sample. A similar pattern holds for the number of conflict occurrences. One variable that remains significant even within our restricted border-sample is the constituencies' mineral endowments. However, we should expect a-priori such a difference and is the basis of our empirical exploration that links secession to natural resources distribution. However to account for this difference, we use constituency fixed effects in our empirical strategy to difference out this time-invariant endowment. Additionally, we check the robustness of our results to differential mineral-specific trends (for e.g., price effects) and show that our results are not affected by this (in Section 5.4). In sum, our difference-in-difference strategy does control for fixed pre-breakup differences such as mineral endowment – this is less of a threat to identification than time varying differences reported below.

We also focus on district-level characteristics, and use information from the 2001 socio-economic census to examine two key characteristics, education and caste composition, that could influence outcomes. The table shows that for both variables, proportion of literates and proportion of backward caste population, the restricted sample differences between the rump and new state are small, and much lower compared to the full sample. We do find a small statistical difference in the percentage of backward caste population in the restricted sample but show later (in Section 5.4) that the trend differential is not statistically significant, as required by the common trends assumption of our identification strategy. We also find no significant difference in the average size of districts across borders, within the restricted sample. Another possible source of bias is the extent of fractionalization based

Table 2: Descriptive Statistics and Balancing Tests

	Full Sample		Restricted Border Sample	
	Mean (SD)	Rump vs. New State Baseline Difference	Mean (SD)	Rump vs New State Baseline Difference
<i>Assembly Constituency Covariates; N=10,116(F), 5985(R)</i>				
Log Luminosity	6.589 (2.260)	0.730*** (0.0616)	6.164 (2.582)	-0.00493 (0.0805)
Mineral Quality	0.006 (0.0503)	-0.0210*** (0.00120)	0.009 (0.0641)	-0.0214*** (0.00173)
# Conflict Occurrences	0.353 (2.613)	-0.00924*** (0.00282)	0.417 (2.091)	0.00427 (0.00391)
<i>District Covariates; N=199(F), 38(R)</i>				
Linguistic Fractionalisation (1992)	0.208 (0.186)	-0.153*** (0.0291)	0.278 (0.185)	-0.0266 (0.0607)
Linguistic Fractionalization (2002)	0.209 (0.195)	-0.143*** (0.0310)	0.278 (0.181)	-0.0257 (0.0595)
Area (in KMs)	4590.8 (2844.4)	-1463.8*** (464.4)	4776.0 (2914.4)	-365.0 (956.7)
Proportion Literate	0.465 (0.103)	-0.0510*** (0.0171)	0.438 (0.102)	-0.0451 (0.0328)
Proportion SC/ST	0.277 (0.146)	-0.120*** (0.0230)	0.287 (0.143)	-0.0768* (0.0451)
<i>Household Covariates; N=2454(F), 520(R)</i>				
Log Income	8.745 (1.180)	0.0752** (0.0338)	8.685 (1.082)	0.0244 (0.0621)
Log Food Expenditure	5.666 (1.198)	0.003 (0.0183)	5.479 (0.493)	0.033 (1.110)
Distance to Piped Water	9.293 (36.82)	-0.778 (2.059)	6.230 (29.61)	0.775 (3.115)
Caste Category	2.556 (1.028)	-0.331*** (0.0463)	2.711 (1.146)	0.164 (0.106)
<i>Firm Covariates; N=6,610,225(F), 1,172,856(R)</i>				
# Workers	3.580 (49.213)	-0.625*** (0.050)	3.574 (35.624)	-0.036 (0.068)
% Mining Workers	0.816 (2.856)	-1.440*** (0.610)	1.155 (2.517)	0.280 (1.047)
Wages & Salaries Paid <sup>‡</sup>	18.24 (200.5)	-15.96*** (5.533)	14.08 (109.9)	-0.632 (5.815)
Consumption of Electricity & Water <sup>‡</sup>	26.73 (249.1)	-20.42*** (6.972)	23.42 (224.9)	16.14 (12.15)

The table reports results the mean (in parentheses standard deviation) of geographic, household and firm-level variables and their differences between the rump and old states (in parenthesis the standard error of the differences). The sample size for each panel are indicated for both the full sample (F) and restricted border sample (R). <sup>‡</sup> variables are obtained from the Annual Survey of Industries for the year 2000; the sample size for these variables is 5144(F) and 1028(R). \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

on linguistic differences across borders. Since the breakup was partly motivated by linguistic differences, it is possible that the areas in the new states were linguistically more fragmented which could indirectly impact economic outcomes (Alesina et al. 2003). Using information from two rounds of the Language Atlas of India, we construct measures of linguistic fractionalization based on Alesina et al. (2003), and find that the measure is stable and statistically not different between the rump and new-state bordering districts.

Next, we use information from the IHDS on income, consumption expenditures, measures of health (proxied by infant mortality) and public goods access (proxied by the distance to piped water), to see if these variables were different across border areas before breakup (year 1992 of the IHDS survey). We conclude that they are not, in the restricted border sample. Finally, we examine firm-specific covariate differentials, combining data on all establishments from the Economic Census (year 1998) and supplementing it with information on a sample of firms from the Annual Survey of Industries (year 2001). Significant differences in employment or wage patterns could represent a threat to our identification as they could shift the distribution of welfare outcomes post-secession. However, as Table 2 shows, we find that while significant differences exist in the full-sample, the restricted border sample means match well across all covariates, leaving small and statistically insignificant difference across borders.

## 5.2 RDD ESTIMATES

We begin with the overall effect of state breakup on the difference in luminosity in Table 3, before moving on to our main results on how they vary with state-level natural resource abundance. The variable *Post* captures the trend across states post breakup while '*Post×New State*' captures the difference between the new and rump states on average, post breakup. The first two columns of the table report the OLS estimate of breakup for the entire sample of ACs across all six states, reporting effects without and with border segment fixed effects. The naive OLS specifications suggest that while all states experience trend increase in luminosity, on average new states did better than the rump states.

There may be other unobservables linked to state borders that might bias the OLS estimates. To address these concerns, we present RDD estimates in columns 3-5 of the table. We choose three bandwidths with distance thresholds of 150km, 200km and 250km throughout our analysis. We choose these thresholds based on our calculations of the optimal bandwidth (Imbens and Kalyanaraman 2011). Our calculations indicate an average optimal bandwidth of 181.36, across all post-breakup years. Its year-wise value ranges from 165.04 to 204.32, all values lying well within our chosen bandwidth span. The RDD estimates suggest the same pattern of results as the OLS, albeit with a much smaller positive growth effect for the new state. We find that the new states did better than the rump states, with a differential in luminosity of 35 percent. Note that the last four columns include border-segment fixed effects allowing the absorption of any unobserved characteristics that are similar across shared boundary segments (Black 1999).

The above results hide a considerable degree of heterogeneity across ACs within states. Table 4 shows how local post-breakup effects are shaped by local natural resources. While ACs with a high concentration of deposits do relatively better across all states, they do worse in comparative terms if they are in the new states, post breakup. So, while natural resource rich ACs do better than natural resource poor ACs on average following the break-up, and ACs in new states do better on average relative to ACs in rump states, natural resource rich ACs do *comparatively* worse in the new states. Since the identification strategy we employ isolates the effects of state breakup from the effects of other possible concurrent factors, these results show that these effects come from an interaction between state breakup and natural resource endowments at the AC level, with the interaction effect operating

Table 3: RDD Estimates of State Breakup on Log Light Intensity

	OLS		RDD		
			BW 150	BW 200	BW 250
Post × New State	0.824*** (0.094)	0.718*** (0.102)	0.348** (0.168)	0.647*** (0.150)	0.669*** (0.143)
Post	0.944*** (0.079)	2.015*** (0.183)	2.050*** (0.194)	2.148*** (0.191)	2.172*** (0.187)
Border segment FE	No	Yes	Yes	Yes	Yes
Observations	20,232	20,232	9,720	11,970	13,608
R <sup>2</sup>	0.123	0.153	0.186	0.188	0.182

The table reports results for the effect of breakup on the log of total luminosity in each AC. The specification includes, AC fixed effects, year fixed effects, border segment fixed effects (in column 2-5) border segment interacted with the *Post* indicator and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting ACs on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *New State* is an indicator for the newly created state. Standard errors, clustered at the AC level, are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

Table 4: RDD Estimates of State Breakup on Log Light Intensity: Mineral Areas

	OLS		RDD		
			BW 150	BW 200	BW 250
Post × New State	0.838*** (0.098)	0.738*** (0.104)	0.381** (0.168)	0.674*** (0.152)	0.693*** (0.146)
Post	0.944*** (0.079)	2.013*** (0.184)	2.037*** (0.194)	2.140*** (0.191)	2.168*** (0.187)
Post × Mineral	-0.246 (0.418)	0.814 (0.545)	1.626** (0.773)	1.599* (0.844)	0.968 (0.631)
Post × New State × Mineral	-0.388	-1.679**	-2.758***	-2.313**	-1.739**
Border segment FE	No	Yes	Yes	Yes	Yes
Observations	20,232	20,232	9,720	11,970	13,608
R <sup>2</sup>	0.123	0.154	0.187	0.188	0.183

The table reports results for the effect of breakup on the log of total luminosity in each AC. The specification includes, AC fixed effects, year fixed effects, border segment interacted with the *Post* indicator and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting ACs on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *New State* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC. Standard errors, clustered at the AC level, are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

Table 5: Effect of Breakup on Household-level Outcomes

	Log Income	Infant Mortality	Log Food Expenditure	Water Availability
Post	1.86*** (0.11)	-0.01 (0.02)	2.60*** (0.07)	0.02 (0.02)
Post × New State	0.42*** (0.13)	-0.04 (0.04)	-0.03 (0.08)	0.03 (0.05)
Post × Mineral	1.74** (0.79)	-0.45* (0.23)	1.25*** (0.47)	-0.13 (0.24)
Post × New State × Mineral	-2.14*** (0.77)	0.53** (0.23)	-1.10** (0.46)	-0.19 (0.22)
Observations	1,035	839	1,039	74
$R^2$	0.82	0.06	0.93	0.13

The table reports results for the effect of breakup on various household indicators obtained from the IHD household survey. The sample is restricted to households residing within districts around the border of each state (pre and post breakup). The outcome variables are: *Log Income* is the total income of a household (in rupees) in logs; *Infant Mortality* is the infant mortality rate of the household (reported only for households with children); *Log Food Expenditure* is the monthly food expenditure of a household (in rupees) in logs; *Water Availability* is the binary response to the survey question “Is the availability of drinking water normally adequate?”. The specification includes household fixed effects and state dummies (all 6 states) interacted with the post-breakup indicator. *Post* refers to the years after breakup i.e., year 2001 onwards; *New State* is an indicator for the newly created state. Standard errors, clustered at the household level, are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

differently in the new states and the rump states.

Analogous patterns are in evidence if we focus on outcomes other than luminosity for a sample of households located in districts that lie along the border of the old and new state (Table 5).<sup>38</sup> On the whole, we find positive effects of breakup on all household level outcomes but negative effects for those ACs in mineral rich ACs of new states, mirroring the results in Table 3: households in mineral-rich ACs of new states saw a decrease in income and food expenditure and, at the same time, an increase in infant mortality relative to their peer mineral-poor ACs and other ACs in the rump states.

If we next look at how breakup affects outcomes separately in each of the new states, employing a specification where the single *New State* indicator is replaced by state-specific indicators (Table 6), a mixed picture takes shape. Effects in one new state (Uttarakhand) are better than that its rump, Uttar Pradesh, but worse for Jharkhand and Chhattisgarh relative to their rumps, and these differences are strongly significant. These stark differences are matched by an equally stark variation in how the natural resource rich (NRR) regions were distributed between the rump state and the new state post breakup (Table 1, column 2). Note that the OLS coefficient estimates for Jharkhand are negative when border-segment fixed effects are included in column 2; clearly, even controlling for shared unobservables within border segments confirms this pattern. We emphasise this point since OLS estimates give us an average across the state and the positive coefficient in column 1 might be thought to be coming from an average positive effect in the interior of the state. The inclusion of border segment fixed effects that overturn this pattern suggests that this is not so.

<sup>38</sup>We use two rounds of data on the same household, utilising information from the 1992 (pre breakup) and 2005 (post breakup) surveys to form a household level balanced panel.

Table 6: RDD Estimates of State Breakup on Log Light Intensity: Heterogeneity

	OLS		RDD		
			BW 150	BW 200	BW 250
Post × Jharkhand (new state)	0.421*** (0.101)	-0.335*** (0.124)	-0.855*** (0.237)	-0.639*** (0.192)	-0.644*** (0.180)
Post × Chhattisgarh (new state)	0.477*** (0.050)	0.764*** (0.052)	-0.324 (0.284)	0.175 (0.203)	0.305* (0.169)
Post × Uttarakhand (new state)	1.746*** (0.253)	1.915*** (0.240)	1.444*** (0.202)	1.784*** (0.217)	1.805*** (0.220)
Post	0.944*** (0.079)	2.119*** (0.175)	2.198*** (0.187)	2.282*** (0.183)	2.287*** (0.179)
Border segment FE	No	Yes	Yes	Yes	Yes
Observations	20,232	20,232	9,720	11,970	13,608
$R^2$	0.136	0.172	0.210	0.210	0.205

The table reports the heterogeneous effect of breakup on the log of total luminosity in each AC. The specification includes AC fixed effects, year fixed effects, border segment interacted with the *Post* indicator and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting ACs on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *New State* is an indicator for the newly created state. Standard errors, clustered at the AC level, are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

Table 7: RDD Estimates by State

Bihar and Jharkhand (Large  $\Delta q$ )

	OLS		RDD		
			BW 150	BW 200	BW 250
Post $\times$ New State	−0.356*** (0.126)	−0.327** (0.131)	−0.093 (0.286)	0.028 (0.245)	−0.059 (0.228)
Post	2.855*** (0.211)	3.251*** (0.250)	2.735*** (0.276)	2.801*** (0.259)	2.879*** (0.249)
Post $\times$ Mineral	22.020** (10.125)	10.490 (9.733)	18.721** (8.240)	19.932*** (7.606)	18.747** (7.394)
Post $\times$ New State $\times$ Mineral	−22.040** (10.151)	−10.458 (9.802)	−18.649** (8.294)	−19.696** (7.670)	−18.568** (7.467)
Border segment FE	No	Yes	Yes	Yes	Yes
Observations	5,832	5,832	4,284	5,238	5,688
$R^2$	0.238	0.244	0.243	0.255	0.254

Madhya-Pradesh and Chhattisgarh (Small  $\Delta q$ )

	OLS		RDD		
			BW 150	BW 200	BW 250
Post $\times$ New State	0.821*** (0.043)	0.765*** (0.053)	0.882*** (0.234)	0.598*** (0.192)	0.564*** (0.160)
Post	0.220*** (0.055)	0.262 (0.175)	0.582** (0.293)	0.617** (0.241)	0.604*** (0.212)
Post $\times$ Mineral	0.756** (0.342)	0.704* (0.402)	0.589 (0.660)	0.422 (0.551)	0.362 (0.386)
Post $\times$ New State $\times$ Mineral	0.141 (1.032)	−0.067 (1.019)	−0.886 (1.136)	0.269 (1.091)	0.312 (1.013)
Border segment FE	No	Yes	Yes	Yes	Yes
Observations	5,886	5,886	2,178	2,772	3,096
$R^2$	0.264	0.267	0.259	0.292	0.292

The table reports results for the effect of breakup on the log of total luminosity in each AC. The specification includes, AC fixed effects, year fixed effects, border segment interacted with the *Post* indicator and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting ACs on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards; *New State* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC. Standard errors, clustered at the AC level, are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

Table 7 disaggregates our mineral interaction results by state pair.<sup>39</sup> In the case of the Bihar/Chhattisgarh state pair, we find that the NRR constituencies in the new state of Jharkhand had comparatively worse outcomes post-secession. This differential effects of secession on NRR vs. NRP ACs is statistically insignificant for the Madya Pradesh/ Chhattisgarh state pair.

### 5.3 THE LINK BETWEEN NATURAL RESOURCES AND POLITICS

The theoretical predictions we derived in Section 3 say that secession can affect the quality of governance through a change in the balance of power between NRR constituencies and NRP constituencies in the state legislatures: as NRP constituencies act as a deterrent to the rent extraction activities generating excessive negative spillovers from the NRR constituencies, a reduction in their relative political weight reduces political accountability at state level and lowers the quality of governance (Proposition 2). The patterns in evidence in Table 6 are consonant with this prediction: where secession produced a very high density of natural resources – the case of Jharkhand, with almost two ACs out of three ACs being resource rich – we see worse outcomes at the state level.

Another prediction from the theory that is more narrowly focused but is more distinctively linked to the mechanism we model is that, when the adverse effect of increased resource endowments dominates other effects, it should bring about a fall in the comparative performance of NRR ACs relative to that of NRP ACs, an outcome that is more likely the larger is the proportion of NRR ACs post secession (Proposition 4). In line with this, we find that in the state of Jharkhand (the state that ended up with the highest proportion of NRR ACs amongst all new states and that also ended up doing worse overall), NRR constituencies had comparatively worse outcomes post-secession. On the other hand, this differential effect of secession on NRR vs. NRP ACs is statistically insignificant when examining the patterns for Chhattisgarh, where the proportion of NRR ACs increased but remained comparatively low.

The picture that emerges from the above results thus aligns with the theoretical predictions of Section 3, whereby a high-enough proportion of NRR ACs triggers a resource curse via a political channel. However, this interpretation of the empirical results hinges on observations for three state-pairs, raising doubts as to whether the patterns we observe could be the result of some other cause that happens to be aligned with the changes in the  $q$ 's that occurred with secession. To address this concern, we present further suggestive evidence that a political channel is at work.

First, in Table 8 we document a positive association between state-level natural resource density (the  $q$ s) and weak governance (proxied by the proportion of legislators with a criminal conviction both across and within states). Columns 1 and 2 show that the proportion of criminal MLAs in the state legislative assembly, as well as in terms of the ratio between NRR and NRP constituencies within a state, is higher in states with a high level of  $q$  (proportion of NRR constituencies). Further, focusing only on the six states in our analysis we find in column 3, in a sample of 179 Parliamentary Constituencies (electing federal level MPs), the likelihood of a politician with a criminal record being elected is increasing in the density of mines in that constituency. Chemin (2012) offers evidence for the link between criminal politicians and weak governance: he demonstrates that criminal politicians decrease the welfare of constituents and increase crime and corruption. In addition, a key assumption of the theory is that vote-buying and electoral fraud is higher in resource-rich areas. This is supported by the evidence in columns 4-5 of Table 8, that vote buying and electoral fraud takes place relatively more in the mineral

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<sup>39</sup>We exclude the state pair Uttar Pradesh and Uttarakhand as the state of Uttarakhand as very few NRR constituencies in the border areas (even at a distance bandwidth of 250 km) and the the interaction of interest (Post  $\times$  New State  $\times$  Mineral) is not well identified.

Table 8: Criminal Politicians and the Distribution of Natural Resources

	All-India		6 States	Jharkhand	
	Prop. Criminal MLA		Criminal MLA	Election Malpractice	
	All ACs	Mineral vs. Rest		Binary	Intensity
Min. Density ( $q$ )	0.32*	4.30***	2.787**		
	(0.19)	(0.72)	(1.105)		
Mineral				0.284***	6.268***
				(0.074)	(2.399)
Observations	29	27	179	626	705
$R^2$	0.08	0.80	0.02	0.18	0.21

This table reports the correlation between criminal politician, election malpractice and its mineral resource endowment. The unit of observation in column 2 is a state; in column 4 it is a parliamentary constituency while in column 5-6 it is a household. The dependent variables in column 2 is the proportion of criminal MLAs in the state assembly as of 2011 (reported by Lokniti); in column 3 it is the ratio of criminal MLAs in mineral vs non mineral areas between 2004-2012 in 16 states; in column 4 it is an indicator variable for if the winning candidate of the constituency (MP) has a criminal record; in column 5 it is an indicator for whether a household witnessed any electoral malpractice/irregularities; in column 5 it is an ordered indicator for the extent to which a household witnessed any electoral malpractice or election irregularities, ranging from 0 (no malpractice) to 3 (several malpractices).  $q$  is the proportion of mineral ACs within a state (columns 2-3) and parliamentary constituency (column 4). *Mineral* refers to the total quality of mines within each AC. The specification in column 2 uses state-level observations for the year 2011 while in column 3 observations are pooled by state and year (depending on the election year for the state). Columns 4-5 report logit and ordered logit specifications (reporting marginal effects and odds-ratio respectively), conditioning on household characteristics (income, assets, caste, rural vs. urban location) and district dummies. Standard errors are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

rich areas. We use survey responses from the State Election Survey for Jharkhand in 2005 to do so, on questions to individual voters about perceptions of voting malpractices. Using a logit/ordered-logit specification of perceived voting malpractice within a district against the number of mines within that district gives a coefficient of 0.28 that is significant at the 1% level, suggesting that electoral malpractices are positively related to natural resource endowments.

Another perspective on the political channel is how the relative difference in outcomes for NRR ACs vs NRP is affected by electoral competition. If a political channel is at work, this gap would vary over the electoral cycle; and, if secession changes the political weight of NRR ACs as our theory says, we would expect secession to change the way the gap is affected by the election cycle. The first two columns of Table 9 show that this is the case: the coefficient we reported refers to the triple interaction of secession, mineral resource abundance at the AC level and election year (a triple difference-in-difference effect). For Jharkand, we find a large and significant effect, which again points to the effects of secession operating through a political channel that flows through NRR ACs.

The third column of Table 9 focuses on how secession affects the gap between NRR ACs that are swing ACs, in the sense that the fraction of voters who firmly support either party (partisan voters) is small, and those where voters firmly support one party. Although our stylised theoretical discussion has made no distinction between ACs along these lines, we might expect votes to be comparatively more valuable in swing ACs, and so a higher “price” ( $x$ ) to be paid for votes in those ACs.<sup>40</sup> The negative

<sup>40</sup>To see this, consider an asymmetric variation of our symmetric setup, in which there are two NRR constituencies, 1 and 2, both having the same fraction,  $v$ , of votes for sale, but featuring electorates with different median ideologies. If 100% of

Table 9: Interactions with Political Indicators

Dependent variable: log light intensity				
	Electoral Cycle		Election Factors	
	Bihar- Jharkhand	Madhya Pradesh- Chhattisgarh	Swing AC	Political Alignment
Post × New State × Mineral × Election Year	35.301*** (7.320)	−0.066 (0.980)		
Post × New State × Mineral × Swing			−4.278** (2.033)	
Post × New State × Mineral × Alignment				−1.973* (1.183)
Observations	5,688	3,096	11,034	9,195
$R^2$	0.259	0.308	0.183	0.136

The table reports results for the effect of breakup on the log of light intensity within each AC, for a distance bandwidth of 250-200 km. The specification includes AC fixed effects, year fixed effects, border segment interacted with the *Post* indicator and controls for distance to the border by treatment status. All specifications also control for all possible interaction combinations, not reported, but which are mostly insignificant. *Post* refers to the years after breakup i.e., year 2001 onwards; *New State* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC; *Elec Year* refers to an indicator for time  $t$  and  $t + 1$  where  $t$  is the identified election year; *Swing* refers to whether the margin of victory in the pre-breakup election year for less than 2%; *Alignment* is a (time-varying) binary indicator for whether the constituency's winning candidate belongs to the (leading) ruling party of the state. The specification in Column 5, uses only observations prior to delimitation in 2008. Standard errors clustered at the AC level are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

Table 10: Mining Employment

	% Mining Workers
Post × New State	0.803 (0.689)
Post	−0.367 (0.599)
Post × Mineral	−0.097* (0.051)
Post × New State × Mineral	0.135** (0.060)
Observations	74
$R^2$	0.128

The table reports results for the effect of breakup on mining employment density in each district. *% Mining Workers* is the proportion of workers employed in the mining sector relative to the total employment in a district. The specification includes, AC fixed effects, year fixed effects, border segment interacted with the *Post* indicator and controls for distance to the border by treatment status. *Post* refers to the years after breakup i.e., year 2001 onwards; *New State* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC. Standard errors, clustered at the AC level, are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

and significant triple-interaction coefficient we see indicates that the negative effects of breakup in NRR ACs for states which experience an increase in  $q$  post breakup are exacerbated when these ACs are swing ACs. The fourth column of the table focuses instead on “politically aligned” NRR ACs where the locally elected political belongs to the incumbent party at state level. We might expect that, when the local politician is aligned with the ruling party, a vote-for-favours transaction might be easier, which should exacerbate the adverse effects of secession in NRR ACs. The results of this triple interaction are in line with this.

The theory also implies that mining-related activity should increase sharply in the new states that see a large share of NRR areas post secession, because of more mining licenses being granted or because of increased opportunities for rent-seeking. Using data from the census of all firm establishments in India between 1998 and 2005, we construct a measure of employment density in the mining sector by taking the ratio of employment in the mining sector to the total employment of all sectors in a particular district. Consistently with the prediction of an effect of secession on the relative intensity of mining and non-mining activities, we find that the proportion of individuals employed in mining increases by 0.14% post-secession in the NRR constituencies of the new states (Table 10).

Our stylised model gives a precise characterisation of the effects of natural resource density that are mediated by political competition; but the model’s predictions can be taken as being about the

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the voters in AC 1 always support the incumbent irrespectively of whether or not votes are bought, then the votes that are for sale in AC 1 have no value (or equivalently, they can be had for free), and therefore, an asymmetric equilibrium with constituency-specific “prices”  $x_1$  and  $x_2$  will always feature  $x_1 = 0$ . On the other hand, if 100% of the voters in AC 1 always support the challenger, then it may be prohibitively costly for the local seller to procure votes (i.e. there would be no votes for sale in that AC), and so again we would have  $x_1 = 0$ . Thus, if resource rich ACs are aligned or swing ACs we expect outcomes to be worse post breakup, relative to non-aligned or non-swing ACs.

economic effects of governance as broadly defined. In practice the way in which the quality of governance is affected by a change in natural resource density in a particular case may materialise in ways other than explicit granting of favours – e.g., what we might observe in a particular case, as a systematic response to a higher density of NRR ACs, is a Chief Minister devoting insufficient attention to the management of natural resources. What we emphasise in our theory is the primacy of a political channel mediating some of the effects of natural resource density that we observe.<sup>41</sup>

There are two main types of potentially competing explanations, not involving a link between politics and natural resources, that we must consider for the effects we see. First, a large literature has looked at terms-of-trade effects associated with natural resource abundance (the “Dutch Disease”); as the outcomes we consider are for regions that are part of a single economy where factors of production can move freely across state borders, this type of explanation does not seem relevant for the context we are studying.<sup>42</sup> Second, it is possible that secession could bring about institutional or political changes that have nothing to do with natural resources; but, as Rodrik et al. (2004) argue, institutions are deep-seated, and so we could not expect them to have changed due to secession and in such a short period. Changes in political outcomes coming from a change in the composition of the electorate in the new states may well explain different outcomes overall, but cannot explain the differential effect for NRR and NRP areas and how it relates to natural resource density.

Still, the effects that we observe to be associated with a large increase in natural resource density could be due to state-level idiosyncratic factors that have nothing to do with the political channel we describe; e.g. a Chief Minister may be a poor manager of natural resources independently of the mechanism we describe. Although we cannot conclusively exclude that other factors may play a role, we can amend our empirical specification to at least exclude those idiosyncratic state-level shocks that are correlated with secession. Table 11 shows results for a specification that additionally conditions on state-by-year effects (and state-by-election year); these controls accommodate any idiosyncratic state-level shocks (such as a poor head of state or bad luck) that may be correlated with secession, leaving only the secession-related structural break as the source of variation used to identify the effects. The inclusion of state-year effects reduces the effect of being in mineral-rich ACs in a new state, but this effect remains statistically significant and negative.

Finally, a potential issue in the interpretation of the empirical results is the role of transfers from the centre to the states upon breakup, which might have affected the evolution of outcomes over time. However, as Figure 5 indicates, the pattern of transfers favours the old rump states, particularly Uttar Pradesh.<sup>43</sup> Although this picture cannot explain the relative success of Uttarakhand, it might explain the relatively poor performance of the other two new states. But, as shown in Table 11, controlling for state-specific time trends does not change the heterogeneity patterns we see, which emanates at the more local level of the assembly constituencies.

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<sup>41</sup>The literature has offered alternative characterisations of a politically-mediated natural resource curse, principal amongst them is one that focuses on windfall revenues leading to lower accountability and consequently higher moral hazard, worse selection and a higher likelihood of corrupt incumbents staying in power (Brollo et al. 2013). In our setting, there are no windfall revenues to states – the windfall gain is just the higher share of mineral rich areas. Also, this explanation does not account for the differences between natural resource rich and poor areas at the local level.

<sup>42</sup>A related explanation is crowding out of other sectors by natural resources (e.g. Perroni and Proto 2010, plus others), but there is no reason to expect that this crowding out would be affected by secession – unless the effect operates through a change in the governance of natural resources.

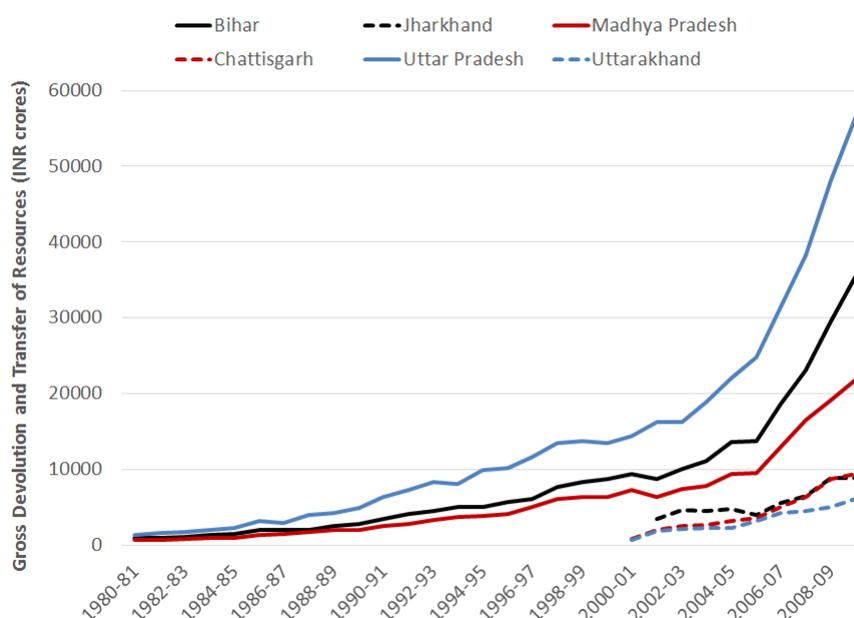
<sup>43</sup>Note that the transfers measured here include all taxes, grants and loans to the state from the Centre.

Table 11: Ruling Out Other Determinants Correlated with Secession

	Lights		
	BW 150	BW 150	BW 150
Post × New State	0.381** (0.168)	-0.123 (0.123)	-0.095 (0.160)
Post	2.037*** (0.194)	-0.594*** (0.085)	-0.620*** (0.084)
Post × Mineral	1.626** (0.773)	1.014* (0.543)	1.166** (0.565)
Post × New State × Mineral	-2.758*** (0.951)	-1.071* (0.647)	-1.232* (0.681)
Additional FEs	-	State×Year	State×Election Year
Observations	9,720	9,720	9,720
R <sup>2</sup>	0.187	0.015	0.015

The table reports results for the effect of breakup on the log of total luminosity in each AC (columns 2-4) in each district (column 5). The specification includes, AC fixed effects, year fixed effects, border segment interacted with the *Post* indicator and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting ACs on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *New State* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC. Standard errors, clustered at the AC level, are reported in parentheses. Standard errors in columns 3-4 are additionally adjusted for auto-correlation. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

Figure 5: Trends in Devolution and Transfer of Resources to New and Old States



The figure shows the amount (in INR crores) of money transferred from the center to the new and old states between 1980-2010. Source: OpenBudgetIndia

#### 5.4 VALIDITY OF CONDITIONAL COMMON TRENDS ASSUMPTION AND ROBUSTNESS CHECKS

This section discusses the conditional common trends assumption underlying our RDD difference-in-difference empirical strategy and presents further robustness checks.

If the conditional common trends assumption holds, we should expect that areas close to the border would display similar trends before the secession, especially when comparing mineral-rich and mineral-poor areas. To account for potential differences in human geography, we first use data from the census to examine whether there are significant differences in the concentration of scheduled tribes and castes and in literacy rates across border areas, as well as the previously discussed effect on electricity tariffs. Table 12 summarises the details of this exercise, comparing differences across boundaries. While there are trend increases in the concentration of scheduled tribes post 2000, we do not find a significant difference across states.<sup>44</sup>

We then carry out two placebo-style checks on conditional common trends (Table 13) to verify that the effects we measure can be attributed to the secession episodes we observe. First, we artificially move back the date of secession to 1996, four years before the actual breakup occurred. Columns 1-3 present results from this exercise; we find throughout that the  $Post \times New State$  effect as well as the  $Post \times New State \times Mineral$  is statistically insignificant, suggesting that the positive discontinuity in outcomes for new states only started revealing itself after the states were formally split in 2000. In the second instance, we examine the effect of a false, 2001 breakup on luminosity in the southern states of Andhra Pradesh (AP) which is resource-rich relative to the new state of Telangana and where breakup occurred only in 2014. We take this as a placebo and ask whether the results here mimic those of the other three states if we pick the date of breakup as 2001. A potential concern is that the effect of concentrated resource endowments might have occurred with or without breakup if, for instance, an increase in returns from mining or opportunities to extract rents had changed for some reason post 2001. These results, in columns 4-6 of the table, strongly support the notion that breakup matters. There is, as for our other specifications, a strong positive trend in outcomes post 2001, but there is no particular effect of the placebo treatment, nor is there any particular effect of local mineral endowments that might independently have been affected post 2001 by a change in prices or rents over time.<sup>45</sup>

Next, we investigate the sensitivity of our results to variations in the estimation approach and to the inclusion of additional controls. To account for spatial correlation in our dependent variable, we apply a spatial correction (Conley 1999) to our method of inference. Table C1 presents our main results with spatially adjusted standard errors and shows that our results are robust to the presence of arbitrary spatial correlation. We also examine the role of conflict, primarily from Marxist (Naxalite) rebellions and differential mineral price trend effects, in driving the state secession results. Mineral rich areas are also areas with heightened violence and conflict, and so the mineral resource effects we find may merely reflect developments in active conflicts in these states around the same time when state borders were redrawn. Additionally it could be that mineral prices (typically endogenous) trended differently after the state-breakup, affecting outcomes in new vs. old states. To investigate this, we included a measure of conflict, as proxied by the number of Maoist rebels-related incidents, and dummies for mineral type interacted with year in all specifications. The mineral type by year fixed effects allow us

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<sup>44</sup>Trend increases can be potentially explained by the fact that, since the border was drawn, re-settlements over time have affected the relative strength of settlements and there has been spillovers in settlements across borders. Census data since 1881 have shown a gradual decline of tribal populations in Jharkhand and Chhattisgarh. The main reason for this pattern are the low birth rates and high mortality rates among the tribes as well as the loss of traditional land.

<sup>45</sup>This result holds even when pooling the “placebo” sample with the original six states sample and testing for the effect of new state interacted with placebo state pair. The coefficient on this interaction is statistically insignificant.

Table 12: Electricity Price, Demographics and State Breakup

	State Electricity Tariff		Demographic Shifts	
			Pr. Literate	Pr. SC/ST
Post × New State	−9.91 (9.44)	−10.40 ( 8.58)	−0.07 (0.04)	0.005 (0.04)
Post	325.39*** (15.50)	353.46*** (14.56)	−0.08*** (0.03)	0.14*** (0.03)
Year FE	Yes	Yes	NA	NA
District/State FE	No	Yes	Yes	Yes
Observations	122	122	63	63
<i>R</i> <sup>2</sup>	0.95	0.97	0.58	0.67

This table reports results for the effect of breakup on electricity tariff (column 1 & 2) and demographics (column 3 & 4). Data on electricity tariff is provided at an annual level for each state. Census data on demographics is available for two periods, 1991 and 2001, at the district level. The analysis in column 3 & 4 is restricted to districts around the border of each state (after breakup). *Post* refers to the years after breakup i.e., year 2001 onwards: *New State* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC. Robust standard errors are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

Table 13: RDD Estimates of Placebo Breakup on Log Light Intensity

	Placebo Breakup 1996			Placebo Breakup AP		
	BW 150	BW 200	BW 250	BW 150	BW 200	BW 250
Post × New State	−0.140 (0.200)	0.134 (0.191)	0.131 (0.175)	0.021 (0.118)	0.038 (0.106)	0.068 (0.101)
Post	2.524*** (0.307)	2.610*** (0.298)	2.684*** (0.292)	1.672*** (0.217)	1.633*** (0.193)	1.595*** (0.176)
Post × Mineral	0.409 (1.149)	0.679 (1.107)	0.026 (0.849)	−7.319 (10.292)	−1.346 (9.359)	3.162 (8.828)
Post × New State × Mineral	−0.912 (1.363)	−1.146 (1.292)	−0.628 (1.107)	0.075 (15.336)	1.694 (9.322)	−2.677 (8.802)
Observations	4,320	5,320	6,048	4,662	5,364	6,012
<i>R</i> <sup>2</sup>	0.183	0.196	0.197	0.221	0.230	0.215

The table reports results for placebo effects. We investigate: (i) in columns 1-3, the effect of a placebo state breakup on luminosity in the pre breakup year of 1996 (four years before the actual breakup occurred); and (ii) in columns 4-6, the effect of a 2001 placebo-breakup on luminosity in the states of Andhra Pradesh (AP) and Telangana (whose breakup occurred only in 2014). The dependent variable for all specifications is the log of total luminosity in each AC. All specifications include, AC fixed effects, year fixed effects, border segment interacted with the *Post* indicator and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting ACs on either side of the border for the analysis. *Post* refers to the years after breakup; *New State* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC. Standard errors, clustered at the AC level, are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

to flexibly control for differential price trends specific to an AC and its mineral deposit without having to include (a potentially endogenous) mineral price variable. Table C2 shows that our results are not affected by the inclusion of conflict or mineral-price trends; furthermore, while the coefficient on the conflict variable is negative throughout, it is mostly statistically insignificant. Column 3 presents results on the effect of mineral resources post breakup on economic activity, after controlling for conflict and mineral-price trends. Here again, we find that our results are robust to controlling for the incidence of conflict and differential mineral prices post-breakup. Changes in luminosity could also be driven by changes in the price of electricity. To examine this, we use available data on electricity prices by state and year (an unbalanced panel) and examine their evolution across states. Results of panel regressions suggests that, while there were trend increases in prices across states, there are no significant differences between new and old states. Such concerns should also be mitigated by the fact that we use regression discontinuity techniques and compare areas around state boundaries.

## 6 CONCLUDING REMARKS

In this paper we exploit the breakup of three of the largest states in India, comprising areas with some of the largest concentration of mineral resources in the country, to examine how changes in the political balance between natural resource related interests and other interests affects outcomes at the local level. Our theoretical framework suggests that within a region where political opponents compete with each other for votes, outcomes vary with the level of natural resource endowments: very high endowments are likely to lead to perverse outcomes. The secession episode that occurred within India allows us to examine this question using longitudinal evidence and in the context of a single larger economy.

Although we only have three three separate cases of secession to compare across, we find that the main predictions of the theory are consonant with the data. In particular, when new states inherit a large share of natural resources, we see NRR areas in such states doing worse relative to comparable NRR areas in rump states and, in comparative terms, doing worse than NRP areas of the same state. According to the theory presented in Section 3, this is a symptom of a natural-resource curse that is mediated through a political channel. While we cannot decisively rule out alternative explanations, a political channel seems the simplest and most intuitive way to understand the evidence.

The question of how to design institutions that can harness the positive effects of natural resources is an important one for economic development, as poorer countries rely comparatively more on natural capital (van der Ploeg 2011). Our results suggest that the adverse effects of patronage politics could be mitigated by redrawing constituency borders so as to reduce the weight of NRR areas within individual ACs and so make it more difficult to buy a large fraction of the total votes – although it has been shown that vote trading is itself a function of the level of development (Aidt and Jensen 2017). Second, our analysis suggests that outcomes might improve if the response to demands for secession were met by higher fiscal redistribution towards the areas that threaten to secede, rather than by creating new political entities (although, of course, this may create a moral hazard problem). Indeed, Aidt and Dutta (2016) shows the importance of the design of fiscal federalism institutions in the face of different types of externalities between local regions. Finally, changing the current allocation of decision powers with respect to mineral concessions and royalty rates, as well as the way public revenues from natural resources are allocated across state and local communities, may be an effective way of mitigating the curse.<sup>46</sup>

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<sup>46</sup>The federal government that was instated in 2014 has proposed an amendment to the original Bill of 1957 that would address some of the problems we have mentioned – principal amongst them the excessive separation between the powers

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to set royalty rates and the powers to grant concessions – establishing District Mineral Foundations (DMFs) in areas affected by mining related operations (Narain 2015). These new institutional arrangements might well hold the key to improved performance for areas with concentrated resources that might succumb to a local natural resource curse otherwise. However, the incentives for local capture of the DMFs cannot be readily discounted.

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## A DATA SOURCES

In this section we describe in detail the additional data used for the analysis.

National and State Election Study 2004: The survey is conducted by the CSDS. The survey interviews respondents immediately after polling and enumerates information on the political behaviour, opinion and attitudes of voters alongside their demographics. The survey uses a dummy ballot box for capturing the respondent's voting choice wherein respondents were asked to mark their voting preference on a dummy ballot paper and drop it in a dummy ballot box. Sampling for the survey is carried out using a multi-stage stratified random sampling design. The first stage involves stratified sampling of Assembly Constituencies by state proportional to their size. In the second stage, polling stations are sampled from each of these ACs, again proportional to electorate size. In the final stage respondents are selected from the Electoral Rolls provided by the Election Commission. Respondents are sampled by the Systematic Random Sampling (SRS) method, which is based on a fixed interval ratio between two respondents in the polling booth. More information on the sampling and questionnaire modules of the 2004 NES can be found in Lokniti (2004).

AC and PC Maps: The Assembly Constituency (AC) and the Parliamentary Constituency (PC) map, shape files were obtained from the Election Commission of India website (<http://eci.gov.in/>). This data was cleaned and geo-referenced using projections provided by Sandip Sukhtankar<sup>47</sup> and INRM Consultants, New Delhi. Note that the AC maps for Uttarakhand are only available post delimitation. However, only a small fraction of constituencies are affected by the delimitation procedure in Uttarakhand and are results are robust to dropping these constituencies. Distances to the border for each AC was calculated by taking the centroid of each AC polygon and measuring its Euclidean distance to the state border line. Finally, we also divide the entire border line into segments which we include as fixed effects in our specifications.

Data on Conflict: The data on the conflict as measured by Maoist incidents is compiled by Gomes (2015)<sup>48</sup> and comes from four different sources: Global Terrorism Database (GTD) I: 1970-1997 & II: 1998-2007; Rand-MIPT Terrorism Incident database (1998-present); Worldwide Incidents tracking system (WITS); National Counter Terrorism Centre (2004-2007); South Asia Terrorism Portal (SATP).

Data on Criminal Politicians: Data on criminal politicians in India is taken from Fisman et al. (2014), who compile this information from candidate affidavits. These are held on the the GENESYS Archives of the Election Commission of India (ECI) and the various websites of the the Chief Electoral Officer in each state. The archives provide scanned candidate affidavits (in the form of pictures or PDFs) for all candidates.

Household Panel Data, IHDS: We use data from two waves (1992 and 2004) of the India Human Development Survey (IHDS). This is a nationally representative survey of 41,554 households in 1,503 villages and 971 urban neighbourhoods across India. Data are publicly available through ICPSR. For details on the survey see Desai et al. (2007).

State Election Results: We use the results of all state elections held in the six states analysed, between the years of 1992 and 2009. This data is obtained from the Election Commission of India.

Human Demographics: We use data on district-level migration and literacy from the two census waves conducted in 1991 and 2001. This data is available on the census of India website.

Electricity Prices: Data on electricity tariff is compiled at an annual level for each state by India Stat. This data is sourced from the annual reports on the working of state electricity boards and electricity departments as well as the Planning Commission reports.

Economic Census: The census data on all firm establishments and employments activity in the mining sectors is obtained from the fourth (year 1998) and fifth (year 2005) round of the Economic Census. We supplement data on firm level outcomes with information on wages and salaries and electricity consumption from the Annual Survey of Industries conducted in 2001.

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<sup>47</sup> Retrieved from <http://www.dartmouth.edu/sandip/data.html>

<sup>48</sup>We are very grateful to Joseph Flavian Gomes for sharing his data on district level conflict in India.

## B PROOFS

### PROOF OF PROPOSITION 1

As only one buyer (the incumbent party,  $L$ ) can buy votes, the votes for sale have no alternative use, and so if the buyer has all the bargaining power and can make a take-it-or-leave-it offer to the vote sellers, it will be able to buy the votes at a price  $x = 0$ . On the other hand, if only the incumbent party,  $L$ , can buy votes, but the sellers have all the bargaining power and operate as a single seller (i.e. they collude), then the take-it-or-leave-it offer price can be derived as follows.

The overall effect for a NRR constituency from  $x > 0$  is given by  $(\lambda + \rho q)x$ , whereas the effect for a NRP constituency is given by  $\rho qx$ . The utility of voters in a NRR constituency from the  $L$  party being elected under shock  $s$  is now given by  $U_i^L = -(-1/2 - i + s)^2 - (\lambda + \rho q)x$ ,<sup>49</sup> and a voter  $i$  is therefore indifferent between the  $L$  and  $R$  parties (i.e.  $U_i^L = U_i^R$ ) iff  $-(-1/2 - i + s)^2 - (\lambda + \rho q)x = -(1/2 - i + s)^2$ . This gives the cutoff ideology conditional on shock  $s$  as  $\hat{i}^{NRR} = -(\lambda + \rho q)x/2 - s$ , and in an NRP constituency the cutoff ideology is  $\hat{i}^{NRP} = -\rho qx/2 - s$ . The vote share of the  $L$  party among the  $1 - v$  voters in  $q$  NRR constituencies who do not sell their votes is then given by  $\hat{i}^{NRR} + 1/2 = 1/2 - (1/2)(\lambda + \rho q)x/2 - s$ . The loss of votes due to  $x > 0$  in an NRR constituency is  $L_R = (\lambda + \rho q)x/2$ . The vote share of the  $L$  party among the voters in each of the  $1 - q$  NRP constituencies is given by  $\hat{i}^P + 1/2$ , and the loss of votes in an NRP constituency due to  $x > 0$  is  $L_P = \rho qx/2$ .

Suppose that party  $L$  buys the  $qv$  votes at price  $x$  in a state. The total vote share conditional on shock  $s$  is given by  $V_{LB} = qv + q(1 - v)(1/2 - s - L_R) + (1 - q)(1/2 - s - L_P)$ . The  $L$  party wins if  $V_{LB} \geq 1/2$ , i.e. iff  $qv + (1/2 - s)(1 - qv) + q(1 - v)(-L_R) + (1 - q)(-L_P) \geq 1/2$ , or

$$\frac{qv}{2} - \frac{q(1-v)\lambda x}{2} - (1-qv)\frac{\rho qx}{2} \geq s(1-qv). \quad (7)$$

Using the fact that  $s$  is uniformly distributed on  $[-1/2, 1/2]$ , the probability of winning is

$$P_L^W = \frac{1}{2} + \frac{1}{2(1-qv)}(qv - q(1-v)\lambda x - \rho qx(1-qv)) \equiv \Phi(x). \quad (8)$$

Then, the maximum price the buyer is willing to pay is that for which  $\Phi(x) = 1/2$ , which gives  $x = v / (\lambda(1-v) + \rho(1-qv)) \equiv \bar{x}$ . The seller's payoff,  $P_L^W x = \Phi(x)x$ , reaches a maximum at  $x = 2\bar{x}/(3qv)$ , which, for  $v \leq 1/2$ , is always greater than  $\bar{x}$ . Thus,  $\bar{x}$  is the value of  $x$  that maximises the seller's payoff subject to the constraint  $P_L^W \geq 1/2$ .

### TWO BUYERS OR MULTIPLE SELLERS

If both the  $L$  and the  $R$  parties can buy votes from a single seller where the seller makes a simultaneous take it or leave it offer to the buyers,  $\bar{x}$  remains unchanged. The sequence of actions is as follows. The seller posts a price. Each buyer can accept or reject the price. If both buyers accept the offer, the votes are sold, at the posted price, to one of the buyers selected at random. If one buyer accepts while the other buyer rejects, the accepting buyer gets the votes. If both buyers reject the offer, another offer can subsequently be made according to the same protocol. We focus on subgame perfect equilibria of this game.

Allowing for multiple sellers also does not change conclusions, as the following discussion demonstrates. Suppose that there is a mass,  $q$ , of  $N$  NRR equal-sized constituencies, each of them having mass  $q/N$ ; and suppose that sellers simultaneously post prices  $x_1, x_2, \dots, x_N$ , and make a take it or leave it offer to the buyer. Each seller chooses its price given the conjectured prices of the other sellers. If the seller of a single NRR constituency,  $j$ , sells  $v$  votes for a price  $x_j$ , while all other sellers in NRR constituencies post a price  $x_0$  (assuming symmetry), the loss of votes (among the  $1 - v$  voters in the NRR districts) to the incumbent in constituency  $j$  is  $(1/2)(\lambda x_j + \rho(x_j + (N-1)x_0)q/N)$ . In the Natural Resource Poor (NRP) constituencies, the loss of votes is  $(1/2)\rho(x_j + (N -$

<sup>49</sup>Note that we ignore spillovers from other constituencies that are not in the state, as voters do not include those in the calculation since they cannot affect those spillovers.

1) $x_0$ ) $q/N$ . Hence the probability of winning is

$$P_{Lj}^W = \frac{1}{2} + \frac{1}{2(1-qv)} \left( qv - q(1-v)(\lambda x_j + \rho(x_j + (N-1)x_0))q/N - (1-q)(\rho(x_j + (N-1)x_0))q/N \right). \quad (9)$$

The best offer from the perspective of seller  $j$  is then that which makes the above expression equal to  $1/2$  (the buyer's reservation value), given the other sellers' choice,  $x_0$ . Solving for this optimal  $x_j$ , as a function of  $x_0$ , and then focusing on a symmetric solution with  $x_j = x_0$ , we obtain a value  $\tilde{x}$  that is the same as that with full collusion. The intuition for this result is that each seller, no matter how small, acts as a monopolist for its votes against the given buyer's total reservation payoff of  $1/2$ .

## PROOF OF PROPOSITION 2

Let  $U^S(x) = \Phi(x)x$  and  $U^B(x) = \Phi(x) - 1/2$ , and let  $(U^S(x_S), U^B(x_S))$  denote the offer made by the seller, and  $(U^S(x_B), U^B(x_B))$  the offer made by the buyer. If the seller is the first mover, an equilibrium corresponds to the solution of the two equations:  $U^B(x_S) = \delta U^B(x_B)$  and  $U^S(x_B) = \delta U^S(x_S)$ . A solution gives:

$$x_S = \tilde{x} \frac{1 + \delta(1 + \delta - \sqrt{1 + \delta(2 + \delta - 4qv(1 - qv))})}{1 + \delta + \delta^2}. \quad (10)$$

This is increasing in  $q$ . Thus, when some of the surplus accrues to the buyer (the incumbent party,  $L$ ), an increase in the density of natural resources (a higher  $q$ ) can make the incumbent's position more secure (it raises  $P_L^W$ ).

## ENDOGENOUS $q$

Suppose that in any AC,  $j$ , there is a cost  $c$  for delivering  $v$  votes to the buyer. ACs are indexed so that the private net unit value,  $z(j)$ , of the concessions made by the state in relation to natural resources (net of taxes and any other private costs incurred by the beneficiaries) is increasing in  $j$ , with  $j \in [0, 1]$ . Then the vote seller will deliver votes from a given AC,  $j$ , iff  $z(j)x > c$ , and will not deliver any votes from that AC otherwise. Since  $z'(j) > 0$ , if  $z(0)x < c$  and  $z(1)x > c$ , there will be a cutoff point  $\underline{j}(x)$  such that there will be votes for sale only in ACs  $j > \underline{j}$ , and so  $q = 1 - \underline{j}(x)$ . The seller's take-it-or-leave-it offer,  $x$ , together with the proportion,  $q$ , of ACs involved in vote sales is then identified by the two conditions

$$\begin{cases} x = \frac{v}{\lambda(1-v) + \rho(1-vq)}; \\ z(1-q)x - c = 0. \end{cases} \quad (11)$$

For the sake of simplicity, in the rest of our discussion we will assume  $z(j) = z_0 + \alpha j$ , but the arguments can be generalised to any schedule  $z(j)$  s.t.  $z'(j) > 0$ . The mean level of  $z$  is  $\bar{z} = z_0 + \alpha/2$ ; solving for  $z_0$ , we can then express  $z(j)$  as  $z(j) = \bar{z} + \alpha(j - 1/2)$ , where  $\bar{z}$  can be interpreted as reflecting the *density* (average value) of natural resources in the state, and  $\alpha$  their *concentration* within the state. Replacing this expression into the above system of equations and solving for  $x$  and  $q$ , we obtain

$$\begin{cases} \tilde{x} = \frac{(\alpha - \rho c)v}{\alpha(\lambda + \rho) - \alpha(\lambda + \rho/2)v - \rho \bar{z} v}; \\ \tilde{q} = \frac{(\alpha/2 + \bar{z})v - (\lambda(1-v) + \rho)c}{(\alpha - \rho c)v}. \end{cases} \quad (12)$$

In an interior solution with  $\tilde{q} \in (0, 1)$ , both  $\tilde{x}$  and  $\tilde{q}$  are increasing in  $\bar{z}$  and decreasing in  $\alpha$ ; i.e. an increase in the *density* of natural resources leads to more votes-for-favours transactions and more rent grabbing, whereas an increase in their *concentration* has the opposite effect.

### PROOF OF PROPOSITION 3

Let  $z \equiv q_A/q_B$ . Since  $(q_A+q_B)/2 = q_U$ , this implies  $q_A = 2q_U z/(1+z)$ ,  $q_B = 2q_U/(1+z)$ . Differentiating  $U_A^{NRP}/U_B^{NRP}$  with respect to  $z = q_A/q_B$ , we obtain

$$\frac{d(U_A^{NRP}/U_B^{NRP})}{d(q_A/q_B)} = \frac{(1-\gamma^2)(1+q_A/q_B)^2((1-\nu)\lambda+\rho)((1-\nu)\lambda+(1-2q_U\nu)\rho)}{\left((1-\nu)(1+q_A/q_B)(1+\gamma q_A/q_B)\lambda + (1+((1+\gamma)(1-2q_U\nu)+\gamma q_A/q_B)q_A/q_B)\rho\right)^2}. \quad (13)$$

Since  $U_A^{NRP}$  and  $U_B^{NRP}$  are both negative, a positive sign means that welfare in  $A$  becomes worse relative to welfare in  $B$ . In turn, the sign of (13) is positive if and only if  $q_U < (1-\nu)\lambda/(2\nu\rho) \equiv \bar{q}_U$ . For  $\nu$  approaching zero  $\bar{q}_U$  approaches infinity and for  $\nu$  approaching one it equals  $(\lambda+\rho)/(2\rho)$ , which is greater than unity given that  $\lambda > \rho$ . We can thus conclude that (13) is positive for any  $\nu \in (0, 1)$ . Also, since  $\lambda > \rho$ ,  $U_A^{NRP}/U_B^{NRP}$  is increasing in  $x_A$ , which in turn is increasing in  $z$ .

## C ADDITIONAL TABLES AND FIGURES

Table C1: RDD Estimates of Log Light Intensity, with Spatially Adjusted Errors

	BW 150	BW 150	BW 150
Post × New State	0.348*** (0.103)		0.381*** (0.104)
Post × Jharkhand (new state)		−0.855*** (0.155)	
Post × Chhattisgarh (new state)		−0.324** (0.149)	
Post × Uttarakhand (new state)		1.444*** (0.109)	
Post			
Post × Mineral			1.626*** (0.530)
Post × New State × Mineral			−2.758*** (0.635)
Observations	9,720	9,720	9,720
$R^2$	0.042	0.070	0.043

The table reports results for the effect of breakup on the log of total luminosity in each AC. All specifications include AC fixed effects, year fixed effects, border segment interacted with the *Post* indicator and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting ACs on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards; *New State* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC. Spatially adjusted standard errors are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.

Table C2: RDD Estimates of Log Light Intensity, Controlling for Conflict

	BW 150	BW 150	BW 150
Post × New State	0.405** (0.166)		0.417** (0.167)
Post × Jharkhand (new State)		−1.068*** (0.236)	
Post × Chhattisgarh (new state)		−0.533* (0.311)	
Post × Uttarakhand (new state)		1.428*** (0.208)	
Post	1.334*** (0.374)	1.632*** (0.356)	1.287*** (0.375)
Post × Mineral			2.488* (1.341)
Post × New State × Mineral			−4.221*** (1.244)
Conflict	−0.403 (0.293)	−0.417 (0.290)	−0.406 (0.293)
Post × Conflict	0.390 (0.296)	0.386 (0.292)	0.394 (0.295)
Post × New State × Conflict	−0.047 (0.032)	0.050* (0.030)	−0.045 (0.032)
Mineral × Year FE	Yes	Yes	Yes
Observations	9,720	9,720	9,720
$R^2$	0.222	0.244	0.222

The table reports results for the effect of breakup on the log of total luminosity in each AC. Effects of breakup for each state-pair are also reported. All specifications include AC fixed effects, year fixed effects, border segment interacted with the *Post* indicator and controls for distance to the border by treatment status. Additionally the specifications include (weighted) dummies for each mineral type deposit interacted by year in an AC (*Mineral × Year FE*). The mineral type dummies are weighted by the number of deposits for that mineral in an AC. BW refers to the area bandwidth, used for selecting ACs on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards; *New States* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC; *Conflict* measures the total number of conflict occurrences, by year, within each AC. Standard errors, clustered at the AC level, are reported in parentheses. \* indicates significance at 10%; \*\* at 5%; \*\*\* at 1%.