Feb 2016 No.268

# The Natural Resource Curse Revisited: Theory and Evidence from India

Amrita Dhillon, Pramila Krishnan,
Manasa Patnam and Carlo Perroni

## WORKING PAPER SERIES

Centre for Competitive Advantage in the Global Economy

Department of Economics

# The Natural Resource Curse Revisited: Theory and Evidence from India*

Amrita Dhillon
*Kings College and CAGE, University of Warwick*

Pramila Krishnan
*University of Cambridge and CEPR*

Manasa Patnam
*CREST-ENSAE*

Carlo Perroni
*University of Warwick*

January 29, 2016

ABSTRACT

In 2000, three of the largest Indian states, comprising areas with some of the largest endowments of natural resources in the country, were split to create three new states. We exploit the dramatic change that ensued, both in the distribution of resources and in the allocation of political power, to examine the interplay natural resources and politics. We construct a theoretical framework designed to account both direct and indirect effects of the change in natural resource concentration on economic outcomes – the direct effects arising from revenue generation, the indirect ones arising, through a political channel, from an exchange of votes for natural resource rents at the local level. We employ a sharp regression discontinuity design to estimate the causal effect of secession and concentrated resources on growth and inequality outcomes at the sub-regional level. Consistently with our theoretical predictions, we find that, while the economic effect of secession is generally favourable, constituencies rich in resources see a relative worsening of outcomes in both economic activity and inequality.

Keywords: Natural Resource Curse, Political Secession
*JEL classification*:

*We would like to thank seminar participants at the Paris School of Economics, Université Libre de Bruxelles, Queen Mary University of London, KIngs College, London, University of Cambridge, London School of Economics, European Development Network 2015, Oslo, Delhi School of Economics, Indian Statistical Institute, New Delhi, and the University of Warwick for their comments. We would also like to thank Toke Aidt, Denis Cogneau, Stefan Dercon, Douglas Gollin, Eliana La Ferrara, Kalle Moene, Kaivan Munshi, Rohini Pande, Debraj Ray and Hans-Joachim Voth for their comments on various versions of this paper.

# 1 Introduction

Is small beautiful? We investigate this question in the context of the breakup, in 2000, of three of the largest Indian states – Uttar Pradesh, Madhya Pradesh, and Bihar – respectively equivalent in size to Brazil, Turkey and Iraq. The post breakup experience has given rise to an intense debate about whether the new, smaller states have done better in governance and economic performance (Kale et al. 2010), and about the potential consequences of further demands for secession.[1] Answers have been many: success for some of the new states has been attributed to the zeal of policy-makers, while weak performance in others has been variously attributed to poor and corrupt leadership and to the large mining rents available. In brief, speculation about how these states have fared has ranged from the Great Man theory of development[2] to the curse of natural resources and to intrinsic efficiency advantages in the governance of smaller states.

A key feature of the breakup was that two of the original states contained a significant share of India's natural resources,[3] and these were concentrated within specific geographical areas. The breakup thus resulted not only in a change in state boundaries and size, but also in a dramatic change in the distribution and concentration of natural resources across new and rump states: rump states were left with a far smaller share of those resources while the new states acquired the lion's share.[4] In what follows, we exploit these parallel changes in political structure and comparative natural resource endowments to examine the interplay between natural resources and politics.

The literature on the natural resource curse can broadly be divided into two camps: those who claim that there is an unconditional resource curse (e.g., Sachs and Warner 2001, Gylfason 2001, Leite and Weidmann 1999) and more recently those who believe the resource curse is conditional upon the quality of institutions (see Lane et al. 1999, Acemoglu and Robinson (2006), Mehlum et al. 2006, Caselli and Tesei 2011). While the latter is now the prevalent view, there is little pointing to which institutional mech-

[1]The article "India Redrawn" in Outlook Magazine (http://www.outlookindia.com/article/india-redrawn/279690) describes the proposed division of India into 50 states compared to the current 25, which makes this discussion both pertinent and important.

[2]This is attributed to the historian Thomas Carlyle (1840) who wrote "The history of the world is but the biography of great men."

[3]India is the largest producer of mica, second largest in chromites and barites, third largest in coal and lignite, fourth largest in iron ore, fifth largest in bauxite and crude steel and eighth largest in the world in aluminium. Two of the three states we study contain 45 per cent of the reserves in iron ore and coal and 18 per cent of copper (see Indian Bureau of Mines 2008 and TERI 2001).

[4]The borders of the new states have always been well-defined as will be discussed later. Figure 3 shows the new borders and the states after breakup.

anisms actually matter. In this paper we look at state breakup to establish an empirical link between economic outcomes and changes in the relative political weight of natural resource districts, a link that points directly to a political patronage channel.

A serious limitation of earlier empirical studies of the link between institutions and the natural resource curse is that they relied on cross-country comparisons. The more recent literature does much to obviate this problem by focusing on within-country studies, but it does so at the expense of giving up on attempts to compare the effects of different institutions. Our paper combines the advantages of within-country studies – primarily the relative homogeneity of culture, history and institutions – with the ability to investigate the role of political institutions through the institutional changes that have been brought about by secession.

We begin our discussion by presenting a stylised model of how secessions affect economic outcomes in the newly formed states. This framework is designed to account for two effects: the first, which is independent of the endowment of natural resources, derives from the smaller size of each state post break up that makes administration easier; while the second derives from the unequal distribution of natural resources across the newly formed states relative to the rump states. We characterise the effects of the unequal distribution in two ways. First, we have a positive effect arising from the change in the comparative allocation of income from natural resources, so that after secession the states end up controlling a comparatively greater or smaller proportion of natural resources than before. Second, we have a negative effect arising from changes in incentives to govern well. This is driven by a higher concentration of natural-resource rich areas in a new state that raise the political influence of those controlling the natural resources and adversely affect economic outcomes, both in natural-resource rich areas and in other areas of the state. We show that these two effects work in opposite directions. When the negative effect dominates, it produces a net fall in welfare in the natural-resource rich areas of the new states that are also relatively natural-resource rich; and by the same mechanism, an increase in welfare in the natural-resource rich areas of the rump states that are now relatively poor in natural resources overall.

We then proceed to document average performance of each of the new entities both pre-2000, before breakup and after. We use data on luminosity as a proxy for the evolution of economic activity at the sub-regional level for the period 1992-2010 together with data on mining deposits across the states, with a view to examining the importance of rents from point-source natural resources. We rely on geographic discontinuity at the boundaries of each state pre-breakup, which allows us to employ a sharp regression discontinuity design to estimate the causal effect of secession on growth and inequality outcomes.

Figure 4 displays the distribution of luminosity across India in 2008; the poorer northern and central regions in which our three states are located stand out for the low levels of luminosity, relative to the rest of India. Our first and basic result is that while all states experience a trend increase in luminosity, it is also clear that, on average, new states did better than the rump states, with a differential in luminosity of 35 percent. It is also clear that the effects are heterogeneous; the average positive effect is driven by Uttarakhand relative to its rump state of Uttar Pradesh, with a strong negative effect of Jharkhand relative to the rump state Bihar, and a milder negative effect of Chhattisgarh relative to Madhya Pradesh. This led us to explore reasons for the heterogeneity and the obvious candidate is that of the heterogeneity in the distribution of natural resources.

Figure 3 shows the states post break up, with the rump states retaining their names (Bihar, Madhya Pradesh and Uttar Pradesh), while the split-offs are Jharkhand, Chhattisgarh and Uttarkhand. Figure 5 describes the dramatic spatial distribution of resources; note that Jharkhand has acquired control of most deposits relative to its rump, Bihar; while Chhattisgarh has a large share, its rump Madhya Pradesh retains a considerable amount. Uttarakhand and Uttar Pradesh do not have much in the way of point source resources and thus offer a counterpoint to the other two sets of states. Given that the distribution of resources remains unchanged within states before and after break up, the main change lies in the creation of a new political entity and the consequent changes in the relative political weight of natural resource rich areas following the change in relative concentration brought about by secession.

Having established these basic patterns, we go on to examine whether a political-economy channel is able to help account for them. For this purpose, we focus on differences in outcomes at the assembly constituency (AC) level across the states.[5] Our empirical design, which exploits the breakup of states, allows us to focus on the political economy channel and rules out fixed structural explanations. We obtain a striking result that banishes other possibilities to the back of the queue: in brief, the heterogeneity in outcomes (both in aggregate activity and local inequality at the AC level) is mirrored in the differences in outcomes by ACs with a large concentration of mineral deposits relative to ACs with little or no resources. In other words, the concentration of resources weakens economic outcomes and seems to generate higher local inequality in ACs with a large

[5]There are two main levels of government in India; the first is the federal level, where parliamentary representatives are elected from (parliamentary) constituencies, within state; the second is the state level, where representatives to state assemblies are elected from assembly constituencies which are demarcated separately

concentration of resources, post breakup. This, together with the enormous concentration of natural resources in Jharkhand relative to Bihar serves to potentially explain the heterogeneity in aggregate or state-level outcomes. Our explanation is thus linked to the spatial pattern in concentration of natural resources across states and and to the interplay of state level and local political structures at the level of the assembly constituency.

These results show that secession is a force for better outcomes, as all constituencies do better on average across all six states post breakup. However, constituencies that are rich in natural resources[6] do relatively worse – suggesting that there is a local curse that flares up within the new political structures created upon breakup and that is related to the change in the political weight of natural resource rich ACs in the new states. As we show later, resource rich ACs suffer from severe law and order problems, which can be linked to politically-sanctioned "rent grabbing" and can affect welfare. This in turn suggests that electoral accountability in the state changes when the spatial distribution of natural resources changes across states.

There are of course many alternative potential explanations for the natural resource curse at both local and national levels. The role of Dutch disease or of volatility induced by fluctuations in commodity prices are but two possible explanations (see Stevens 2003) while diversion away from human capital accumulation and entrepreneurial activity (Gylfason 2001, Torvick 2002) might be another. Unless there was a dramatic change in volatility at the same time as the break up, such structuralist explanations fail to explain why outcomes changed post break up.

Our interest thus lies in examining the consequences of the breakup and re-alignment for economic outcomes: the existing literature suggests that this may well increase welfare but local capture remains a possibility. Indeed, the addition of natural resources to this mix makes this more than plausible. There have been several studies focusing on the direct links between political outcomes and natural resources. For instance, case study evidence (Karl 1997) suggests that resource rents change the political climate in the host country. Another study (Brollo et al. 2013) has focused on the relationship between political opportunism and corruption with natural resources. Our study is most closely related to this strand of literature, but we add substantively to this literature in three ways. First, we focus on a particular set of institutions that are most likely to be affected by large rents: in brief, electoral accountability. Second, we examine these institutions in a democracy where power and revenues are concentrated not at the local but the state

[6]Resources are usually classified as point and dispersed resources, the former being the most easily appropriated. Our focus in this paper is on minerals which are point source resources.

level. Note that, while like other within-country studies, this in a context where larger, federal institutions remain the same, sub-regional institutions are changed by the creation of new states thus changing electoral incentives. Third, the change in the spatial distribution of resources effected by the secession offers also changes the concentration of rents.

The remainder of the paper is organized as follows. Section 2 presents the institutional context for our study. Section 3 presents the theoretical setup for examining the effects of secession. 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 and section 6 concludes.

## 2 The institutional context

The basis on which state borders were originally drawn by the State Reorganisation Act of 1956 was along linguistic boundaries. This criterion, however, tended to ignore other ethnic and social boundaries, leading to large tribal populations in some states seeing themselves as ethnically distinct and socially neglected. The case of the most recent re-organisation is a departure from this linguistic principle; the main divisions along which the states were re-organised was ethnic and social, particularly in the case of Jharkhand and Chhattisgarh.[7,8] It should be noted, however, that some of the sharp distinctions along ethnic, social and linguistic lines, maintained post-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 boundary.

Tillin (2013) explores how the breakup of existing states in 2000 came about. She suggests four possible explanations. The main explanation proffered is that of distinct cultural identities in the breakaway areas that have historically made consistent demands for secession, demands that have progressively gained prominence since 1947. Arguably,

[7]This has also fuelled discontent and the growth of Marxist movements that have taken to open rebellion. Indeed, the new states are also the scene of armed conflict which has been ongoing since the 1970s and has flared up sharply since re organisation (Kapur, Gawande, and Satyanath 2012).

[8]Linguistic divisions still matter: the languages spoken in these states, while variations on Hindi, have been treated as separate languages. Chhattisgarhi, the regional form of Hindi spoken in the plains areas of Chhattisgarh has recently been declared the state language, while part of the demand for separation from Bihar was based on tribal languages spoken there being different from the Hindi spoken in Bihar while Uttarakhand claimed differences based on dialects in Kumaon and Garhwal.

not all these demands were centered around statehood but they did involve claims for more local representation and local management of natural resources, both mines and forestries.[9] The second explanation relates to the changing federal election context since 1989, when the leading coalition partner, the Bharatiya Janata Party (BJP), favoured granting statehood to boost their popularity in the areas concerned. Thirdly, Tillin suggests that 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".[10] 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 as it meant better governance and more ease of administration – as well as an acknowledgment of local identities.

This list of explanations flags two potential difficulties for the analysis that follows, each of which we discuss below. 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 6 districts in Bihar which were eventually separated from Bihar in 2000 (Hazaribagh, Ranchi, Palamu, Singhbhum, Santhal Parganas and Dhanbad, then Manbhum).[11] 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 deter-

[9] 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 among miners, the Chhattisgarh Mines Shramik Sangh; and the worker-peasantry movement in Jharkhand led by the Jharkhand Mukti Morcha (JMM). These regions were all distinguished from the remainder of their parent states by their distinctive ecology and concentration of natural resources. 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."

[10] 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.

[11] 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.

mined 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 18 districts where Chhattisgarhi was spoken and again, these district borders have remained the same since independence.[12]

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 but again at the head of a coalition government but by this time there was general consensus both at national and state levels: the other leading party of the Congress was in support, as were the state assemblies of the full states before breakup. While there might have been a initial spurt of political activity by the BJP,[13] by this time there was little political opposition anywhere to 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 in part, it was clear that there was no political gain in opposing secession. To summarise, 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. 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. 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.

The political context for our analysis centers on the role of state legislative assemblies, which are responsible for governance at the state level. 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 and setting up a team of ministers to govern the state. States have executive, fiscal and regulatory powers over a range of subjects that include education, health, infrastructure and law and order.

[12]Since 2012, these borders have been redrawn to give nine new districts.

[13]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 (see Mawdsley 2002).

With respect to natural resource extraction, there is an overlap in authority between the central government and state governments, 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. State budgets benefit from the royalties but rates are set by the central government, which sets royalty rates rates on output as well as any "dead rent" which accrues in the absence of extraction, and also decides on environmental clearances for mining. Property rights on land reside in the states, which are the legal owners of all major mineral resources (except uranium), and claim all royalties (but do not control the rates). The main power of the states derives from the legal authority to grant licenses. However, there is no requirement for the royalties and returns from mining to accrue to local areas and the entire proceeds accrue to the state budget.[14] Thus, there are 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 sector and who pays the royalty according to the rates and terms fixed by the Centre to the State.

Figure 6, taken from Chakraborty et al. (2014), displays the share of mining in state level domestic product since 2004 for the two sets of states with a large share of revenues from mining – for these states revenues vary from 0.1 per cent and 5 per cent for the rump states of Bihar and Madhya Pradesh, to an average of 10 per cent for their split-offs, Jharkhand and Chhattisgarh. Table 2 describes the key minerals in the two splitoff states of Jharkhand and Chhattisgarh and highlights the fact that these two states have 45 per cent of the reserves in iron ore and coal and 18 per cent of copper reserves (Chakraborty and Garg 2015, Indian Bureau of Mines 2008). Despite the enormous share of minerals in their portfolios, both Jharkhand and Chattisgarh actually display a rather low share of revenue from minerals, a fact that we exploit in our theoretical framework below. The low importance of official revenues relative to potential revenues and the consequent importance of illegal mining is largely due to the institutional structure of rents from minerals. The split of authority between the Centre and State provides an explanation for the large scale of illegal mining in these and other mineral rich states. The royalty rates set by the central government are widely seen as being inefficiently low, lowering incentives for states to police illegal mining, since royalties from mining contribute so lit-

[14]The previous government of India had proposed a draft Mines and Mineral Development and Regulation Bill, 2011, which had provided for a 26 per cent share in mining profits for local communities, which would have been a substantial change in policy.

tle to their budgets. Another major incentive for illegal mining is evading environmental regulations by operating outside the areas given clearance by the Centre – as the authority for policing resides in the State while the Centre decides on the areas that can host mining activity. All of this has led to conflict between Centre and State about the weak policing and monitoring by state governments.[15]

Given this institutional context, the politics of resource extraction in India takes on a different flavour from that seen in other federal states. In the case of natural resources, fiscal windfalls occur at the state level and power resides at the state level even for provision of public goods. In particular, as mentioned before, the provision of education, health, law and order and rural electrification is firmly under state control. We thus expect that there will be distributional impacts of resource rents. Local level patron client networks are the lens through which voters decide outcomes, creating a value for the intermediaries who buy votes. In this setting, one would expect that local level patrons can exercise their power over votes and gain rents in return. When state level politicians want to increase their rents they have to collude with local intermediaries to be able to satisfy voters at the same time. In return for the votes local intermediaries get a share of the rents. (Prakash et al. 2014; Asher and Novosad 2011; Vaishnav 2011; Khemani 2013).

## 3 Political secession, natural resource revenues, and vote trading

This section describes a simple, stylised theoretical framework to describe how the spatial distribution of natural resource deposits affect economic outcomes in the newly formed states. The Indian context is one where formal institutions are weak so that the main accountability of politicians comes from elections. We thus focus in this section on how changes in electoral accountability due to secession affect economic outcomes. When secession takes place we are left with a very heterogeneous spatial distribution across states post break up (see Figure 5). On the one hand, the geographical re-distribution of mineral resources across states has unequal effects on the old and new states in terms of the potential royalties from natural resources: many of the resource rich ACs however are also more prone to elite capture, thus the larger potential royalties may not translate into higher *actual* royalties. We categorize the effects of the unequal distribution of

[15]See the article which discusses the difficulties of Centre-State coordination in policing at: http://bit.ly/1OHFIRM .

resources into (a) a first effect arising from the change in the comparative allocation of revenues from natural resources, whereby after secessions the newly formed states and the surviving states end up controlling comparatively greater or smaller proportion of natural resources than before; (b) a second effect arising from changes in governance outcomes, whereby a higher concentration of natural-resource rich areas in a new state may raise the political influence of the mining mafia and adversely affect policies and economic outcomes in relation to other activities not related to natural resources – both in natural-resource rich areas and in other areas of the state. As we shall show, these two effects work in opposite directions, and it is possible for the latter to dominate the former, producing a net fall in welfare in the natural-resource rich areas of the new, natural-resource richer states; and possibly, by the same mechanism, in an increase in welfare in the natural-resource rich areas of the old, natural resource poorer states.

### 3.1 Secession and the revenues from natural resources

A first effect of secession by a state $s$ (effect (a) above) is to change the discretionary funds from natural resource royalties potentially available at the state level, and this percolates down to the constituency level. Suppose that there is a continuum of constituencies of mass one, each having identical population. A fraction $q \in (0, 1)$ of those constituencies are natural resource rich and each yield a potential level $r$ in revenue from natural resources, which are distributed equally across all constituencies, yielding per-jurisdiction revenues of $r\,q$, which translate into public goods $G = r\,q$ valued at $\mu\,G$. If a fraction $s$ of those constituencies secede and form a new state, with a higher fraction of those being natural resource rich the change in per-constituency revenues for the seceding constituencies equals $r$ times the change in $q$. So, if $q$ increases (i.e. the new state contains a higher proportion of natural resource rich constituencies), there is a direct potential gain from secession.

### 3.2 Secession and vote sales

A second effect (effect (b)) stems from how a change in the concentration of natural resources shapes concessions made to natural-resource related interests under political competition. We make the following assumptions:

A1. The presence of natural resource rents leads to "rent grabbing" activities, such as emergence of local mafias that control rents (see e.g. Mehlum et al. 2006). Such rent grabbing activities are relatively less prevalent in poorer areas, and mainly consist of illegal mining. Underpayment of royalties in just one area in Karnataka state was about 350-400 million dollars. Additional costs include environmental degradation, road accidents due to overloaded trucks on the roads, etc.[16]

A2. Vote buying takes place relatively more in the mineral rich areas.[18]

The data seem to support both assumptions A1. and A2. The State Election Survey for Jharkhand in 2005 posed questions to individual voters about whether there were any malpractices at voting time in their assembly constituency. This was also the first election after breakup of these two states in 2000 and thus of significance. In table 16, we examine the correlation between being in a mineral rich constituency and reporting malpractices, including payment for votes[19]. We find a strong and significant relationship between both reports of malpractice and the intensity of malpractice in mineral rich constituencies within districts of the state, based on answers to the questions of whether individual voters thought there had been malpractices and whether they thought these were serious. Indeed, there is extensive evidence that election malpractices are correlated with natural resource rents. For instance The Economic Times and the Observer Foundation in India held a panel discussion on the role of coal and other resources in election expenditures in 2012 (see: http://bit.ly/1ntfQDx). They quote one of the panelists thus: " "According to Sahoo, increasingly, they are not extracting rent from programmes that are politically beneficial like NREGA and PDS. Instead, he adds, they are moving to minerals and natural

[16] How does the bribing work? Take, for example, 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." (Reuters special report 2013[17]). 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."

[18] The Election Commission of India, an independent body with the authority to monitor electoral fraud lists a number of ways in which politicians attempt to circumvent the rules governing election spending in India. These include: (i) Paying cash as an incentive for not casting vote by the committed voters of other rival candidate, monitored by the display of the voter's finger without indelible ink after polling; (ii) Cash given in advance before notification of election to the local leaders for distribution among voters; (iii) Cash given through community feasts under the plate or banana leaf; (iv) Cash given to leaders of rival political parties or rival candidates not to seriously campaign in elections; (v) Cash given to village headman for ensuring votes (see the instructions for Master Trainers for election monitoring at:http://bit.ly/1SxRyE6).

[19] The political parties and candidates routinely spend huge amount of money on intermediaries to buy votes. While the upper limit of election spending for candidates contesting for MPs and MLAs are Rs. 25 Lac and Rs. 10 Lac respectively, the current trend as captured by several studies and acknowledged by the Election Commission that candidates spend 20-30 times more than the limits. According to an estimate from Centre for Media Studies (CMS), political parties and candidates spent a whopping Rs. 10,000 crore (including Rs.3,000 crore by the Election Commission) in the last Lok Sabha elections (see: http://bit.ly/1ntfQDx).

resources. [See: http://bit.ly/1V1lsiE.] This is a form of corruption the common man stays more or less oblivious to".

A3. The nexus of rent grabbing and political collusion creates worse outcomes in mineral rich constituencies. So natural resource rich constituencies have worse economics outcomes. In A2. above we cited suggestive evidence that resource rich ACs are more likely to elect criminal politicians. Prakash et al. (2014) show that criminal politicians create worse outcomes than non-criminal politicians. Using data on luminosity and a similar identification strategy to that used in this paper, they demonstrate that the election of criminally accused candidates leads to 5 percent lower GDP growth per year on average. Chemin (2011) shows that districts where criminal politicians won narrowly, spent 19% less on public goods for the poor. Again as Sahoo (http://bit.ly/1V1lsiE) emphasises, "...most important consequence of an expensive electioneering process is the growing criminalisation of democratic space and governance institutions. Since money becomes the prime mover, political parties desperate for victory are compelled to nominate mostly those candidates who can generate big money to fund the election expenses. Consequent of this trend is the influx of a large number of criminals and people with dubious records to the high seats of power."

A4. Collusion with constituency-level politicians is required to sustain these rent grabbing activities. We saw in the discussion above that states have ownership rights to onshore minerals although they are subject to regulation by central government. States grant licences and leases: the Mines and Minerals Development and Regulation Act 1957 empowers state and central govt. officers to enter and inspect any mine at anytime. 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. Using the presence of criminal politicians as evidence of mafia control, we show in Table 3 that the likelihood of an MP with a criminal record being elected is significantly and positively related to the density of mines at the Parliamentary Constituency level.[20]

It follows from assumption A2, that there is a "political bargain" to be struck between state level politicians and the local level entrepreneurs who, through either persuasion or coercion of local voters, are able to "deliver" a certain volume of votes to whichever candidate or party they choose. We focus on a scenario with two parties, which can buy votes from local political entrepreneurs (sellers) in return for policy concessions to those sellers, the "price" paid for the votes. These concessions raise rents for the local sellers

[20]Fisman et al. (2014, p. 34) also offer general support to this proposition: they find that the financial returns from holding office "is more pronounced among legislators in more corrupt regions of India, implying that the higher returns are likely associated with political rent extraction."

Figure 1: Shantytown near mine (Guardian 2015)

Figure 2: Home of Gang leader (Reuters 2012)

but worsen welfare for other citizens both in the natural-resource rich areas and in other areas, making them politically costly for the buyer in relation to those votes that have not been secured from the seller. Sellers engage in bilateral bargaining with buyers, which determines the price of votes. We first characterize a pure strategy Nash equilibrium of the game where the price of votes is determined. Next, we show how the price of votes changes when the number of sellers changes, thus capturing the effect of secession.

#### 3.2.1 Single seller (decentralised outcome)

There is a given unit mass of citizens/voters. Each voter has an ex-ante ideal point on ideology/policy, denoted by $z_i \in [-1/2, 1/2] \equiv Z$. The distribution of ideology across voters is uniform over the support $Z$. There are two parties, $L$ and $R$, competing for a state-level election. We assume that the $L$ party has an exogenously specified platform of $-1/2$ while the $R$ party has an exogenously specified platform of $1/2$. A voter's utility is quadratically decreasing in the distance of policy from her ideology, i.e. the payoff levels a voter $i$ obtains if $L$ and $R$ are elected are respectively $U_i^L = -(-1/2 - z_i)^2$, and $U_i^R = -(1/2 - z_i)^2$. Thus ideology, $z_i$, represents a direct effect on the individual voter's payoff of $R$ defeating $L$, with the voter with the median ideology ($z_i = 0$) being indifferent between the two political contestants. Additionally, there is an incumbency-related ideology shock, $s$, with uniform support $[-1/2, 1/2]$, that shifts the ex-post ideology of voter $z_i$ to $z_i + s$, so that the share of votes for $L$ and $R$ are respectively given by $\frac{1}{2} - s$ and $\frac{1}{2} + s$.[21] In the absence of vote trading, the probability of the $L$ party winning is therefore the probability that $s < 0$, and the probability of the $R$ party winning by the probability that $s > 0$, both of which are equal to 1/2 given the assumed distribution of shocks.[22]

[21] This incumbency related shock could be thought of, for example, as being linked with a common but unpredictable assessment by voters of the incumbent's performance while in office.

[22] 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.

In a given state, there is a proportion $q$ of local natural-resource rich constituencies where a local leader has full control of a fraction, $v \in (0, 1/2)$ of the total votes (through intimidation or persuasion, the local leader can fully determine which single party those votes will be cast for).[23] We assume that the given tranche of votes, $v$, can only be delivered to a single party for a price $x$, which consists of targeted concessions to the sellers, such as, for example, a relaxation of restrictions and policing of abuses by those exploiting the natural resources locally, delivered to the seller if the vote buyer wins the election, and entailing a loss of utility equal to $\lambda x$, $1 > \lambda > 0$, for the remaining $1 - v$ voters in each NR rich constituencies, with voters in the remaining $1 - q$ constituencies experiencing a lower loss of $\rho x$, where $0 < \rho < \lambda$.

The winning party, $j \in \{L, R\}$, obtains political rents, $W$, which we assume to be unity without loss of generality. Each party $j \in \{L, R\}$ thus aims at maximising expected political rents, $P_j^W W$, where $P_j^W$ is the probability of party $j$ winning, given the vote trading outcome. The seller's expected payoff if votes are sold to party $j$ for a price $x$ is $P_j^W x$.

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 will consider first a scenario where there is a single seller controlling votes $v$ votes in each of the $q$ natural resource rich districts (normalizing the total number of districts to unity),[24] and then extend it to the case where there are two sellers. We focus on subgame perfect equilibria of this game. Proofs are given in the appendix.

**Claim 1**: *If a party, j, secures the votes that are for sale, paying a price x, the probability of j winning is* $P_{jB}^W = (1/2) + (1/2)\big(q(v - \lambda x(1-v)) - (1-q)\rho x\big)/(1 - qv)$.

**Claim 2**: *Assume* $x \geq 0$ *and s.t.* $P_{jB}^W \geq 1/2$. *There does not exist an equilibrium where only one buyer accepts the seller's offer.*

Indeed, whenever $P_{jB}^W(x) \geq 1/2$, each buyer has a weakly dominant strategy to accept the offer: it is strictly dominant to accept the offer if $P_{jB}^W(x) > 1/2$. To see this, notice that the payoff of buyer 1 when he accepts the offer, given that buyer 2 does not, is $P_{jB}^W$ and if

[23] These local leaders are often union bosses who control how much mining can be carried out via control over transport and workers.

[24] For the purpose of our arguments, working with non-integer numbers entails no loss of generality.

he rejects the offer he gets $\frac{1}{2}$. If buyer 2 accepts the offer then his payoff from accepting is $\frac{1}{2}P^W_{jB} + \frac{1}{2}(1 - P^W_{jB})$ while if he rejects then his payoff is $1 - P^W_{jB}$. In both cases, he prefers to accept the offer as long as $P^W_{jB} \geq 1/2$.

**Claim 3**: *Suppose the seller posts a price* $x \leq \dfrac{q\,v}{\rho\,(1-q) + \lambda\,q\,(1-v)} \equiv \tilde{x}(q)$*; then there exists a pure-strategy equilibrium where both buyers accept. If* $x \geq \tilde{x}(q)$*, then there is an equilibrium where both buyers reject.*

**Claim 4**: *The unique payoff maximising price for the seller is* $\tilde{x}(q)$ *– as defined in Claim 3. This is increasing in* $q, v$*, and decreasing in* $\rho$*.*

These result imply that an increase in $q$ will raise $x$ and thus lower welfare for individuals (other than the vote sellers) in the natural resource rich constituencies, as well as in the natural resource poor constituencies (albeit to a lesser extent). The number of sellers increases in the NRR states post break up and the fraction $q$ also goes up. It could be that competition between sellers reduces the price of votes. On the other hand, the increase in $q$ makes each vote more valuable than before. We show that the first change has no effect on the price of votes while the second effect increases the price. Competition between buyers ensures that buyers prefer to buy the whole set of votes. The marginal gain from buying from both sellers is bigger than the marginal cost fixing the other buyer's action. Moreover there is no equilibrium where one buyer chooses to reject all offers with price $x \leq \tilde{x}$ and one buyer accepts.

Of course, there are more vote sellers than just one. We next extend our results to sellers from two constituencies, assuming that each seller has $v(2) = v/2$ votes to sell. We denote with $n_j$ the number of sellers from which party $j$ accepts offers. As in the case with one seller, the only pure strategy equilibria are the fully symmetric ones where both buyers accept offers from both sellers or where both buyers reject both sellers. Moreover the subgame perfect price for the full tranche of votes $v$ remains the same as before. Extension to more than two constituencies follows the same logic.

**Claim 5**: *Let the number of sellers be* $n = 2$*, and* $2v(2) = v$*. There exists a symmetric equilibrium where each seller sets a price* $\tilde{x}_2(q)$ *such that* $2\tilde{x}_2(q) = \tilde{x}(q)$ *for all* $q$*, and such that both buyers bid for all votes,* $v$*.*

**Claim 6**: *Let the number of sellers be* $n = 2$*, and* $2v(2) = v$*. There does not exist a symmetric equilibrium such that each buyer only accepts votes* $v(2) = v/2$*.*

There are also asymmetric equilibria (from the buyers' point of view) possible, which can be categorized into: (1) $n_1 = 2, n_2 = 1$; (2) $n_1 = 2, n_2 = 0$; (3) $n_1 = 1, n_2 = 0$ (plus their mirror images). Below, we show that none of these equilibria exist. Thus the only possible symmetric equilibria are where both buyers accept both sellers' offers or where both reject both sellers offers. Indifference occurs when $x = \tilde{x}(q)$. Since the equilibria with rejection exists because the space of "prices" $x$ is continuous, we ignore the rejection equilibria and assume that when indifferent buyers will accept rather than reject.

**Claim 7**: *Suppose $x < \tilde{x}(q)$. Then, there does not exist a pure strategy asymmetric (for buyers) equilibrium where buyer 1 accepts offers from $n_1$ sellers and buyer 2 from $n_2$ sellers and $n_1 \neq n_2$.*

The intuition behind the result of Claim 5 in relation to the price of votes is the following: our setting is symmetric and we look only at symmetric equilibria. In this class of equilibria the price of buying $v/2$ votes is $x/2$ where $x$ is the price for $v$ votes. However $P^W_{jB}(v/2) < (1/2)P^W_{jB}(v)$. The marginal gain in $P^W_{jB}$ is higher than the marginal cost, fixing the other player's action. This is why it cannot be an equilibrium for buyers to accept less than the full quota of votes $v$ from all sellers. The result depends on the assumption that the total votes for sale is fixed at $v$. Adding more sellers then does not affect the equilibrium price of votes.

### 3.3 Welfare before and after secession

Combining the analysis of the previous two subsections, we are now in a position to derive conclusions as to the effects of secession on welfare.

As in the discussion at the beginning of Section (3) making states smaller is assumed to lead to increased efficiency in administration. We represent this effect in terms of a welfare component $A(s)$, where $s$ measures the size of the state and where $A'(s) < 0$. $A(s)$ thus captures the costs of a large population size; e.g. in the 2011 Census, Bihar has a population of 103 million while Jharkhand has a population of 32 million: it is hard to argue that an even larger size is beneficial for economies of scale.

Welfare of a representative citizen in a natural resource rich (NRR) constituency, gross of the idiosyncratic component $z$ and of the ideology shock component (both of which vary with the identity of the office holder), can then be expressed as $W^R(s) = A(s) + (\mu r q - \lambda \tilde{x}(q))$. The corresponding level of welfare in a natural resource poor constituency is $W^P(s) = A(s) + (\mu r q - \rho \tilde{x}(q))$.

Recall that we assumed $1 > \lambda > \rho$ and $v < \frac{1}{2}$.

To see how welfare changes due to secession, we use the welfare expressions above. With secession, the size of the state becomes smaller, which we assume helps in improving outcomes: thus $A(s)$ increases for all states with secession. When secession is accompanied by an increase in $q$, then we have $\partial W^R(s)/\partial q = \mu r - \partial \tilde{x}(q)/\partial q = \mu r - \nu\rho/\big(\rho\,(1-q) + \lambda\, q\,(1-\nu)\big)$. The overall effect is positive if the second part of the expression – the negative effects coming from worse governance – are relatively small. Now, $\partial^2 \tilde{x}(q)/\partial q^2 = \big(2\nu\rho^2 - 2\nu\rho\lambda(1-\nu)\big)\big/\big(\rho\,(1-q) + \lambda\, q\,(1-\nu)\big)^2$, which is positive iff $\rho > \lambda(1-\nu)$; i.e. the responsiveness of $\tilde{x}(q)$ to $q$ increases at higher levels of $q$ if the per capita negative spillovers are worse for the ACs that are relatively less resource rich than the spillovers for those voters in the resource rich constituencies who do not sell their vote. This could happen if, e.g., $\nu$ is relatively high. The upshot of this discussion is that if vote buying is a sufficiently big problem in resource rich constituencies, then having a higher proportion of resource rich constituencies has large negative effects due to lowered accountability from elections in such states. The welfare effects of secession in resource poor ACs are much the same, except that (by assumption) the negative effects are lower for resource poor ACs, since the rent grabbing activity takes place overwhelmingly in resource rich constituencies. This yields our main prediction: secession leads to higher welfare in all ACs in new states if the positive effects from larger revenues overcome the negative governance effects in states with a high $q$.

The model's predictions can be summarized as follows:

**P1** Secession leads to higher welfare in ACs in new states where $q$ is relatively low or in states where vote buying is relatively low.

**P2** Secession leads to lower welfare in ACs in states where $q$ is relatively high or in states where vote buying is relatively high. These negative effects are relatively bigger in resource rich constituencies relative to resource poor constituencies.

## 4 Empirical Strategy

Based on our predictions above, using levels of luminosity and inequality in luminosity as a measure of welfare at the AC level, we expect that the effect of break up will be positive in all ACs in new states which ended up with $q$ that is not too different from the old (combined) state. This positive effect is driven by the smaller size of states, and the fiscal windfall due to natural resources. However, in states which end up with disproportionately high levels of $q$ relative to the old combined state, we expect that the effect of break up will be negative.

The average effect on ACs in new states will depend on whether the positive effects of states where $q$ does not increase too much outweighs the negative effects of worse governance in states that have much higher levels of $q$ relative to the old combined state. If we look at the subsample of resource rich constituencies, the effects will be negative in ACs of states which end up with a much larger $q$, and they will be worse relative to resource poor ACs within the same state,[25] as well as relative to resource rich ACs in the rump states.

Our findings are anticipated in Table 1, where we describe both our measure of $q$ as described in the model above and the differential growth rates across breakaway and rump states over time. First, note that Jharkhand, the breakway from Bihar now has 65 percent of assembly constituencies (ACs) with mineral deposits, compared with the rump Bihar, left with 5 percent of ACs with mineral deposits. Chattisgarh has 54 percent of ACs thus endowed relative to its rump of Madhya Pradesh with 35 percent, while Uttarakhand has 23 percent relative to its rump Uttar Pradesh with barely 2 percent of ACs with mineral deposits. If ACs with point source minerals also afford rents to politicians then winning such ACs is more than sufficient in both Jharkhand and Chattisgarh in a first past the post system.

The second part of the table presents the levels and changes in growth rates from district level data used by the Planning Commission of India to predict changes in state level gross domestic product. We do not have access to the dis-aggregated data and hence these figures serve as the benchmark for our predictions based on data on luminosity rather than domestic product. The predictions here suggest that Jharkhand grows *slower* than its rump state of Bihar; while the other two breakaway states fare better. Chattisgarh grows a trifle faster than its rump but the difference is not substantial, while Uttarakhand gains substantially relative to its rump Uttar Pradesh. In sum, we see considerable heterogeneity and a pattern that seems negatively correlated with increased resource endowments. As a preview to our results, this is also the pattern we see reproduced in our analysis below.

[25]This follows from our assumption that rent grabbing spillovers have worse effects in the resource rich ACs.

### 4.1 Data

We examine differences in local outcomes across states in the context of the breakup of three states in India in the year 2000. Later as a placebo check, we also examine the differences in outcomes for a fourth, more recent, state break-up (the states of Andhra Pradesh and Telangana) which broke up in 2014. We use two main sources of data in examining the relationship between natural resources and economic outcomes. First, we rely on luminosity[26] data to proxy the evolution of outcomes between 1992-2010, thus capturing the period 1992-2001, pre break-up and 2002-2010, the period post break-up. We use luminosity data as a proxy for economic activity (see Henderson et al. 2011; Chen and Nordhaus 2011; Kulkarni et al. 2011; Alesina et al. 2015) to construct the outcome variables, both as a sum of lights within Assembly Constituencies (ACs) and also construct (Gini) measures of local inequality. 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 (1 sq km) is assigned a digital number (DN) ranging from 0 to 63 and luminosity is measured as the DN3/2. The luminosity of an area is thus obtained as a sum of lights over the gridded area which in our case is defined as the assembly constituency. We use GIS data on the administrative boundaries of states and assembly constituencies to enable the aggregation within constituencies.[27]

There are two main reasons why we rely on luminosity data, despite the fact that it is a proxy for economic activity and incomes rather than a more direct measure. The first is that panel data on households, by assembly constituencies[28] 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 and we offer corroborative evidence below. In brief, we use data on income, wealth and education from the National Election Survey in the

[26]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.

[27]We are grateful to Asher and 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 digitized GIS data based on maps published by the Election Commission of India (Asher and Novosad 2011).

[28]Districts are at a higher level of aggregation than assembly constituencies.

year 2004, which surveys voters at the constituency level to examine the correlation of standard economic indicators with luminosity. Table 4 describes the correlations we observe between luminosity and AC level measures of wealth, income and education. The correlation with wealth is about 0.6, while that with income and education lies between 0.4 and 0.45.[29] 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. A related question is whether luminosity data accounts for rural activity. As explained above, while urban lights might reach saturation because of the methods used to quantify the data on luminosity, it also allows dimmer lights to be captured in rural, electrified areas. However, as we will argue later, the empirical strategy we adopt compares relative levels of luminosity across similar areas across the boundary and the inability to measure absolute levels should not matter. We restrict our analysis to the years 1992-2010 because constituency borders have been re-drawn since then.[30]

Still, concerns undoubtedly remain about the difficulties in the interpretation of this variable. A key concern in the use of such data are variation in the price of electricity and local differences in the propensity to use lights at night. To examine this, we use available data on electricity prices by state and year and examine their evolution across states. The data are an unbalanced panel and the results are presented in Table 5. The results suggest that while there were trend increases in prices across states, there are no significant differences between new and old states. Note that such concerns should also be somewhat dissipated by the fact that we use regression discontinuity techniques and compare areas around state boundaries.

The second set 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). Minerals are grouped into nine categories and each commodity is classified by size which is proportional to the estimated reserve of the deposit. The atlas comprises seventy-six mapsheets on a generalized geological base and three size categories of mineral deposits that vary by mineral. 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. In

[29]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.

[30]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.

sum, we have data on the centroid latitude and longitude, mineral type, and associated size class.[31] Since size categories represent different ranges of reserve depending on the minerals, combining mineral type with the size ranges gives us an approximate measure of the amount of deposits. Figure 5 is a map of mineral deposit locations in the six states considered. We use data on deposits rather than the location of mines in operation to avoid issues of endogeneity inherent in such analysis. The location of deposits is strictly geographical and the location was mapped before 1975 and hence its exploration cannot be said to be controlled by subsequent political and economic incentives or institutional factors. It also avoids the difficulties inherent in other commonly used measures such as the share of resource incomes or royalties in state incomes.

Apart from these two main sets of data, we use several other data sources to strengthen our analysis. To corroborate our measure of night-time lights as a good proxy as well as to examine the correlation between mineral areas and election malpractices, we use post-poll survey data on voting outcomes from the National and State Election Survey conducted by Lokniti. We also estimate the effect of state breakup on household level outcomes to support our findings from the night-time lights data. For this exercise, 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.2 provides further details on these data sources.

### 4.2 Identification & Estimation

In order to identify the effect of state breakup on development outcomes, we make use of geographic discontinuity at the boundaries of each pre-breakup state and employ a Regression Discontinuity Design (RDD) to identify the parameters of interest. For each geographic location (grid or AC), assignment to treatment was determined entirely on the basis of their location. This key feature of the state break-up allows us to employ a sharp regression discontinuity design to estimate the causal effect of secession on growth and inequality outcomes. Such a discontinuity is clearly supported by Figure 8, where local polynomial estimates of the light intensity around the distance to the threshold, before and after breakup, are displayed. Figure 9 assesses the validity of the identifying assumption with the McCrary (2008) test for breaks in the density of the forcing variable

[31] 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.

at the treatment boundary with negative distances to state boundary for old states and positive distances for new states. The figure clearly shows that the density does not change discontinuously across the boundary suggesting that for the window around the coverage boundary there seems to be no manipulation. This is to be expected given the firm exogeneity of the borders, but it is heartening all the same.

We define a variable, $D_i$, as the distance to the geographic boundary $d$ 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

$$T_i = \mathbb{1}_{[D_i \geq d]}. \tag{4.1}$$

The discontinuity in the treatment status implies that local average treatment effects (*LATE*) are nonparametrically identified (Hahn, Todd, and Van der Klaauw 2001). Essentially we compare outcomes of constituencies on either side of the geographic border that determined treatment assignment. Formally, the average causal effect of the treatment at the discontinuity point is then given by (Imbens and Lemieux 2008)

$$\tau_a = \lim_{g \to d^+} \mathbb{E}[Y_{it} \mid D_i = g] - \lim_{g \to d^-} \mathbb{E}[Y_{it} \mid D_i = g] = \mathbb{E}[Y_{it}(1) - Y_{it}(0) \mid D_i = d], \tag{4.2}$$

where $Y_{it}$ is the satellite light density of constituency $i$ in year $t$; $D_i$ is the constituency's distance to the state boundary.

An important feature to note in the above-mentioned design is that the discontinuity is geographical, i.e., it separates individuals in different location based on a threshold along a given *distance boundary*. Using Eq. (4.2) to estimate the causal effect would ignore the two-dimensional spatial aspect of the discontinuity. This is because the *boundary line* can be viewed as a collection of many points over the entire distance spanned by the boundary. An individual located north-west of the boundary is not directly comparable to an individual located south-east of the boundary. 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* the boundary line. We address this issue in the following ways. We divide the boundary 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 boundary and include polynomials of distance and its interactions with the treatment variable. We condition on the post-breakup interacted, line-segment fixed effects in all the specifications, so that only ACs within close proximity of each other are compared.[32]

The local average treatment effect can be estimated using local linear regression by including polynomials of distance to the boundary (controlling for line 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 an additional 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 distinctly 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. Essentially our overall identification strategy combines the RDD with a difference-in-difference framework.

With this in mind, the specification we estimate is:

$$Y_{it} = \alpha_i + \beta_t + \gamma T_i \times Post_t + \delta^{'} V_{it} + \varsigma_s \times Post_t + \varepsilon_{it}, \tag{4.3}$$

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 boundary-segment fixed effects $\varsigma_s$ (interacted with $Post_t$ to account for the panel dimension). $\alpha_i$ and $\beta_t$ represent constituency and time fixed effects respectively; and where the $V_{it}$ are defined as

$$V_{it} = \begin{pmatrix} \mathbb{1}_{[D_i < d]} \times Post_t \times (D_i - d) \\ \mathbb{1}_{[D_i \geq d]} \times Post_t \times (D_i - d) \end{pmatrix}. \tag{4.4}$$

The regressors $V_{it}$ are introduced to avoid asymptotic bias in the estimates (Hahn et al. 2001, Imbens and Lemieux 2008). Standard tests remain asymptotically valid when regressors $V_{it}$ are added in regressions.

A panel fixed-effects estimators around the distance thresholds, $h$, is equivalent to

[32] See Black (1999) who first discussed the use of the boundary 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.

use a uniform kernel for local linear regression suggested by Hahn et al. (2001). We offer several bandwidths in our analysis, based on the optimal bandwidth calculations of Imbens and Kalyanaraman (2011). With the selected bandwidths, we then compute the following OLS-FE estimates using observations lying within the respective distance thresholds.

## 5 Results

### 5.1 Descriptive Evidence & Validity of Identifying Assumptions

We begin by validating the basis for our strategy by examining the evolution of luminosity across the six states, both overall and between border areas in Figure 7. As the figure indicates, before breakup, the areas constituting the new states were similar in trend to the rump but the levels of activity are substantially lower. After 2000, it is clear that on average the trends have changed; both overall and across border areas in particular, activity in new states is rising faster, to overtake the old states on average by the end of the period. It is also clear that the trends in new and old states do not diverge immediately upon breakup but do so around 2003 which is consistent with the fact that elections to new assemblies and the definitive changes in governance does not take place in the same year. Uttarakhand's first assembly elections were held in 2002, followed by Chhattisgarh in 2003, and Jharkhand in 2005. The first assemblies were constituted on the basis of the holders of seats in the relevant ACs in the joint assembly in the states before breakup.

The spatial discontinuity design we use compares ACs across borders, with the basic notion that differences in patterns of local activity, controlling for trends before breakup can only be attributed to differences by state rather than differences due to local environment and geography effects. This in turn depends on the variation in observable attributes including human and physical geography. The demarcation of the borders here are historical, based on ethno-linguistic particularly scheduled tribes and language 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 use the data from the IHDS on household size, incomes and consumption expenditures, together with measures of health, proxied by infant mortality and public goods, proxied by the availability of drinking water. Table 4 examines the differentials between border areas before breakup to check if these household variables are different across border areas. We conclude they are not, apart from the availability of drinking water which is just significant at the 10 percent level.

Note, however, that our difference-in-difference strategy does aim to control for fixed pre breakup differences such as water availability – this is less of a threat to identification than time varying differences such as incomes.

To explore potential differences in human geography, we use data from the census to examine whether there are significant differences in the concentration of scheduled tribes and castes and literacy rates across border areas as well as the previously discussed effect on electricity tariffs. Table 5 summarises the details of this exercise, comparing differences across boundaries. While there are trend increases in concentration of scheduled tribes post 2000, we do not find a significant difference across states. It is clear that settlements over time, since the border was drawn, 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 is low birth rates and high mortality rates among the tribes as well as the loss of traditional land. Both Bihar and Madhya Pradesh, the rump states saw an increase in the share of the ST population between 2001 and 2011, while their split-offs, Jharkhand and Chhattisgarh saw a stagnation in this share, despite the fact they harbour a large absolute share of between 26 and 31 percent.

### 5.2 RDD Estimates

We now present results from our identification strategy, exploiting the spatial discontinuity around state borders. In what follows, we define states that have broken away as being "treated" by the act of secession. Admittedly, this is not the usual definition of a "treatment": post breakup, the rump state is also a new creation. The idea behind viewing only the new state as being "treated" is 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. The various Acts of Reorganisation for each state specify the division of the local civil service and administrative institutions, the sharing of assets and liabilities, and the organisation of the assemblies for the new states. The key point is that the rump states saw no reorganisation apart from the loss of territories and thus a lower population and smaller administration.

We begin with the overall effect of state breakup on the difference in luminosity in Table 6. 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 column reports the OLS estimate of breakup for the entire sample of Ac's across all six states. The naive OLS specification suggests that while all states experience trend increase in luminosity, it is also clear that on average, new states did better than the rump.

However, given the endogenous placement of the state borders we expect the OLS estimates to be biased. To mitigate this concern, we present RDD estimates in columns (2)-(4) with differing bandwidths. 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, with a differential in luminosity of 35 percent.

In order to validate the luminosity measure, our proxy for economic growth, we also present the effect of state breakup on various household level outcomes. Using data from the India Household Development Survey (IHDS) we examine the effect of breakup on a few development indicators of sample households located in districts that lie along the border of the old and new state. We use two rounds of data on the same household, utilising information from the 1992 (pre-breakup) and 2005 (post-breakup) survey, to form a household level balanced panel. The outcomes we examine are per-capita income, infant mortality, water availability and monthly food expenditure. Table 7 presents these results. Overall we find positive effects of break-up on all household level outcomes, mirroring our results from Table 6 which uses luminosity as an outcome variable. Specifically, we find that households in new states saw an increase of INR 3737.45 (approx. USD 50) in their total income and a 15% increase in their access to piped water.

Next, we examine heterogeneity in the overall new state effect, across the affected states. Table 8 shows that the average positive effect is driven by Uttarakhand relative to its rump state of Uttar Pradesh, with a strong negative effect of Jharkhand relative to the rump state Bihar and an insignificant effect of Chhattisgarh relative to Madhya Pradesh. A similar exercise in Tables 10-11, examining the effect of state breakup on the Gini coefficient of inequality in luminosity produces a similar result; it suggests that while inequality fell post breakup in the new states on average relative to the rump, Jharkhand moves differently, with a rise in inequality relative to Bihar.

Table 9 shows how post-breakup effects are shaped by natural resources. The proximate reason for the heterogeneity in outcomes is the enormous difference in natural resources and as explained earlier, Jharkhand obtained almost all of the resources relative to Bihar upon breakup while Uttarakhand does not have very much in point source resources. The breakup of Madhya Pradesh did mean that a substantial part of resources accrued to the new state of Chhattisgarh but Madhya Pradesh remains one of the natural resource rich states nevertheless. We examine whether the presence of mineral deposits in assembly constituencies affords part of the explanation for the heterogeneity across states that we see. Table 9 demonstrates that ACs with a high concentration of deposits do relatively worse post breakup. Given the enormous concentration in Jharkhand compared to all of the other states, this in turn suggests that the heterogeneity across states is driven largely by the variation in natural resource endowments.

In Table 12, we examine this using the Gini coefficient[33] in luminosity within ACs and find a similar result; inequality rises in mineral rich ACs relative to mineral poor ACs, post breakup. Note that this implies a local natural resource curse in all states;however, the relative scale of natural resource endowments in Jharkhand simply tips aggregate outcomes in that state into relatively poorer performance.

### 5.3 Robustness and placebo checks

Table 13 examines the role of another proximate candidate, the Marxist (Naxalite) rebellions in these states. This is clearly endogenous, but we ask whether the presence of active conflict in these states affects the conclusions above. It is clear from Table 13 that the role of conflict in the state matters or not. It is certainly the case that mineral rich areas are also areas where conflict has been high but extraction of rents has continued unabated. It is certainly plausible that the relationship we find here has fuelled conflict, but the fact the mineral producing areas have actually expanded in production across states suggests that causal impacts on conflict require deeper explanations. We also account for spatial correlation in our dependent variable and apply a spatial correction (Conley 1999) to our method of inference. Table 14 presents our main results with spatially adjusted standard errors and shows that our results are robust to the presence of arbitrary spatial correlation.

Second, we examine the sensitivity of our results by analyzing two counterfactual contexts. First, we artificially move back the date of secession to 1996, four years before the actual break-up occurred. Columns (1)-(3) present results from this exercise; we find throughout that the *Post*×*New State* effect 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.

[33]We calculate the Gini coefficient by measuring the inequality in light intensity across all 1km grids contained withing each AC.

We also examine the effect of a false, 2001 breakup on luminosity in the southern states of Andhra Pradesh (AP) and Telangana whose break-up 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. Our 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 Table 15, strongly support the notion that breakup matters. There is as before a strong positive trend in outcomes post 2001 but there is no particular effect of the pretended "treatment" nor any particular effect of local mineral endowments that might independently have been affected post 2001 by a change in prices or rents over time.

The results of our main regression exercise point quite strongly to the conclusion that the interplay between natural resources and secession operates through a political channel. To find additional evidence that can corroborate this interpretation, we can look at some more implications of the theoretical analysis. The theory revolves around showing how the reduction in political accountability through vote buying allows more rent grabbing activity to take place. In the analysis we do not distinguish between ACs whose elected representative is aligned with the state government and those where that is not the case; or between those 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 firmsly support one party. If any of these parameters makes the bargaining position of the local intermediaries stronger vis-à-vis the state, then we would expect $\tilde{x}(q)$ to be higher and thus outcomes to be worse. We may expect that if the locally elected politician is aligned with the state level party, this could make it easier to buy votes for the state level party. If $v$ increases, $\tilde{x}(q)$ increases as well, $\partial \tilde{x}(q)/\partial v > 0$ and $\partial^2 \tilde{x}(q)/\partial q \partial v > 0$. Second, if an AC is swing in the state level election, then votes from that AC are comparatively more valuable, and therefore we would expect a higher $\tilde{x}(q)$. Thus, if resource rich ACs are either aligned or swing we expect outcomes to be worse relative to non-aligned or non-swing ACs.

To validate our theoretical prediction, first, we examine whether the extent of electoral malpractice is greater in resource rich constituencies compared to other constituencies. For this, we analyse voter opinion about the existence of malpractice during the state election for Jharkhand in 2005. Using data from the State Election Study (for a sample of constituencies), we find that voters in mineral rich constituencies are 28% more likely to experience malpractices during elections[34]. This is reported in Column

[34] The dependent variable for Columns (1) and (2) takes the value 1 if the respondents do not report

(2) of Table 16. On a scale of 0-3 (0 indicating no malpractice and 3 indicating several malpractices), voters in mineral rich constituencies are six times more likely to experience a high intensity of malpractice relative to voters in other constituencies (Column (4)). These results give us an indication that mineral rich constituencies, were outcomes deteriorated after break-up, experience more vote buying or electoral rigging.

More formally, Table 17 and 18 reports results which are directly consistent with the theoretical predictions: the negative effects (on growth and inequality, respectively) of governance changes in the resource rich ACs for states which experience an increase in $q$ post break up are exacerbated when these ACs are aligned or swing.

## 6 Concluding remarks

In this paper we exploited 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 whether secession improved economic outcomes, both in terms of the levels of activity and in terms of redistribution. The parallel changes induced by secession in the political structure and in the comparative concentration of natural resources enables us to examine whether the link between natural resources and economic outcomes at the local level flows arises from the interplay between natural resources and politics. Our empirical results are consonant with the predictions of our theoretical framework, indicating that effects flow through a political-economy channel.

The form this political-economy channel takes here is somewhat peculiar to the Indian case, where political power resides at the state level but where the power to influence voters resides at the local level, and where states have no control over royalty rates and thus limited incentives to police rent grabbing by local groups. In this context, the political bargain between local-level elites and state-level elites becomes a key part of the story, and a given increase in local natural resource rents at the state level can thus lead to better or worse outcomes depending on how the political bargain changes.

The new government has proposed an amendment to the original Bill of 1957, which has a rather convoluted provision for sharing of benefits in local communities. It proposes the establishment of District Mineral Foundations (DMFs) in areas affected by mining related operations. The object of this foundation is to work for the "interests and benefits

---

"No malpractices" to the question: "To what extent do you think there had been electoral malpractices or irregularities in your area in this election?". Respondents can report "several", "some extent" or "very little" if they experienced any malpractice. This is recorded as the intensity of malpractice and constitutes the dependent variable for Columns (3) and (4).

of persons and areas affected by mining related operations”. Holders of mining leases are to pay the DMF an amount, not exceeding one-third of the royalty in the case of new leases and equivalent to the royalty in case of old leases. The amendment allows state governments to set the rules for the foundation and determine its composition (Narain 2015). These new institutional arrangements might well be the key to the improved performance of 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 dismissed. Our paper suggest that state division in the presence of substantial natural resource endowments may be particularly susceptible to the curse.

## References


ACEMOGLU, D. AND J. A. ROBINSON (2006): "Economic backwardness in political perspective," *American Political Science Review*, 100, 115–131.

ALESINA, A., S. MICHALOPOULOS, AND E. PAPAIOANNOU (2015): "Ethnic Inequality," *Journal of Political Economy*, forthcoming.

ASHER, S. AND P. NOVOSAD (2011): "Digging for Development: Natural resource wealth, mining booms and local economic development," *mimeo*.

BHANDARI, L. AND K. ROYCHOWDHURY (2011): "Night lights and economic activity in India: A study using DMSP-OLS night time images," *Proceedings of the Asia-Pacific advanced network*, 32, 218–236.

BLACK, S. (1999): "Do better schools matter? Parental valuation of elementary education," *The Quarterly Journal of Economics*, 114, 577–599.

BROLLO, F., T. NANNICINI, R. PEROTTI, AND G. TABELLINI (2013): "The Political Resource Curse," *The American Economic Review*, 103, 1759–1796.

CASELLI, F. AND A. TESEI (2011): "Resource windfalls, political regimes, and political stability," Tech. rep., National Bureau of Economic Research.

CHAKRABORTY, L. ET AL. (2014): "Revival of Mining Sector in India: Analysing Legislations and Royalty Regime," Tech. rep.

CHAKRABORTY, L. S. AND S. GARG (2015): "The Political Economy of Mining regulations 2015: Spatial Inequality and Resource Curse in Two New States, India," Tech. rep.

CHATURVEDI, M., T. GHOSH, AND L. BHANDARI (2011): "Assessing income distribution at the district level for India using nighttime satellite imagery," *Proceedings of the Asia-Pacific Advanced Network*, 32, 192–217.

CHEN, X. AND W. D. NORDHAUS (2011): "Using luminosity data as a proxy for economic statistics," *Proceedings of the National Academy of Sciences*, 108, 8589–8594.

CONLEY, T. G. (1999): "GMM estimation with cross sectional dependence," *Journal of econometrics*, 92, 1–45.

DELL, M. (2010): "The persistent effects of Peru's mining Mita," *Econometrica*, 78, 1863–1903.

DESAI, S., A. DUBEY, B. JOSHI, M. SEN, A. SHARIFF, R. VANNEMAN, AND H. CODEBOOK (2007): "India human development survey (IHDS)," *Computer file, icpsr22626-*

*v2, University of Maryland, National Council of Applied Economic Research, New Delhi and Inter-University Consortium for Political and Social Research, Ann Arbor*.

FISMAN, R., F. SCHULZ, AND V. VIG (2014): "The Private Returns to Public Office," *Journal of Political Economy*, 122, 806–862.

GOMES, J. F. (2015): "The political economy of the Maoist conflict in India: an empirical analysis," *World Development*, 68, 96–123.

GYLFASON, T. (2001): "Natural resources, education, and economic development," *European Economic Review*, 45, 847–859.

HAHN, J., P. TODD, AND W. VAN DER KLAAUW (2001): "Identification and estimation of treatment effects with a regression-discontinuity design," *Econometrica*, 69, 201–209.

HENDERSON, J. V., A. STOREYGARD, AND D. N. WEIL (2011): "A bright idea for measuring economic growth," *The American economic review*, 101, 194.

IMBENS, G. AND K. KALYANARAMAN (2011): "Optimal bandwidth choice for the regression discontinuity estimator," *The Review of Economic Studies*, rdr043.

IMBENS, G. W. AND T. LEMIEUX (2008): "Regression discontinuity designs: A guide to practice," *Journal of econometrics*, 142, 615–635.

INDIAN BUREAU OF MINES (2008): "Indian Minerals Yearbook," *Nagpur, India*.

KALE, S., L. BHANDARI, S. K. MAJUMDAR, AND S. KULKARNI (2010): "Small States–Large States," .

KAPUR, D., K. GAWANDE, AND S. SATYANATH (2012): "Renewable Resource Shocks and Conflict in India's Maoist Belt," *Center for Global Development Working Paper*.

KARL, T. L. (1997): *The paradox of plenty: Oil booms and petro-states*, vol. 26, Univ of California Press.

KHEMANI, S. (2013): "Buying votes vs. supplying public services: political incentives to under-invest in pro-poor policies," *World Bank Policy Research Working Paper*.

KULKARNI, R., K. E. HAYNES, R. R. STOUGH, AND J. D. RIGGLE (2011): "Revisiting Night Lights as Proxy for Economic Growth: A Multi-Year Light Based Growth Indicator (LBGI) for China, India and the US," *GMU School of Public Policy Research Paper*.

LANE, P., A. TORNELL, ET AL. (1999): "The voracity effect," *American Economic Review*, 89, 22–46.

LEITE, C. A. AND J. WEIDMANN (1999): "Does mother nature corrupt? Natural resources, corruption, and economic growth," *IMF Working Paper*.

LOKNITI (2004): "National Election Study 2004: An Introduction," *Economic and Political Weekly*, 5373–5382.

MAWDSLEY, E. (2002): "Redrawing the body politic: federalism, regionalism and the creation of new states in India," *Commonwealth and Comparative Politics*, 40, 34–54.

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

MEHLUM, H., K. MOENE, AND R. TORVIK (2006): "Institutions and the resource curse*," *The economic journal*, 116, 1–20.

NARAIN, S. (2015): "The Making of Mining Policy," *The Business Standard*.

PRAKASH, N., M. ROCKMORE, AND Y. UPPAL (2014): "Do criminal representatives hinder or improve constituency outcomes? Evidence from India," .

SACHS, J. D. AND A. M. WARNER (2001): "The curse of natural resources," *European economic review*, 45, 827–838.

SHARMA, K. (1976): "Jharkhand movement in Bihar," *Economic and Political Weekly*, 37–43.

STEVENS, P. (2003): "Resource impact: curse or blessing? A literature survey," *Journal of Energy Literature*, 9, 1–42.

TERI (2001): "Overview of Mining and Mineral Industry in India," *Tata Energy Research Institute Report No. 185*.

TILLIN, L. (2013): *Remapping India: New states and their political origins*, Hurst Publishers.

VAISHNAV, M. (2011): "The market for criminality: Money, muscle and elections in India," *mimeo*.

# A Appendix

## A.1 Proofs

**Proof of Claim 1**:

Focus on $L$ party and a given realisation of the shock $s$. If the $L$ party buys the $v$ votes that are for sale in a fraction $q$ of constituencies, the utility that each voter whose vote is not for sale receives if $L$ is elected becomes $-(-1/2-(z+s))^2-\lambda x$ if the voter resides in a natural resource rich constituency. The voter who is indifferent between $L$ and $R$ in the natural resource rich constituency under realization $s$ is then $\tilde{z}' = -s - \lambda x/2$. The vote share of the remaining $1-v$ votes in the $q$ natural resource rich constituencies that will be cast for $L$ is therefore $1/2 - s - \lambda x/2$. For a voter residing in a natural resource poor constituency, utility if $L$ is elected becomes $-(-1/2-(z+s))^2-\rho x$, and so the indifferent voter in those constituencies is $\tilde{z}'' = -s - \rho x/2$. The vote share in the $1-q$ natural resource poor constituencies that will be cast for $L$ is therefore $1/2 - s - \rho x/2$. Thus the total vote share of the $L$ party, conditional on $L$ buying $q v$ votes at a price $x$, is therefore $V_{LB} = q v + q(1-v)\big(1/2 - s - \lambda x/2\big) + (1-q)\big(1/2 - s - \rho x/2\big)$.

The probability of $L$ winning if $L$ buys the votes is the probability that $V_{LB} \geq \frac{1}{2}$. This equals the probability that $s \leq \tilde{s}$, where $\tilde{s}$ is the value of $s$ for which $V_{LB} = 1/2$, i.e. $\tilde{s} = (1/2)\big(q(v - \lambda x(1-v)) - (1-q)\rho x\big)/(1-q v)$. For the given uniform distribution of ideology shocks, $s$, over the support $[-1/2, 1/2]$, this probability equals $\tilde{s} - (-1/2) = \tilde{s} + 1/2$. The derivation for $R$ is symmetrically identical and leads to the same result.

**Proof of Claim 2**:

Suppose that there is such an equilibrium, where buyer $j$ accepts and buyer $-j$ rejects. If buyer $-j$ has rejected, then, accepting gives buyer $j$ an expected payoff of $P_{jB}^W$, whereas rejecting gives $j$ an expected payoff of $1/2$ (each competitor wins and gets rents $W = 1$ with probability $1/2$). Thus it is optimal for $j$ to accept if and only if the price is such that $P_{jB}^W \geq 1/2$ (i.e., $\tilde{s} \leq 0$ for $L$ and $\tilde{s} \geq 0$ for $R$). Similarly, it is strictly optimal for buyer $-j$ to reject the offer – given that buyer $j$ has accepted it – if and only if $1 - P_{jB}^W > (1 - P_{jB}^W)/2 + P_{jB}^W/2$. This requires $P_{jB}^W < 1/2$ – a contradiction.

**Proof of Claim 3**:

Given the previous claim, each buyer accepts the offer rather than rejecting it if and only if $P_{jB}^W \geq 1/2$. Solving for the value of $x$ that makes the inequality binding, we obtain $\tilde{x} = \frac{q v}{\rho(1-q) + \lambda q(1-v)}$. Each buyer rejects the offer rather than accepting iff $P_{jB}^W \leq 1/2$.

**Proof of Claim 4**:

The first part of the claim follows immediately from the previous claim by backward induction. Comparative statics effects are derived as follows: $\dfrac{\partial \tilde{x}}{\partial q} = \dfrac{v}{\rho\,(1-q)+\lambda q\,(1-v)} - \dfrac{q\,v\,(-\rho+\lambda(1-v))}{(\rho\,(1-q)+\lambda q\,(1-v))^2}$. This is equivalent to $\dfrac{v(\rho\,(1-q)+\lambda q\,(1-v))}{(\rho\,(1-q)+\lambda q\,(1-v))^2} - \dfrac{q\,v\,(-\rho+\lambda(1-v))}{(\rho\,(1-q)+\lambda q\,(1-v))^2} = \dfrac{v\rho}{(\rho\,(1-q)+\lambda q\,(1-v))^2} > 0$. Note that $\dfrac{\partial^2 \tilde{x}}{\partial q^2} = \dfrac{2v\rho(\rho-\lambda(1-v))}{(\rho\,(1-q)+\lambda q\,(1-v))^3}$. Similarly, $\dfrac{\partial \tilde{x}}{\partial v} = \dfrac{q}{\rho\,(1-q)+\lambda q(1-v)} + \dfrac{\lambda q^2 v}{(\rho\,(1-q)+q\,(1-v))^2} = \dfrac{q\rho\,(1-q)+\lambda q^2}{(\rho\,(1-q)+q\,(1-v))^2} > 0$,
$\dfrac{\partial \tilde{x}}{\partial \rho} = -\dfrac{q\,v(1-q)}{(\rho\,(1-q)+\lambda q\,(1-v))^2} < 0$, $\dfrac{\partial \tilde{x}}{\partial \lambda} = -\dfrac{q^2\,v(1-v)}{(\rho\,(1-q)+\lambda q\,(1-v))^2} < 0$.

**Proof of Claim 5**:

Denote the price at which each seller sells as $\frac{x}{2}$. A necessary condition for this equilibrium is that $P^W_{jB}(\frac{v}{2}) \geq \frac{1}{2}$, or $x \leq \frac{q\,v}{\rho\,(1-q)+\lambda\,q\,(1-v)} \equiv \tilde{x}_2(q)$. We have to show that: (1) $\frac{1}{4}P^W_{jB}(v)+\frac{1}{2}P^W_{jB}(\frac{v}{2})+\frac{1}{4}(1-P^W_{jB}(v)) \geq \frac{1}{2}P^W_{jB}(\frac{v}{2})+\frac{1}{2}(1-P^W_{jB}(v))$; and (2) $\frac{1}{4}P^W_{jB}(v)+\frac{1}{2}P^W_{jB}(\frac{v}{2})+\frac{1}{4}(1-P^W_{jB}(v)) \geq (1-P^W_{jB}(v))$. We now show that $(1-P^W_{jB}(v)) < P^W_{jB}(\frac{v}{2})$, so that constraint (1) is binding. Note that $P^W_{jB}(\frac{v}{2}) = \frac{1}{2}+(1/2)\big(\frac{1}{2}\,(q\,(v-\lambda\,x\,(1-\frac{v}{2}))-(1-q)\,\rho\,x)\big)/(1-\frac{q\,v}{2})$ and $P^W_{jB} = (1/2)+(1/2)\big(q\,(v-\lambda\,x\,(1-v))-(1-q)\,\rho\,x\big)/(1-q\,v)$. Hence, we need to show that $1-\big((1/2)+(1/2)\big(q\,(v-\lambda\,x\,(1-v))-(1-q)\,\rho\,x\big)/(1-q\,v)\big) \leq \frac{1}{2}+(1/2)\big(\frac{1}{2}\big(q\,(v-\lambda\,x\,(1-\frac{v}{2}))-(1-q)\,\rho\,x\big)\big)/(1-\frac{q\,v}{2})$, or, equivalently, that

$$\frac{1}{2}\left(q\left(v-\lambda\,x\left(1-\frac{v}{2}\right)\right)-(1-q)\,\rho\,x\right)/\left(1-\frac{q\,v}{2}\right) \geq 0.$$

This is equivalent to $x \leq \tilde{x}_2(q)$. Constraint (1) is thus the binding constraint. This constraint can be re-written as $P^W_{jB}(v) \geq \frac{1}{2}$, i.e. $x \leq \tilde{x}(q)$.

**Proof of Claim 6**:

We prove this by contradiction. Suppose that there exists such an equilibrium. This requires the following conditions to be met: (1) given that buyer 2 has accepted $v(2)$ from 1 seller, buyer 1 also prefers to accept $v(2)$ from one seller (chosen at random) to accepting both; (2) given that buyer 2 has accepted $v(2)$ from 1 seller, buyer 1 also prefers to accept $v(2)$ from one seller (chosen at random) to rejecting both.

Conditions (1) and (2) translate into the following inequalities:

$$\frac{1}{4}P^W_{jB}\left(\frac{v}{2}\right)+\frac{1}{4}\left(1-P^W_{jB}\left(\frac{v}{2}\right)\right)+\frac{1}{4} \geq \frac{1}{2}\left(\frac{1}{2}\right)+\frac{1}{2}\left(P^W_{jB}\,(v)\right) \tag{A.1}$$

$$\frac{1}{2}P^W_{jB}\left(\frac{v}{2}\right)+\frac{1}{4}\left(1-P^W_{jB}\left(\frac{v}{2}\right)\right)+\frac{1}{4}\geq 1-P^W_{jB}\left(\frac{v}{2}\right) \tag{A.2}$$

(A.1) is equivalent to $\frac{1}{4}\geq\frac{1}{2}P^W_{jB}(v)$. But $x\leq\tilde{x}_2(q)$ implies that $P^W_{jB}(v)>\frac{1}{2}$. Thus the RHS is strictly bigger than 1/4, and this inequality can never be satisfied. A contradiction.

**Proof of Claim 7**:

Suppose $n_1=2, n_2=0$. Then we have (1) $P^W_{jB}(v)\geq\frac{1}{2}$, i.e. buyer 1 prefers accepting both to rejecting both, given that buyer 2 rejects both. (2) $P^W_{jB}(v)\geq P^W_{jB}\left(\frac{v}{2}\right)$,i.e. buyer 1 prefers accepting to accepting one and rejecting one. (3) $(1-P^W_{jB}(v))\geq\frac{1}{2}(\frac{1}{2})+\frac{1}{2}(1-P^W_{jB}(v))$, i.e. buyer 2 prefers rejecting both to accepting one and rejecting one given that buyer 1 accepts both. (4) $(1-P^W_{jB}(v))\geq\frac{1}{4}P^W_{jB}(v)+\frac{1}{2}P^W_{jB}((\frac{v}{2})+\frac{1}{4}(1-P^W_{jB}(v))$, i.e. buyer 2 prefers rejecting both to accepting both. Clearly (1) and (3) contradict each other. (3) cannot be satisfied if $x<\tilde{x}(q)$.

Suppose that $n_1=2, n_2=1$. Then we have (1a) Buyer 1 prefers to accept both than accept one and reject one given that buyer 2 rejects one and accepts one. If he accepts both given that buyer 2 accepts one we have:

| | $S1$ | $S2$ |
|---|---|---|
| $S1$ | $\frac{1}{2}P^W_{jB}(v)+\frac{1}{2}\left(\frac{1}{2}\right)$ | $\frac{1}{2}P^W_{jB}(v)+\frac{1}{2}\left(\frac{1}{2}\right)$ |
| $S2$ | $\frac{1}{2}P^W_{jB}(v)+\frac{1}{2}\left(\frac{1}{2}\right)$ | $\frac{1}{2}P^W_{jB}(v)+\frac{1}{2}\left(\frac{1}{2}\right)$ |

If he accepts one and rejects one given that buyer 2 does the same we get:

| | $S1$ | $S2$ |
|---|---|---|
| $S1$ | $\frac{1}{2}P^W_{jB}(\frac{v}{2})+\frac{1}{2}\left(1-P^W_{jB}(\frac{v}{2})\right)$ | $\frac{1}{2}$ |
| $S2$ | $\frac{1}{2}$ | $\frac{1}{2}P^W_{jB}(\frac{v}{2})+\frac{1}{2}\left(1-P^W_{jB}(\frac{v}{2})\right)$ |

Therefore we have: (1a) $\frac{1}{2}P^W_{jB}(v)+\frac{1}{2}\left(\frac{1}{2}\right)\geq\frac{1}{2}\left(\frac{1}{2}\right)+\frac{1}{2}\left(\frac{1}{2}P^W_{jB}(\frac{v}{2})+\frac{1}{2}\left(1-P^W_{jB}(\frac{v}{2})\right)\right)$.

(2a) Buyer 1 prefers accepting both to rejecting both given that buyer 2 rejects one and accepts one: $\frac{1}{2}P^W_{jB}(v)+\frac{1}{2}\left(\frac{1}{2}\right)\geq 1-P^W_{jB}\left(\frac{v}{2}\right)$. (3a) Buyer 2 prefers rejecting one to accepting both given that buyer 1 accepts both: $\frac{1}{2}\left(\frac{1}{2}\right)+\frac{1}{2}(1-P^W_{jB}(v))\geq\frac{1}{4}P^W_{jB}(v)+\frac{1}{2}P^W_{jB}((\frac{v}{2})+\frac{1}{4}(1-P^W_{jB}(v))$. (4a) Buyer 2 prefers accepting one and rejecting one to rejecting both, given that buyer 1 accepts both: $\frac{1}{2}\left(\frac{1}{2}\right)+\frac{1}{2}(1-P^W_{jB}(v))\geq(1-P^W_{jB}(v))$. Notice that (1) and (4) are the same and are equivalent to $P^W_{jB}(v)\geq\frac{1}{2}$, while (2) and (3) together imply that $1-P^W_{jB}(v)\geq P^W_{jB}((\frac{v}{2})\geq\frac{3}{4}-P^W_{jB}(v)$: this holds iff $1-P^W_{jB}(v)\geq\frac{3}{4}-P^W_{jB}(v)$, i.e. $P^W_{jB}(v)\leq\frac{1}{2}$: a contradiction to $x<\tilde{x}(q)$.

Suppose that $n_1=1, n_2=0$. (1b) Buyer 1 prefers accepting one and rejecting one to reject both given that buyer 2 rejects both: $P^W_{jB}(\frac{v}{2}) \geq \frac{1}{2}$. (2b) Buyer 1 prefers accepting one and rejecting one to accepting both given that buyer 2 rejects both: $P^W_{jB}(\frac{v}{2}) \geq P^W_{jB}(v)$ (3b) Buyer 2 prefers rejecting both to accepting one and rejecting one given that buyer 1 accepts one and rejects one: $1 - P^W_{jB}(\frac{v}{2}) \geq \frac{1}{2}\left(\frac{1}{2}\right) + \frac{1}{2}\left(\frac{1}{2}P^W_{jB}(\frac{v}{2}) + \frac{1}{2}\left(1 - P^W_{jB}(\frac{v}{2})\right)\right)$. (4b) Buyer 2 prefers rejecting both to accepting both given that buyer 1 accepts one and rejects one: $1 - P^W_{jB}(\frac{v}{2}) \geq \frac{1}{4}P^W_{jB}(v) + \frac{1}{2}P^W_{jB}((\frac{v}{2}) + \frac{1}{4}(1 - P^W_{jB}(v))$. Clearly (2b) cannot hold when $x \leq \tilde{x}(q)$.

## A.2 Data Sources

In this section we describe in detail the axillary 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 AC's, 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[35] 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 (see table 17). Distances to the boundary for each AC was calculated by taking the centroid of each AC polygon and measuring its Euclidean distance to the state boundary line. Finally, we also divide the entire boundary line into segments which we include as fixed effects in our specifications.

[35] Retrieved from http://www.dartmouth.edu/ sandip/data.html

Data on Conflict: The data on the conflict as measured by Maoist incidents is compiled by[36] Gomes (2015) 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, Schulz, and Vig (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 neighborhoods across India. Data are publicly available through ICPSR. For more details on the survey see Desai et al. (2007).

State Election Results: We use the results of all state elections held in the six analyzed states, 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 at the census of India website.

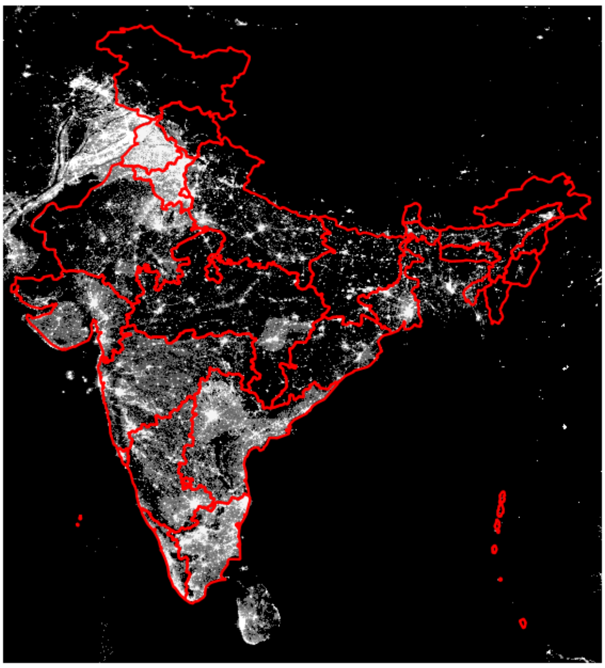
Electricity Prices: Data on electricity tariff is compiled at an annual level for each state by India Stat.This data is sourced from the annual reports on the working of state electricity boards and electricity departments as well as the Planning Commission reports.

[36]We are very grateful to Joseph Flavian Gomes for sharing his data on district level conflict in India.

Figure 3: States Reorganization in 2001

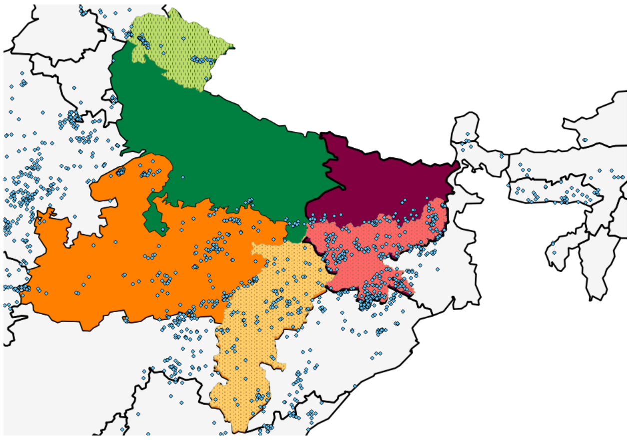

**Note:** The figure shows the actual breakup of states in 2001. Ares shaded by dots represent newly created states; these are the states of Jharkhand, Chhattisgarh and Uttarakhand which broke away from Bihar, Madhya Pradesh and Uttar Pradesh respectively.

Figure 4: Density of Night-time Lights in India



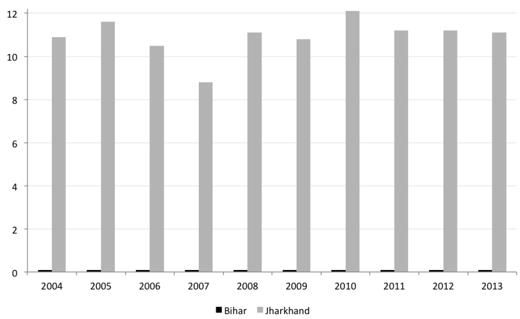
**Note:** The figure shows the density of night-time lights in India for the year 2008, as measured by the DMS P-OLS. The map of India, showing administrative divisions, is overlaid on top.

Figure 5: Distribution of Mines Across Reorganized States

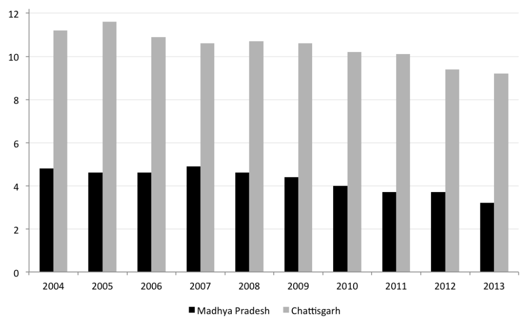


**Note:** The figure shows the distribution of mine deposits in India, across the states that were reorganized in 2002. Mine deposits are indicated by tiny circles.

Figure 6: Mining Revenue as a Share of State GDP



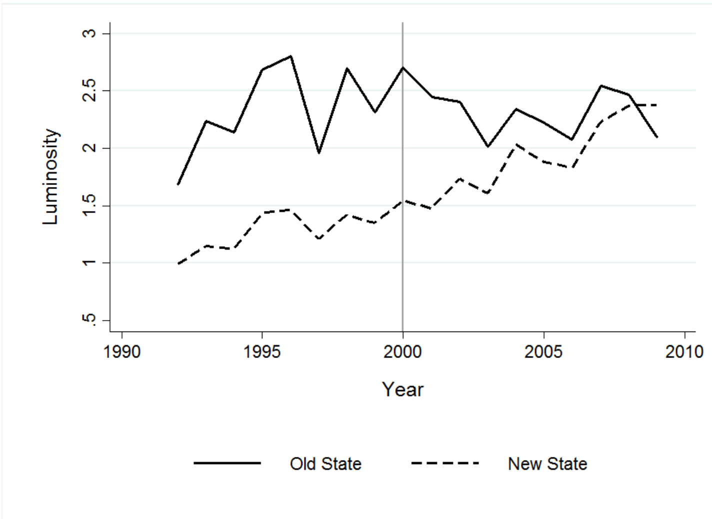

(a) Bihar-Jharkhand **(High q)**



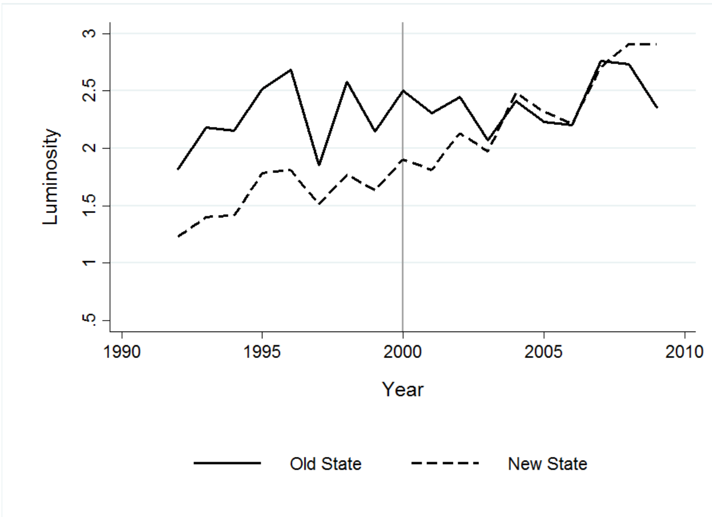

(b) Madhya Pradesh-Chhattisgarh **(Low q)**

These figures report the time series of mining revenues as a share of state GDP, for the state pairs Bihar-Jharkhand **(High q)** and Madhya Pradesh-Chhattisgarh **(Low q)** . *Source: CSO, Govt of India (various years)*.

Figure 7: Light Intensity Trends, Before and After Break-Up



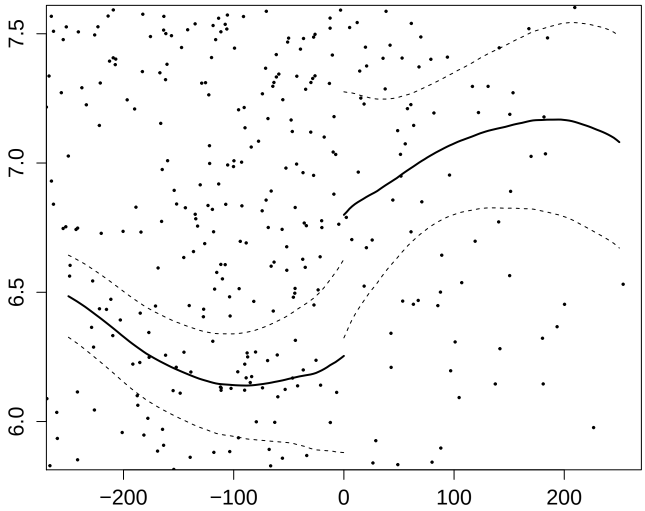

(a) **Average Luminosity across all 6 States**




(b) **Average Luminosity in border areas across all 6 States**

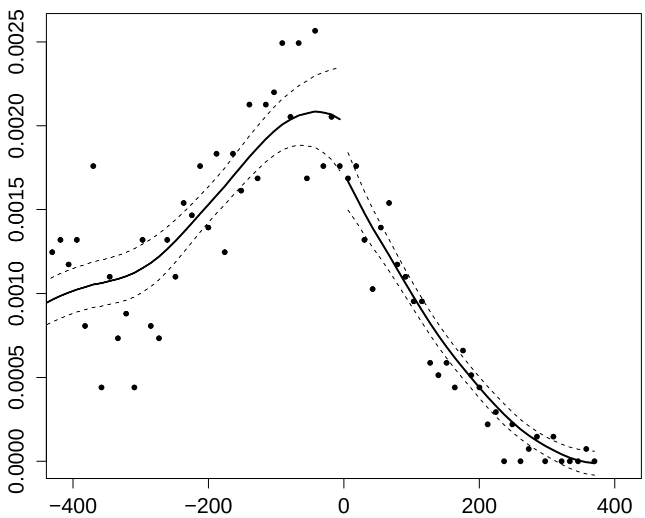
These figures report the time series of average luminosity across each of the six reorganized states of India. Figure (a) shows the trends for the entire area spanned by each state, whereas Figure (b) shows the trends for only areas lying within 150 km of new state boundaries. In each figure, the solid black line represents the combined average luminosity for old states whereas the dotted line represents the combined average luminosity for new states. Average luminosity is measured by taking the average across value of the the satellite measure (digital number ranging from 0 to 63) over the 1km by 1km gridded area of each state.

Figure 8: Light Intensity after Secession




**Note:** The figure plots the local polynomial estimates of the light intensity around the threshold distance.

Figure 9: RD Validity: Density Smoothness Test for Distance to State Boundary




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

Table 1: Endowment of Natural resources and Growth across States

| | Proportion of Mines (**q**) | | | Average Growth Rate (Planning Commission) | | |
|---|---|---|---|---|---|---|
| | Pre-breakup | Post-breakup | Post-Pre difference | Pre-breakup | Post-breakup | Post-Pre difference |
| *State Pair 1:* | | | | | | |
| Bihar | 0.2 | 0.05 | −0.15 | 4.9 | 11.4 | 6.5 |
| Jharkhand (New state) | | 0.65 | **0.44 (+)** | 3.6 | 6.3 | **2.7 (-)** |
| *State Pair 2:* | | | | | | |
| Madhya Pradesh | 0.4 | 0.35 | −0.05 | 4.7 | 7.6 | 2.9 |
| Chhattisgarh (New State) | | 0.54 | **0.14 (+)** | 3.1 | 8.6 | **5.5 (+)** |
| *State Pair 3:* | | | | | | |
| Uttar Pradesh | 0.05 | 0.02 | −0.03 | 4 | 6.8 | 2.8 |
| Uttarakhand (New State) | | 0.23 | **0.17 (+)** | 4.6 | 12.3 | **7.7 (+)** |

This table reports the level and change in the proportion of mine regions (AC's) after state reorganization, 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 are calculated by the planning commission in India. (+) indicates that the figures for the new state increased relative to the old state; (-) indicates that the figures for the new state decreased relative to the old state.

Table 2: Mineral Reserve Shares (state's share as percentage of all-India reserves)

| Mineral | Jharkhand (High q) | Chhattisgarh (Low q) |
|---|---|---|
| Coal | 26.76 | 17.2 |
| Iron Ore | 25.71 | 18.4 |
| Copper Ore | 18.49 | 5.15 |
| Bauxite | 4.21 | 10.95 |
| Graphite | 7.48 | 35.59 |
| Kyanite | 5.53 | 15.14 |

This table reports the state's share of each mineral, as a percentage of all-India reserves. Source: Indian Minerals Yearbook 2013 and Coal Directory of India 2013-14.

Table 3: Criminal Politicians and Natural Resources

| | Winning MP Criminal | Winning MP Criminal |
|---|---|---|
| # Mines | 3.65* | |
| | (0.191) | |
| Mine Density | | 2.787** |
| | | (1.105) |
| # Observations | 179 | 179 |
| *R2* | 0.01 | 0.02 |

This table reports the correlation between criminal politicians in a **parliamentary constituency** and its mineral resource endowment. The dependent variables is binary, taking the value 1 if the winning candidate of the constituency (MP) has a criminal record, zero otherwise. *# Mines* is the total number of mines within a parliamentary constituency; *Mine Density* is the proportion of assembly constituencies, within a parliamentary constituency, that have at least one mine. Standard errors are reported in parentheses. * indicates significance at 10%; ** at 5%; *** at 1%.

Table 4: Descriptive Statistics

| *Variable* | Obs | Mean | Std. Dev. |
|---|---|---|---|
| Log Luminosity | 20,232 | 6.588 | 2.259 |
| Luminosity Gini | 20,232 | 0.674 | 0.257 |
| Mineral Quality | 20,232 | 0.006 | 0.050 |
| # of Mines | 20,232 | 0.165 | 0.371 |
| # Conflict Occurrences | 20,232 | 0.353 | 2.612 |

*Luminosity Correlations (HH level NES Data):*

| | Mean AC Wealth | Mean AC Income | Mean AC Education |
|---|---|---|---|
| Mean AC Luminosity | 0.59*** | 0.45*** | 0.40*** |

*Pre-Breakup Differential in Border Districts (HH level IHDS Data):*

| Variable | Old State | New States | Difference |
|---|---|---|---|
| Income | 4,624.45 | 4340.2 | 284.25 (0.75) |
| HH Size | 5.87 | 5.56 | 0.315 (1.41) |
| IMR Rate | 0.0776 | 0.0776 | 0.0005 (0.03) |
| Water Availability | 0.937 | 0.888 | 0.048* (1.99) |
| Food Expenditure | 143.51 | 135.80 | 7.703 ( 0.99) |
| # Observations (pre-breakup) | 287 | 233 | |

The first panel of the table reports summary statistics for the main variables used in our regression analysis. There are 202,32 AC-year observations in our data. The second panel of the table reports the correlation coefficient between (the average) luminosity in an AC and its (average) wealth, income and education. AC level averages of wealth, income and education are calculated for a sample of AC's based on household survey responses obtained from the National Election Survey (NES) data. The third panel of the table reports balancing checks for some household level indicators observed in the India Household Development Survey Data (IHDS) data. The sample is restricted to households residing within districts around the border of each state (after breakup). The indicators are: *Per-capita Income* which is the household size adjusted total income of a household (in rupees); *Infant Mortality* is the infant mortality rate of the household (reported only for households with children); *Water Availability* is the binary response to the survey question "Is the availability of drinking water normally adequate?"; *Food Expenditure* is the monthly food expenditure of a household (in rupees). T-statistics for the differences, are reported in parentheses. * indicates significance at 10%; ** at 5%; *** at 1%.

Table 5: Electricity Price, Demographics and State Break-Up

| | State Electricity Tariff | | Border District Demographics, Census (2001-1991) | |
|---|---|---|---|---|
| | | | Percentage Literate | Percentage SC/ST |
| Post × New State | −9.91 | −10.40 | −0.07 | 0.005 |
| | (9.44) | ( 8.58) | (0.04) | (0.04) |
| Post | 325.39*** | 353.46*** | −0.08*** | 0.14*** |
| | (15.50) | (14.56) | (0.03) | (0.03) |
| Year F.E. | Yes | Yes | NA | NA |
| District/State F.E. | No | Yes | Yes | Yes |
| Observations | 122 | 122 | 63 | 63 |
| *R2* | 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: *Treat* 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 6: RDD estimates of state break-up on **Log Light Intensity**

| | OLS | RDD | | |
|---|---|---|---|---|
| | | BW 150 | BW 200 | BW 250 |
| Post × New State | 0.824*** | 0.348** | 0.647*** | 0.669*** |
| | (0.094) | (0.168) | (0.150) | (0.143) |
| Post | 0.944*** | 2.050*** | 2.148*** | 2.172*** |
| | (0.079) | (0.194) | (0.191) | (0.187) |
| Observations | 20,232 | 9,720 | 11,970 | 13,608 |
| $R^2$ | 0.123 | 0.186 | 0.188 | 0.182 |

This 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 year fixed effects and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting AC's on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *Treat* 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: Effect of Breakup on Household Indicators

| | Per-capita Income | Infant Mortality | Water Availability | Food Expenditure |
|---|---|---|---|---|
| Post × New State | 3,737.451** | 0.093 | 0.158** | 45.249 |
| | (1462.780) | (0.099) | (0.080) | (41.714) |
| Post | 93.374 | −0.130 | 0.022 | 174.202*** |
| | (719.003) | (0.083) | (0.021) | (26.988) |
| Observations | 1,040 | 839 | 1,040 | 1040 |
| $R^2$ | 0.128 | 0.062 | 0.106 | 0.495 |

This table reports results for the effect of breakup on various household indicators obtained from the IHD household survey. The outcome variables are: *Per-capita Income* which is the household size adjusted total income of a household (in rupees); *Infant Mortality* is the infant mortality rate of the household (reported only for households with children); *Water Availability* is the binary response to the survey question "Is the availability of drinking water normally adequate?"; *Food Expenditure* is the monthly food expenditure of a household (in rupees). The specification includes, AC fixed effects, year fixed effects, border segment interacted with year fixed effects and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting AC's on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *Treat* 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 8: RDD estimates of state break-up on **Log Light Intensity**

| | OLS | RDD | | |
|---|---|---|---|---|
| | | BW 150 | BW 200 | BW 250 |
| Post × New State × Bihar | 0.421*** | –0.855*** | –0.639*** | –0.644*** |
| | (0.101) | (0.237) | (0.192) | (0.180) |
| Post × New State × MP | 0.477*** | –0.324 | 0.175 | 0.305* |
| | (0.050) | (0.284) | (0.203) | (0.169) |
| Post × New State × UP | 1.746*** | 1.444*** | 1.784*** | 1.805*** |
| | (0.253) | (0.202) | (0.217) | (0.220) |
| Post | 0.944*** | 2.198*** | 2.282*** | 2.287*** |
| | (0.079) | (0.187) | (0.183) | (0.179) |
| Observations | 20,232 | 9,720 | 11,970 | 13,608 |
| $R^2$ | 0.136 | 0.210 | 0.210 | 0.205 |

This 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 year fixed effects and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting AC's on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *Treat* 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 9: RDD estimates of state break-up on **Log Light Intensity**

| | OLS | RDD | | |
|---|---|---|---|---|
| | | BW 150 | BW 200 | BW 250 |
| Post × New State | 0.838*** | 0.381** | 0.674*** | 0.693*** |
| | (0.098) | (0.168) | (0.152) | (0.146) |
| Post | 0.944*** | 2.037*** | 2.140*** | 2.168*** |
| | (0.079) | (0.194) | (0.191) | (0.187) |
| Post × Mineral | −0.246 | 1.626** | 1.599* | 0.968 |
| | (0.418) | (0.773) | (0.844) | (0.631) |
| Post × New State × Mineral | −0.388 | −2.758*** | −2.313** | −1.739** |
| | (0.735) | (0.951) | (1.001) | (0.842) |
| Observations | 20,232 | 9,720 | 11,970 | 13,608 |
| $R^2$ | 0.123 | 0.187 | 0.188 | 0.183 |

This 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 year fixed effects and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting AC's on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *Treat* 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 10: RDD estimates of state break-up on **Log Gini**

| | OLS | RDD | | |
|---|---|---|---|---|
| | | BW 150 | BW 200 | BW 250 |
| Post × New State | −0.110*** | −0.067*** | −0.081*** | −0.087*** |
| | (0.008) | (0.017) | (0.015) | (0.014) |
| Post | 0.007 | −0.092*** | −0.077*** | −0.077*** |
| | (0.006) | (0.013) | (0.011) | (0.010) |
| Observations | 19,521 | 9,227 | 11,381 | 12,958 |
| $R^2$ | 0.156 | 0.271 | 0.263 | 0.265 |

This table reports results for the effect of breakup on the gini (inequality) of luminosity in each AC. The specification includes, AC fixed effects, year fixed effects, border segment interacted with year fixed effects and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting AC's on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *Treat* 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 11: RDD estimates of state break-up on **Light Gini**

| | OLS | RDD | | |
|---|---|---|---|---|
| | | BW 150 | BW 200 | BW 250 |
| Post × New State × Bihar | −0.060*** | 0.007 | −0.006 | −0.013 |
| | (0.007) | (0.016) | (0.014) | (0.013) |
| Post × New State × MP | −0.127*** | −0.132*** | −0.140*** | −0.147*** |
| | (0.012) | (0.026) | (0.023) | (0.021) |
| Post × New State × UP | −0.148*** | −0.106*** | −0.119*** | −0.120*** |
| | (0.015) | (0.020) | (0.019) | (0.018) |
| Post | 0.007 | −0.103*** | −0.086*** | −0.084*** |
| | (0.006) | (0.011) | (0.010) | (0.009) |
| Observations | 19,521 | 9,227 | 11,381 | 12,958 |
| $R^2$ | 0.156 | 0.271 | 0.264 | 0.266 |

This table reports results for the effect of breakup on the gini (inequality) of luminosity in each AC. The specification includes, AC fixed effects, year fixed effects, border segment interacted with year fixed effects and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting AC's on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *Treat* 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 12: RDD estimates of state break-up on **Light Gini**

| | OLS | RDD | | |
|---|---|---|---|---|
| | | BW 150 | BW 200 | BW 250 |
| Post × New State | −0.112*** | −0.070*** | −0.084*** | −0.089*** |
| | (0.008) | (0.017) | (0.015) | (0.014) |
| Post | 0.007 | −0.091*** | −0.077*** | −0.076*** |
| | (0.006) | (0.013) | (0.011) | (0.010) |
| Post × Mineral | −0.059 | −0.065 | −0.100** | −0.095** |
| | (0.056) | (0.041) | (0.048) | (0.042) |
| Post × New State × Mineral | 0.141** | 0.149*** | 0.174*** | 0.171*** |
| | (0.065) | (0.050) | (0.057) | (0.052) |
| Observations | 19,521 | 9,227 | 11,381 | 12,958 |
| $R^2$ | 0.156 | 0.271 | 0.264 | 0.266 |

This table reports results for the effect of breakup on the gini (inequality) of luminosity in each AC. The specification includes, AC fixed effects, year fixed effects, border segment interacted with year fixed effects and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting AC's on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *Treat* 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 13: RDD estimates of **Log Light Intensity**, controlling for conflict

| | BW 150 | BW 150 | BW 150 |
|---|---|---|---|
| Post × New State | 0.382** | | 0.409** |
| | (0.163) | | (0.163) |
| Post × New State × Bihar | | −0.994*** | |
| | | (0.223) | |
| Post × New State × MP | | −0.342 | |
| | | (0.281) | |
| Post × New State × UP | | 1.430*** | |
| | | (0.201) | |
| Post | 2.084*** | 2.233*** | 2.069*** |
| | (0.193) | (0.185) | (0.193) |
| Post × Mineral | | | 1.627** |
| | | | (0.777) |
| Post × New State × Mineral | | | −2.620*** |
| | | | (0.945) |
| Conflict | −0.369 | −0.389 | −0.372 |
| | (0.259) | (0.256) | (0.259) |
| Post × Conflict | 0.359 | 0.357 | 0.362 |
| | (0.262) | (0.259) | (0.262) |
| Post × New State × Conflict | −0.046 | 0.055* | −0.042 |
| | (0.030) | (0.028) | (0.030) |
| Observations | 9,720 | 9,720 | 9,720 |
| $R^2$ | 0.187 | 0.211 | 0.188 |

This 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 year fixed effects and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting AC's on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *Treat* 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%.

Table 14: RDD estimates of **Log Light Intensity**, with spatially adjusted errors

| | BW 150 | BW 150 | BW 150 |
|---|---|---|---|
| Post × New State | 0.348*** | | 0.381*** |
| | (0.103) | | (0.104) |
| Post × New State × Bihar | | −0.855*** | |
| | | (0.155) | |
| Post × New State × MP | | −0.324** | |
| | | (0.149) | |
| Post × New State × UP | | 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 |

This 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 year fixed effects and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting AC's on either side of the border for the analysis. *Post* refers to the years after breakup i.e., year 2001 onwards: *Treat* 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 15: RDD estimates of placebo break-up on **Log Light Intensity**

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

This table reports results for placebo effects. We investigate i.) in columns 1-3, the effect of a placebo state break-up on luminosity in the pre break-up year of 1996 (4 years before the actual break-up 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 break-up 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 year fixed effects and controls for distance to the border by treatment status. BW refers to the area bandwidth, used for selecting AC's on either side of the border for the analysis. *Post* refers to the years after breakup; *Treat* 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 16: Voting Malpractices and Mineral Rich Constituencies

| | Whether Malpractice | | Intensity of Malpractice | |
|---|---|---|---|---|
| | Logit | Logit | OLS | Ordered Logit |
| Mineral | 0.118*** | 0.284*** | 0.576*** | 6.268*** |
| | (0.004) | (0.074) | (0.098) | (2.399) |
| District FE | Yes | Yes | Yes | Yes |
| Household Controls | No | Yes | Yes | Yes |
| Observations | 642 | 626 | 705 | 705 |
| $R^2$ | 0.16 | 0.18 | 0.21 | 0.17 |

This table reports the correlation between election malpractices, as perceived by sampled households from the State Election Survey, and mineral rich constituencies in the state of Jharkhand in 2004. The dependent variable for Columns (1)-(2) is a binary indicator for whether a household witnessed any electoral malpractice or election irregularities while voting in the state election; the dependent variable for Columns (3)-(4) 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). Household controls include fixed effect for various income categories, whether a household has access to television and telephone/mobile-phone, caste affiliation and a dummy for rural location. *Mineral* refers to the total quality of mines within each AC. Marginal effects are reported for logit specifications; odds-ratios are reported for the ordered logit specification. Standard errors clustered at the AC level are reported in parentheses. * indicates significance at 10%; ** at 5%; *** at 1%.

Table 17: Break-up, Political Channels and Luminosity (**Log Light**)

| | Swing Cutoff: 2% | Swing Cutoff: 5% | Political Alignment |
|---|---|---|---|
| Post × New State | 0.397** | 0.383** | 0.340** |
| | (0.187) | (0.194) | (0.164) |
| Post × New State × Mineral | −0.507 | −0.396 | −1.335* |
| | (0.823) | (0.808) | (0.778) |
| Post × Mineral × Swing | 1.783** | 2.676*** | |
| | (0.826) | (0.747) | |
| Post × Mineral × Alignment | | | 0.978 |
| | | | (0.617) |
| Post × New State × Mineral × Swing | −4.278** | -4.454** | |
| | (2.003) | (2.033) | |
| Post × New State × Mineral × Alignment | | | -1.973* |
| | | | (1.183) |
| Observations | 11,034 | 11,034 | 9,195 |
| $R^2$ | 0.183 | 0.183 | 0.136 |

This table reports results for the effect of breakup on the log of total luminosity in each AC, for a **distance bandwidth of 200 km**. The specification includes, AC fixed effects, year fixed effects, border segment interacted with year fixed effects and controls for distance to the border by treatment status. All specification 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: *Treat* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC; *Swing* refers to whether the margin of victory in the pre-breakup election year for less than 2% (Column 1) or 5% (COlumn 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 3, 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 18: Break-up, Political Channels and Luminosity (**Gini**)

| | Swing Cutoff: 2% | Swing Cutoff: 5% | Political Alignment |
|---|---|---|---|
| Post × New State | −0.071*** | −0.067*** | −0.071*** |
| | (0.018) | (0.018) | (0.016) |
| Post × New State × Mineral | 0.103** | 0.086** | 0.098** |
| | (0.043) | (0.043) | (0.040) |
| Post × Mineral × Swing | −0.157** | −0.204*** | |
| | (0.069) | (0.072) | |
| Post × Mineral × Alignment | | | −0.121** |
| | | | (0.058) |
| Post × New State × Mineral × Swing | 0.898*** | 0.865*** | |
| | (0.247) | (0.269) | |
| Post × New State × Mineral × Alignment | | | 0.181* |
| | | | (0.105) |
| Observations | 10,532 | 10,532 | 8,831 |
| $R^2$ | 0.253 | 0.253 | 0.242 |

This table reports results for the effect of breakup on the gini of luminosity within each AC, for a **distance bandwidth of 200 km**. The specification includes, AC fixed effects, year fixed effects, border segment interacted with year fixed effects and controls for distance to the border by treatment status. All specification 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: *Treat* is an indicator for the newly created state; *Mineral* refers to the total quality of mines within each AC; *Swing* refers to whether the margin of victory in the pre-breakup election year for less than 2% (Column 1) or 5% (COlumn 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 3, 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%.