TSE WP
working paper series

12-329

"Provoking Insurgency in a Federal State: Theory and Application to India"

Jean-Paul Azam and Kartika Bhatia

Toulouse
School
of Economics

Provoking Insurgency in a Federal State:

Theory and Application to India

by

Jean-Paul Azam and **Kartika Bhatia***

*: Toulouse School of Economics (UT1-C, ARQADE)

Abstract: This paper presents a model of provocation in a federation, where the local government triggers an insurgency with a view to acquire the control of some economic assets with the help of the central government. Some econometric support for this model is found using data on the Naxalite conflict that affects eight states of India. The tests performed control for endogeneity of the local government's police force interventions. They suggest that the latter are meant to amplify the violent activity of the insurgents, with a view to lure the central government to intervene and to help clear the ground for exploiting mineral deposits lying under the land of tribal people.

1: Introduction

The American war of secession brought the issue of civil war in a federation to the lasting attention of historians and analysts. This war pitted several northern states against a number of southern states which had opted for secession by founding a confederation. In a fairly iconoclastic book DiLorenzo (2003) suggests that "the South was goaded into firing the first shots" (p. 121). He claims that Abraham Lincoln "hoped that he could goad the South Carolinians into firing at Fort Sumter, and his hopes were realized" (p. 121). He thus claims that although the Southerners fired the first shots, responsibility rests in fact with the Northern government which thus managed to silence any opposition within its own side, by posturing as the victim. This episode brings out the issue of provocation for igniting violent conflict, an issue which has seldom been analyzed by economists. Rocco and Ballo (2008) offer a seminal analysis of this issue, with a view to explain the start of the civil war in Côte d'Ivoire in 2002. In a variant of their main model, these authors show how the resulting violence lured the French military to intervene and provide, in fact, some armed protection to the instigator of the outbreak of violence. The present paper provides a different analysis of provocation by dealing explicitly with a three-player game involving some asymmetric information. We analyze the case of a local government, within a federation, that tries to lure the central government to intervene on its own side to increase its chances of winning an internal conflict with a rebel group. The federal setting is especially relevant for discussing civil war and its prevention because federalism has often been defended as a means to reduce the occurrence of armed conflict in a polity. For example, after three decades of civil war, Ethiopia opted in the early 1990s for a federal structure, which seems to have fulfilled its peaceful objective up to this day. In contrast, Nigeria has gradually been partitioned into a federation of 36 states, without producing a lasting peace. These divergent outcomes suggest that a deeper analysis is required to understand the mechanisms that can lead to a civil war in

this setting. The present paper first explores theoretically the complex game that can take place between the local and the federal levels of government when a potential violent conflict exists. It then tests the model's key predictions using Indian data.

The case of the Naxalite conflict in India provides some very useful data for testing the main predictions of this provocation model. This case offers some additional features that make it important in its own right, as it raises the issue of whether democracy provides any credible protection against civil war and human rights violations and what are the conditions for reaching this objective. India is the largest democracy in the world, but two distinct worlds of democracy seem to have been subsisting inside the country. For the rich and influential people, democracy implies a right to justice, liberty and equality but for the poor, landless, tribals and other marginalized groups democracy is nearly empty. Amartya Sen has argued in his numerous discourses on democracy that 'democracy gives political power to the vulnerable by making the rulers accountable for their mistakes' and hence prevents economic and social disasters (Sen 1999, Sen and Scalon 2004). However, Bardhan (1984) has brought out the subtle mechanisms whereby what he calls "the dominant proprietary classes" manage to exert a disproportional degree of political influence. Recent events in India have shown that democracy does not necessarily prevent the outbreak of political violence. The Indian government currently has heavy military presence in Kashmir and the North East and has paramilitary and other Special Forces in eight states of Central India. Roughly, this constitutes 55% of the land mass in India. This increasing militarization of the democratic space is a direct threat to basic human rights. A former police officer, Subramanian (2007) documents a series of cases where the Indian police have been involved in blatant human right violations, as well as in some open political discrimination against some specific groups. In 2002, the state of Gujarat witnessed riots that left 1,267 dead as per official figures (but unofficial figure says 5,000) in which the ruling government is accused of being

complicit (see as well Nussbaum, 2007). Thus the use of violence against civilians under the aegis of democracy seems to be on the rise.

This paper is about one such challenge to the Indian democracy. It brings into focus the distinct incentives of the local and the central governments in a federation when dealing with a conflict. There is a civil war being fought in the forests and hills of Central India. According to mainstream media and the government, this war is between the state and the extreme left wing group called the "Naxalite or Maoist". Naxalism is a political movement which completely rejects the parliamentary democratic system of Indian Governance and vows to wage a 'people's war for a people's government'. Even though the Naxalites have been present in India since the end of 1960s[1], it is only in this new millennium that the Indian government decided to take on them in a big way. In 2006, the Prime Minister of India touted the Naxalites as the 'biggest threat to the internal security of the country'[2]. Thereafter on 22nd June 2009, the Government of India banned the Communist Party of India (Maoist)[3] under Section 41 of the Unlawful Activities (Prevention) Act 1967. This essentially puts them in the same category as a terrorist organization. Finally in July 2009, the Home ministry of India together with the concerned state governments launched an armed operation (nicknamed *Operation Green Hunt*[4]) for wiping out the Naxalites.

---

[1] The history of the Naxals can be traced back to 1967 when in a village called Naxalbari, a group of landless peasants surrounded a piece of land with red flags and started cultivating it. Soon this struggle for land and tenancy rights spread to other parts of India. The first phase of the movement was heavily supported by educated middle class and youth. This first outburst was crushed around 1972 but the political ideology survived and made considerable inroads into the rural and tribal areas of India. The main support base for Naxalites in this second phase are the poorest and the most deprived classes – landless agricultural laborers, poor peasants, people displaced by forest officials or industrial projects, lower caste people all of whom regularly suffer discrimination and social humiliation by the landed and elite class of the villages and undergo persecution by the police.

[2] Prime Minister of India Manmohan Singh noted this in his address to the 2nd meeting of the Standing Committee of Chief Ministers on Naxalism on 13th April 2006.

[3] The Communist Party of India (Maoist), born in 2004 after the unity of the People's War Group and the Maoist Communist Centre, leads the Maoist movement in India.

[4] In a curious turn of events, Mr. P Chidambaram, Home Minister, Government of India, has denied the existence of "Operation Green Hunt" and emphasized that no such co-coordinated joint-operations have been launched by the Central and State forces against the Naxalites. This clarification issued in a press conference held on April 7, 2010 is an indication of the nature of political sensitivities involved in the matter. Also see "Green Hunt: The anatomy of an operation", *The Hindu*, February 6, 2010.

This new millennium has also witnessed an unprecedented inflow of investment into the mineral sector. The Naxalite area of operation roughly covers the states of Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Karnataka, Maharashtra, Orissa and West Bengal (see Map 1). These states also roughly form the mineral belt of India. In 2009-2010, out of a total of 2999 operating mines in India, 1672 were located in the above eight states. In the same year, the bulk of value of mineral production of about 68% was confined to these 8 states (including off-shore regions)[5]. As the price of iron ore rose from 13$ per metric ton in Jan 2002 to 179$ per metric ton in Jan 2011 and of aluminum from 1371 $ per metric ton in Jan 2002 to 2440$ per metric ton in Jan 2011, the state governments went eager to cut deals with mining companies. Between 2002 and 2008, Chhattisgarh government signed a total of 115 Memorandum of Understandings (MoUs) worth 37$ billion with mining companies. Jharkhand government signed 74 MoUs valued at 61$ billion and Orissa government signed 79 MoUs worth 76$ billion. On June 3, 2010 Karnataka government alone signed 361 MoUs that propose an investment of 84$ billion[6].

However, the state government's quest for exploiting natural resources in collaboration with private companies has not been very easy. The area with the minerals is inhabited by tribals or Adivasis or 'Scheduled tribes'[7]. There are 84.3 million tribal people (8.2%) as per Census 2001 in India of which 80% live in this belt. Under the Constitution of India, and by virtue of an array of legislations and court judgments, the alienation of tribal land is almost impossible for any commercial purpose. The Constitution, under Schedule V and Schedule VI, provides for a special framework of administration in the tribal areas which prescribes a special regime for land rights in forest areas. Also, various state laws bar the

---

[5]Off-shore regions contributed 29% to value of Mineral Production in 2009-2010.
[6]http://www.jharkhandonline.gov.in/DEPTDOCUPLOAD/uploads/13/D200813070.pdf
  http://chhattisgarh.nic.in/departments/sipb/List%20of%20MoUs%20-%20Alive.pdf
  http://www.teamorissa.org/list%20in%20MoU%20Companies%28as%20of%20April%202009%29.pdf
[7] Shah (2010) provides an anthropological approach to the Mundas of Jharkhand that gives the reader some familiarity with their animist beliefs and rituals as well as to their traditional political institutions.

alienation of tribal-owned land to non-tribals[8]. To extend the self-governance framework to forest areas, the Indian parliament also enacted the *Provisions of Panchayats (Extension to the Scheduled Areas) Act, 1996* (PESA). PESA provides extensive rights to village collective (*Gram Sabha*) for deciding "use" and ownership of the forest land vis-à-vis tribals settled on that land. Indian parliament also passed another historical law in 2006 titled as the Scheduled Tribes and other Forest Dwelling Communities (Recognition of Forest Rights) Act, 2006 to recognize land rights of tribals on forest land. These legal entitlements have made land acquisition from tribals through just means lengthy and difficult. In addition, the tribals in this area are strongly resisting displacement, acquisition of their land, poor rehabilitation packages and environment degradation from mining. There are numerous instances where tribals groups have filed cases against mining firms in the Indian courts, gathered support from Human Rights groups or NGO's and staged almost daily protest for their cause[9]. In principle, the Naxalites support the tribal resistance movements. Some people argue that many of these protests are started by the Naxalites or have Naxalite cadre working for them. Others believe that the Naxalites and tribals are two separate entities. The truth lies somewhere in between. As writer and political activist, Arundhati Roy puts it "99% of

---

[8]Chotanagpur Tenancy Act, 1908, the Santal Pargana Tenancy Act, 1949, the Bombay Province Land Revenue Code, 1879, Orissa Scheduled Areas Transfer of Immovable Property Regulation, 1956 the Bihar Scheduled Areas Regulations, 1969, the Rajasthan Tenancy Act, 1955, the MPLP Code of Madhya Pradesh, 1959, the Andhra Pradesh Scheduled Areas Land Transfer Regulation, 1959, the Tripura Land Revenue Regulation Act, 1960, the Assam Land and Revenue Act, 1970 and the Kerala Scheduled Tribes (Restriction of Transfer of Lands and Restoration of Alienated Lands) Act, 1975.

[9]We highlight here some examples of protest in the last decade (Source: News reports). In Jagatpur district of Orissa, POSCO faces major protest for its proposed steel plant. In the same state in Kalinganagar district, Tata Steel has been battling resistance for setting up of a steel plant. On January 2, 2006 fourteen tribal men and women were killed while opposing building of a boundary wall on the land allotted to Tata steel. In March 2010, people of affected villages were beaten up by a 700 strong police force for resisting the building of a road by Tata Steel. The main contention of the tribals here is that the government is taking away their land and is not offering enough compensation. In Kashipur district, Orissa people are fighting against proposed Bauxite mining as this will destroy their agricultural land and perennial water streams. In Jharkhand, Arcelor Mittal faces stiff resistance for their proposed two steel plants from Adivasi Moolvaasi Asthitva Raksha Manch (AMARM, Forum for the Protection of Existence of Tribal and Native Population). Protests against land acquisition for Special Economic Zones (SEZ) have also taken a bloody turn. On March 14, 2007 in a place called Nandigram in West Bengal a group of 2000 villagers were opposing the forcible land acquisition by the West Bengal government for the purpose of forming SEZ. The land was to be used to set up a chemical hub by Indonesia based Salim group. What followed was carnage. Around 3000 policemen including some members of the ruling state party CPI (M) opened fire on the group of protestors leaving 14 dead and over 70 injured which included women and children. In the same district amid massive protest from farmers TATA Motors had to withdraw their small car (Nano) project from Singur. Tribal activists in Jharkhand have held up a steel project, citing "identity" issues. They consider their land sacred and are not willing to part with it for any amount of compensation. The list can go on increasing but the main issue here is that the life, culture and social values of tribals are linked to their forest and land and taking these away will threaten their existence and survival. Hence they are waging a struggle for their survival.

Naxalites are Adivasis but not all Adivasis are Naxalites". Irrespective of the differences or similarities between the two, both the tribals and the Naxalites are an impediment to government's plan of industrialization. The protests have severely delayed mining and industrial projects in this area. According to a report by Bloomberg Business week 'delays in approval for land and mines have stalled 80$ billion of projects in India. Most of these projects are located in the tribal belt of India.' The world's biggest steel company "Mittal Steel" has threatened to pull out its 20$ billion project to set up steel plants in Jharkhand and Orissa due to severe delays[10]. Tata Motors have already pulled out their Nano project from West Bengal over protest from farmers. The Orissa Mining Corporation is waiting for clearance on five of its project from the Environment and Forest Ministry[11]. In an interview to a newspaper, the previous Central Environment and Forest Minister, Jairam Ramesh accepted that the state governments are under pressure to show that their economies are doing well and hence some of the states are allowing the flouting of forest and land laws by mining companies[12]. In the sensitive case of bauxite mining in the Niyamgiri hills of Orissa, the Primitive Tribal Group, Dongria Kondh, staged protest with support from Amnesty International, Survival International and even the Church of England. This led to the Central government rejecting environment clearance to Orissa Mining Corporation (state-owned company which holds the mining lease for bauxite in Niyamgiri area) and its partner Sterlite industries (Indian arm of UK based Vedanta group) for its 1.7$ billion mining project citing rampant violation of environment and forest laws[13]. The Orissa Mining Corporation has since moved to the Supreme Court challenging the decision of the Central government[14].

---

[10]'Mittal plans 6mt plant in Karnataka' Business standard, 24th Nov, 2009.

[11]"CM peeved at clearance delay". Statesman News Service, 21st Oct. 2005.

[12]'Cannot deny links between forest depts. & mining lobbies' *Hindustan Times*, 15th May, 2010.

[13] On bauxite in Orissa, see Padel and Das (2010).

[14] "SC defers hearing on Niyamgiri Bauxite mining", *Business Standard*, 31st January 2012.

These delays and roadblocks have given an incentive to the government to provoke a conflict. States are in a rush to get their districts declared as 'Naxalite affected' by the Central Ministry of Home Affair. On various occasions, in Singur, Nandigram, Lalgarh, Niyamgiri etc. the state governments have tried to declare a 'Naxalite hand' behind protests by local people. Districts which are declared 'Naxalite affected' have at their disposal the police force of the state and also Special Central Forces like paramilitary, Commando Battalions for Resolute Action (CoBRA) and India Reserve (IR) battalion. In addition the districts get special funds from the Centre under the Security Related Expenditure (SRE) scheme for combating the Naxalites[15]. These armed forces and funds are being used rather arbitrarily by the State governments to clear the forest and hills of their inhabitants. The Chhattisgarh state government has taken extreme steps to this effect. In 2006, the government of Chhattisgarh actively supported the creation of a civilian vigilante army named '*Salwa Judum'* (purification hunt). The *Salwa Judum* had very clear instructions from the government to burn down the villages inside the forests and force the people to take shelter in big relief camps situated outside the forests. Those who stayed behind were deemed as Naxalite supporters. A public interest litigation petition filed in 2008 by a group of citizens in the Supreme Court records that, during this cleansing act, at least 2,825 houses have been burnt, 99 women raped and approximately 100,000 persons were forcibly displaced by the *Salwa Judum*. To establish further control, the government passed a law titled as *Chhattisgarh Special Public Security Act, 2005* which makes it very difficult for journalists to do any credible and independent reporting from these areas. In effect, the law criminalizes all contacts with the Naxalites by the media. Hence, the wider civil society in the country only has access to the government's version of events served as "news" by the mainstream media outlets.

---

[15]SRE funds are for setting up of Counter Insurgency and Anti-Terrorist (CIAT) Schools, modernizing the police forces, buying weapons, giving lump sum grants to village self-defense committees, building infrastructure etc.

This paper presents a theoretical model of provocation by the local government to start and continue a conflict with the rebels. In the model, the local government wants the Central government to intervene in the conflict on its side. We have a three player game between the government at the Centre, government at the state level and the rebels[16]. We incorporate the federal nature of the Indian constitution in our model because the incentives of the state and central government to bring force into the region need not always align. While both governments would like to have more revenues from mining and industry, the action of the Central government is more visible and put to greater scrutiny than the state government. The 2009 decision of the Central government to launch *Operation Green Hunt* received considerable coverage by the Indian media. Prominent civil society members were concerned about the indiscriminate spiral of violence this action will trigger. In contrast, the launch of *Salwa Judum* by the Chhattisgarh state government in 2006 was not picked up by the media in the same spirit. So the Central government may face a heavier political cost if it involves itself in the conflict. Our key theoretical prediction is that any aggressive move by the local government forces will provoke an insurgency by the rebels. Also an increase in the economic value at stake, e.g., minerals, will lead to an escalation of violence by all three players if the increased economic value favours mainly the local government. When the increased economic value has a spill over effect on the Central government, the effect on violence levels might be ambiguous. To test the predictions of our theoretical model, we collect data on conflict casualties between January 2005 and July 2011. The violence data together with data on mineral deposits, tribal population and socio-economic controls validate our key theoretical prediction. Our empirical finding supports the hypothesis of local government provocation and violence escalation effect.

---

[16]The rebels in the theoretical model imply both the tribals and the Maoist, who are resisting against government's plan to mine and setting up of mineral based industries.

The paper is organized as follows. The theoretical model is developed in Section 2. The empirical model is presented in section 3. Section 4 describes the data and the variables used, and Section 5 reports our results. The concluding remarks are in section 6.

2: A Model of Local Provocation and Central Government Intervention

There are three players involved in this model, whose time-line can be decomposed into two main stages: (i) There is first a local-level game where the local government chooses a level of armed intervention A and the potential rebels choose an intensity of rebellion R in response to this move. At this stage, we assume that the rebels do not play first, and that either the two players play simultaneously or the local government plays first. In either case we derive the potential rebels' best-response function that is tested empirically below.

(ii) there is next a national-level game where the federal government chooses a level of military intervention M after having observed the equilibrium decisions made by the two other players. The central government is potentially incurring a political cost when a rebellion occurs, whose value depends on whether it intervenes or stays outside. Let $\pi_0 R$ represent this political cost in the absence of intervention, when the intensity of the rebellion takes the value R, and let $\pi_I R$ be the political cost it incurs when intervening militarily. Moreover, we assume that there exists a constitutional constraint such that the central government is facing an infinite cost in case of military intervention in the absence of a rebellion. Then, $\Delta \pi = \pi_I - \pi_0$ measures the per-unit political cost of the central government's intervention, conditional upon observing the outburst of rebellion. It is not necessarily positive and could be negative, e.g., if the national political elite felt that once the rebellion is on, then it is the federal government's duty to provide military support to the local state, and exerts pressure to that end.

While the government knows this political cost of intervention in case of rebellion when making its decision, we assume that the other two players have to make their decisions before the political game determines $\Delta\pi$. Assume instead that they form a common probability distribution about it, which we specify for the sake of simplicity as the following cumulative distribution:

$$F\left(\Delta\pi\right)=\max\left\{0,\,\min\left\{\delta\left(\alpha+\Delta\pi\right),\,1\right\}\right\},\quad \delta>0,\quad \alpha\delta<1. \tag{1}$$
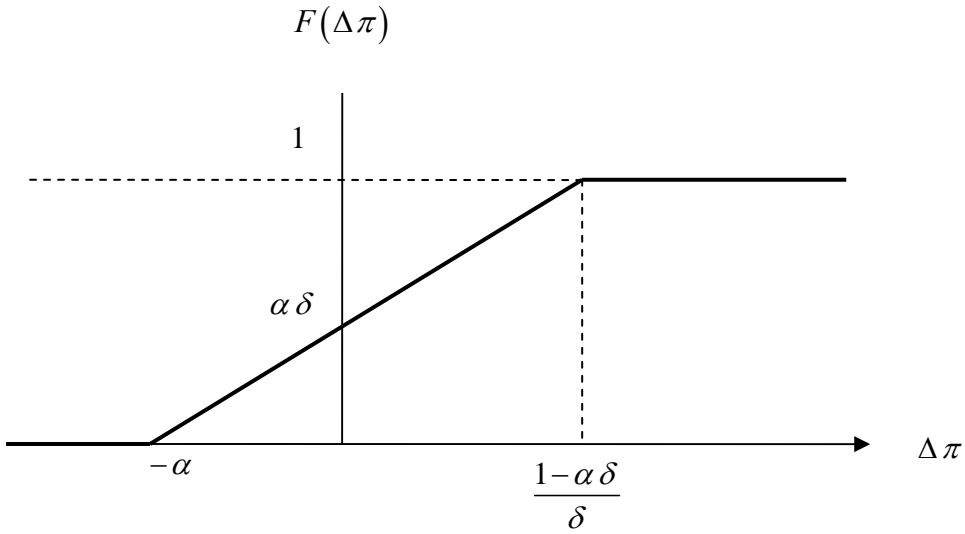

Figure 1: Cumulative Probability Distribution over $\Delta\pi$

Figure 1 depicts this probability distribution. This specification allows for negative values of $\Delta\pi$ when $\alpha>0$, for the sake of generality. This allows in particular for the case where the national polity would regard intervention to support the local government as one of the federal government's duties. This probability distribution is in fact the standard uniform distribution over $\left[-\alpha,\left(1-\alpha\delta\right)/\delta\right]$ support. The value of δ is an important parameter for describing the political orientation of the country. A strong δ describes the case of a fairly "centralist" public opinion, making the political cost of central government's intervention quite low with a higher probability. In contrast, one can also use this setting for capturing the

case where the civil society mobilizes to exert some pressure on the central government not to get involved in human rights violations for the sake of economic objectives and to try instead to discourage violence at the local level. For example, Nussbaum (2007) argues that the BJP party was ousted in the 2004 elections because of its alleged complicity in the 2002 Gujarat massacre.

Now, define μ as the economic value at stake for the central government in the potentially rebellious area per unit of military intervention. For example, one may assume that the intensity of the military interventions A and M, by the local and the central governments respectively, determine the size of the territory that the government takes over, with a probability of finding a valuable mineral deposit in its underground which is higher, the larger is the territory thus brought under control. Then, define the net economic value of intervention for the central government as:

$$h(\mu, A) = \max_{M} \mu\, f(A, M) - c(M), \tag{2}$$

where $f(A, M)$ is increasing and concave in its two arguments and $c(M)$ is increasing and convex. This expression is akin to a profit function as it subtracts the resource cost of the military intervention incurred by the central government from its expected benefit. Moreover, it entails an externality as this economic value for the central government is enhanced by the armed intervention of the local government. Assume that $\mu\, \partial f(A, 0)/\partial M > c'(0)$ for any $A \geq 0$. This ensures that $h(\mu, A) > 0$, so that some positive values of M might be economically profitable for the central government.

Using Hotelling's Lemma, one derives easily from the first-order condition of problem (2), that if it chooses to intervene, then the central government will choose a level of intervention given by:

$$M^* = M(\mu, A) > 0 \quad \text{if} \quad R > 0, \tag{3}$$

which is increasing in its two arguments. Similarly, one can check that the economic value of intervention $h(\mu, A)$ defined in (2) is increasing in its two arguments (provided $\partial^2 f(A, M) / \partial M \, \partial A \geq 0$), showing that the economic incentive for the central government to intervene in case of rebellion depends positively on the per-unit economic value at stake as well as on the size of the local government's force engaged on the ground.

Now, the central government's decision to intervene or not will be made by comparing the economic gain so obtained to the political cost incurred $\Delta \pi R$. The central government will thus opt for a positive intervention as described in (3) if and only if:

$$\Delta \pi R \leq h(\mu, A). \tag{4}$$

From the point of view of the potential rebels and the local government, this decision rule by the central government translates into the following central government's intervention probability function:

$$p(\mu, A, R) = 0 \quad \text{if} \quad R = 0, \quad \text{and}$$
$$= \max \left\{ 0, \min \left\{ \delta \left(\alpha + \frac{h(\mu, A)}{R} \right), 1 \right\} \right\} \quad \text{if} \quad R > 0. \tag{5}$$

Equation (5) thus predicts that, within the relevant range, the probability of the central government's intervention increases with A and μ and decreases with R. Notice that δ also has a positive impact on this probability of central government's intervention, reflecting the "centralist" attitude of the polity. In what follows, we neglect the case where the federal government's intervenes with probability 1.

Given this probability function, the potential rebels might launch an insurgency with a view to minimize the expected cost of aggression inflicted by the governments' forces to the local population, taking into account the deterrence effect against the central government's military intervention captured at (5). In the Indian case, these potential rebels are mainly tribal people and other rural populations concerned by their loss of communal land or traditional territory, by poor compensation and by environmental degradation of their area. Let us assume that the unit cost inflicted by the governments' forces to the affected population, which the rebels want to reduce, is an iso-elastic function of the ratio of the governments' forces to the rebels' ones. Denote it $(F/R)^{\xi}$, $\xi > 0$, where $F \in \{A, A+M*\}$, as appropriate. This captures simply the rebels' ability to reduce the damage inflicted by the armed forces. We then model the potential rebels' loss function as follows, given the level of governmental armed forces A and $M*$, and the value of $p(\mu, A, R)$ given at (5):

$$L_T^* = \min_{R} \gamma R + (1-p)\left(\frac{A}{R}\right)^{\xi} + p\left(\frac{A+M*}{R}\right)^{\xi} \tag{6}$$

subject to $p = p(\mu, A, R)$ as specified in (5).

Hence, to the direct resource cost of launching the rebellion γR is added the cost inflicted to the local population by the expected value of the governments' armed interventions, which is decreasing with the strength of the rebellion. Under this assumption, we can now prove proposition 1.

Proposition 1: The level of rebellion $R*$ is strictly positive *if and only if $A > 0$*, and it is an increasing function $R* = R(\mu, A)$ in this case.

The proof is in the appendix.

Figure 2 depicts the optimum choice of $R*$ in the case of an interior solution with $p<1$. The downward-sloping curve with a flat top represents the probability function (5) for given values of μ and $A>0$ such that $h(\mu,A)>0$. The non-monotonic concave curve is the iso-loss curve for (6) that is tangent to the probability curve at the optimum point. It can be shown easily that it intersects the horizontal axis twice in the interior of the set $R \in \left]0, L_T*/\gamma\right[$ if $A>0$.
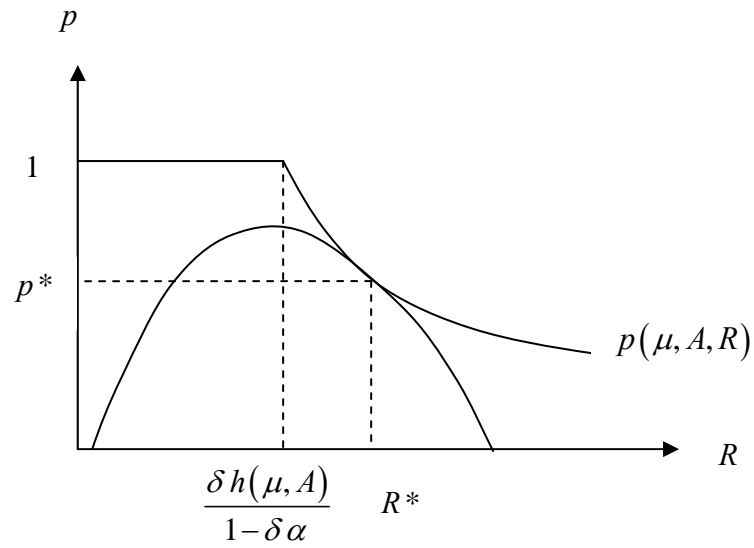

Figure 2: The Best-Response Level of Rebellion

Therefore, proposition 1 shows that any aggressive move by the local government's armed forces will provoke in this model an insurgency by the rebels aimed at minimizing the expected cost of the armed aggression to the local population, including an attempt at reducing the probability of the central government's intervention. This proposition brings out the essence of the provocation hypothesis in an equilibrium framework while downplaying to some extent the issue of the timing of the first attack, as confirmed in the following analysis.

Now, the question arises whether the local government will exploit the opportunity for provocation brought out by proposition 1. Define $\lambda > 0$ as the local government's

economic benefit per unit of intervention. Then, the local government gets an expected

economic benefit $\lambda(A + pM^*)$ from attacking the local population in case of intervention,

while incurring a cost $x(A)$ for mobilizing the local armed forces for doing so, and an

additional expected cost inflicted by the rebels νR. The latter might include some political

cost similar to the one assumed above for the federal government as well as some resource

cost in terms of loss of lives and property. We assume that $x(A)$ is increasing and convex

with $x(0) = 0$ and $x'(0) = \theta \geq 0$. In practice, we expect λ and μ to be positively correlated.

However, we can imagine cases where these parameters changed independently of the other

one. For example, a mining company might concentrate all its campaign contributions to help

the local government being re-elected, while the central government would only benefit from

indirect and deferred fallout, like increased tax revenues.

As announced above, we rule out the case where the rebels attack first, and we

analyze the two cases where either the local government plays first or the two players act

simultaneously. Then, the local government will launch a provocation if:

$$\max_{A} \lambda\left(A + p\left(\mu, A, R^*\right)M\left(\mu, A\right)\right) - \left(x(A) + \nu R^*\right) \geq 0,$$
$$\text{s.t. } R^* = R\left(\mu, A\right) \text{ if the local government plays first or} \tag{7}$$
$$R^* = R^N \text{ if the two players act simultaneously.}$$

Define f_{AM}, f_{AMA} and f_{AMM} as the second and third derivatives of function $f(A, M)$ used

in (2) with respect to the variables indicated. Then, solving maximization problem (7) allows

us to derive the following prediction.

Proposition 2: (i) The local government chooses $A > 0$ and thus provokes an insurgency if

$\lambda > \theta$. (ii) Its level of armed intervention $A^* = A(\lambda, \mu, \nu)$ is finite and increasing in λ and

decreasing in ν, while the impact of μ is ambiguous, if

$$f_{AM} > 0, \quad f_{AMA} \geq 0 \text{ and } f_{AMM} \geq 0. \tag{8}$$

Proof: If $R = 0$, the local government's objective function reduces to $\lambda A - x(A)$, which is strictly increasing in the neighbourhood of $A = 0$ if $\lambda > \theta$. It takes some simple calculations to show that condition (8) ensures that $p(\mu, A, R) M(\mu, A)$ is strictly concave in A. This property is used in the following graphical analysis.

Figure 3 represents the two possible equilibrium points $\{A^*, R^{**}\}$, where the local government plays first, and $\{A^N, R^N\}$, where the two players act simultaneously as Nash-equilibrium players.
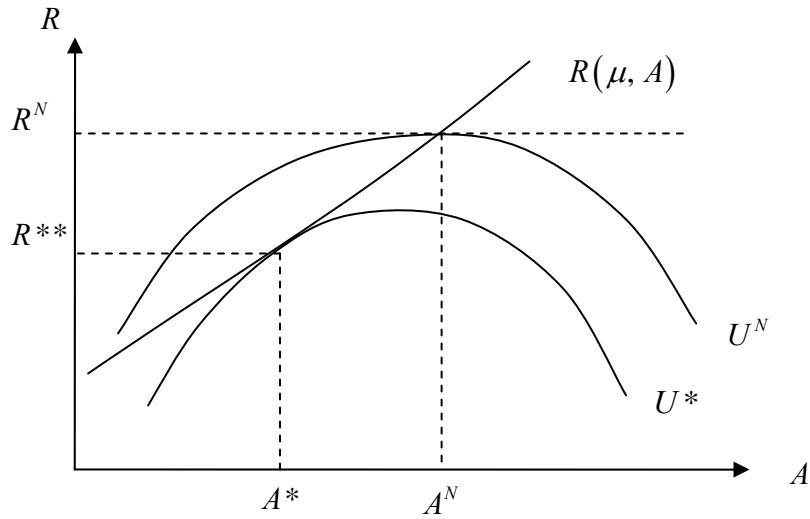
Figure 3: Equilibrium Levels of Insurgency and Provocation

The upward-sloping curve represents the potential rebels' best-response function: it is strictly positive and increasing if $A > 0$, from proposition 1, and it is zero if $A = 0$. The non-monotonic concave curves labelled U^* and U^N, $U^* > U^N$, represent the local government's indifference curves at equilibrium when either the latter plays first or the two players act simultaneously, respectively. These curves are concave because condition (8) ensures that

$p(\mu, A, R)M(\mu, A)$ is strictly concave in A, and it is also monotonically decreasing in R, while $x(A)$ is convex. The $R(\mu, A)$ function is drawn as a convex curve in this space for clarity, but existence of the $\{A^*, R^{**}\}$ interior equilibrium only requires it to be locally "less concave" than the indifference curve. The $\{A^*, R^{**}\}$ equilibrium outcome is found where the local government's indifference curve is tangent to the rebels' best-response function. In this case, the local government internalizes the violent response of the rebels and reaches a higher level of utility $U^* > U^N$ than in the simultaneous-move case. In the latter case, the Nash equilibrium of the first-stage game is found where the local government maximizes its objective function, given the equilibrium R^N. Then, its indifference curve is tangent to a horizontal line through the latter, while cutting $R(\mu, A)$ at $A = A^N$. Quite naturally, the level of violence by both parties is higher in the simultaneous-move equilibrium than when the local government is the leader in this game. Hence, the assumed order of play captures in fact some political or institutional characteristics of the local government that determine whether it is able to commit credibly to exert some self-restraint in violence or it is liable to get caught in some kind of escalation process.

In figure 3, an increase in λ or a decrease in ν rotate the indifference curves counter-clockwise, leading to an increase in violence by the two sides, as $R(\mu, A)$ does not shift. This figure also clearly brings out that there is some ambiguity regarding the impact of an increased economic value at stake for the central government μ on the equilibrium outcome. $R(\mu, A)$ shifts upwards in this case, while the indifference curve might become steeper or flatter, depending on the values of $\{A^*, R^{**}\}$ and on the cross-second derivative of $M(\mu, A)$. The shift in the $R(\mu, A)$ curve entails a kind of negative income effect for the local government, entailing plausibly an incentive to reduce its own level of aggression,

while the rotation of the indifference curve might instead provide an incentive to step up the aggression, as the marginal reward on the latter increases. It is only when the latter effect is dominant that we can predict an unambiguous escalation effect, leading the three players to increase their level of violence as a response to the increase in μ. However, this escalation effect might in fact be dampened if the negative "income" effect due to the autonomous increase in the rebellion effort in response to the increase in μ led the local government to reduce its own level of intervention.

This analysis suggests that the level of violence perpetrated by the local government is determined endogenously as a function of the $\{\mu, \lambda, \nu\}$ triplet of parameters. To summarize the key prediction of proposition 2, an increase in the economic value at stake will probably lead to an escalation effect, boosting the level of violence unleashed by the three players, if the federal government intervenes, if it accrues mainly to the local government through λ. If there is a strong enough spill-over effect in favor of the central government through μ, then the resulting increase in the rebels' activity for any given level of local government aggression might lead the local government to respond by exercising some restraint with its own forces. Hence, in the empirical analysis of the so-called Naxalite conflict in India that follows, we control for endogeneity by using instruments that are meant to capture either ν, μ or the deviations of λ relative to μ, reflecting local conditions.

3: Empirical Specification

The theoretical model analyzed above yields four predictions that can be confronted with the data: (i) the rebels will respond to an aggression by the local government's forces by stepping up the intensity of their rebellion; (ii) a larger economic value at stake will lead to a higher level of violence perpetrated by the rebels, as well as by the other two players if certain conditions hold; (iii) the rebels do not respond to the violence perpetrated by the central

government's forces, and (iv) the level of the local government's intervention is endogenous in an equation explaining the level of violence perpetrated by the Maoists. The contrast in the rebels' response to the violence perpetrated by the local and the central governments, respectively, implied by (i) and (iii) is the key test of our theory, as it bears directly on our assumed time line of the game. While (i) could also describe a simple aggression/retaliation cycle, (iii) precludes the latter interpretation and leans in favour of a more strategic interpretation. Prediction (ii) could also be derived from a simple "greed" model, but our assumed time line yields this prediction without the latter assumption, as the rebels' behaviour is predicted to be based on their expectations about the central government's best-response function, which depends on the economic value at stake. Hence, the conjunction of these four predictions is what distinguishes our model from more standard alternatives.

We will test this set of predictions using data from the Naxalite conflict. The rebels in our theoretical model include all the individuals who are protesting against mining and setting up of mineral-based industries. We do not have data for this whole group but we have data for a subset of this group. We have data on the number of killings perpetrated by the Naxalites between 2005 and July 2011. This is our key dependent variable R or *rebellion*. Numbers of Naxalites killed between 2005 and July 2011 by the police forces of local government and by Security forces of Central government[17] represent the variables A or *local_forces* and M or *central_forces* respectively. We want to estimate the structural equation $R^* = R(\mu, A)$. Since the response variable R or *rebellion* is a count variable and has a large number of zeroes, we use a negative binomial regression model (NBRM model[18]). There is a problem of endogeneity here since A or violence by local government is

---

[17]India has a federal form of governance where the power of the states and the Center are defined by the constitution. Police and public order comes under state list and so the responsibility for maintaining law and order lies with the state. The Central government has supplemented their efforts in the Naxalite-affected districts by providing Special Forces such as Central paramilitary forces (CPMFs), Commando Battalions for Resolute Action (CoBRA) and India Reserve (IR) battalions.

[18] Hilbe (2011) gives a detailed description of the NBRM model. Also see Cameron and Trivedi (2005).

endogenous. To control for this, we use the two-stage estimation technique for count data (or structural model approach) as discussed in Cameron and Trivedi (2009) or Wooldridge (2002) [19].

Let R_i be the number of killings by Naxalites in district i and assume it is Negative Binomial distributed

$$E(R_i | X_i, Z_i, u_i) = \exp(\beta_1 X_i + \beta_2 Z_i + u_i) \tag{9}$$

where Z is endogenous and X is a vector of exogenous regressors and u_i is the error term that is correlated with the endogenous regressor Z but is uncorrelated with X.

The reduced form for Z_i is:

$$Z_i = \delta_1 W_i + \delta_2 X_i + \varepsilon_i \tag{10}$$

Where W is a vector of exogenous variables that affects Z nontrivially but do not directly affect R. In addition we assume that $u_i = \rho\varepsilon_i + \eta_i$ where $\eta_i \sim [0, \sigma_\eta^2]$ is independent of $\varepsilon_i \sim [0, \sigma_\varepsilon^2]$. After substituting we get,

$$E(R_i | X_i, Z_i, \varepsilon_i) = \exp(\beta_1 X_i + \beta_2 Z_i + \rho\varepsilon_i). \tag{11}$$

First we estimate (10) by OLS and get the residuals $\hat{\varepsilon}_i$. Second we replace ε_i by $\hat{\varepsilon}_i$ in equation (11) and estimate the parameters of the NBRM model. We can test for endogeneity explicitly in this method since if $\rho = 0$ then Z can be treated as exogenous. Further if $\rho \neq 0$ then we need to use a robust variance estimator (Hilbe, 2011, pp 419-421).

---

[19]The two-stage estimation (2SE) method was first proposed by Hausman (1978) as a means for testing endogeneity in linear models. Consistent 2SE methods for specific nonlinear models have been developed by Blundell and Smith (1986, 1993), Newey (1987) and Rivers and Vuong (1988).

4: Data and Variables

We collect district-wise information for eight states in the conflict zone. These states are Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Karnataka, Maharashtra, Orissa and West Bengal (see Map 1)[20]. To maintain consistency with the 1991 census, we keep the political boundaries of the districts from the year 1991. This makes our sample consist of 191 districts[21].

The level of violence perpetrated by the three players is captured by the number of people killed by them. Both our dependent variable *rebellion* and the endogenous regressors *local_forces* and *central_forces* are from the web site South Asia Terrorism Portal (SATP)[22]. Map 2 shows district-wise total casualties (*rebellion + local_forces +central_forces*) in the Naxalite conflict. The SATP data is compiled from news reports. Among the advantages of this dataset is its systematic detailed presentation of Maoist-related incidents as daily summaries, something that is unavailable in the official statistics compiled by the Home ministry of India. However, this dataset has some limitations. First, it is not all inclusive. There may be casualties happening in remote areas which are not picked up by the news media. Second, all civilian casualties are attributed to the Maoists. There can be incidents where local mining mafia or contractors commit murder and attribute it to the Maoists. There are also some violent incidents among the various Maoist factions which are hard to

---

[20]As in Vanden Eynde (2011), the neighboring states Uttar Pradesh (UP) and Madhya Pradesh (MP) to the north are not included in our sample. These states are not significantly concerned by the conflict: UP has 70 districts out of which only 3 have been notified as Naxalite affected. MP has only 1 notified Naxalite affected district out of 50. These districts are located just across the boundaries of our sample states (see appendix), on the fringe of the forest zone included in our sample. The rest of UP and MP seem qualitatively different, with a much lower presence of tribal people. In the last seven years, both states have reported very few (almost none) cases of Naxalite violence. There have also been very few reported cases of protests by tribals against mining or mineral based industry in this region.

[21] Since we use data from the 1991 census, we keep the political boundaries of Indian states from the year 1991. In 2000, two new states were formed. Chhattisgarh state was formed by partioning 16 districts from Madhya Pradesh and Jharkhand was carved out of the southern 18 districts of Bihar. The two new states are historically predominantly tribal and had been requesting for separation since the 1950s. Their separation movement predates the Maoist movement which began only at the end of 1960s. It is easy to recognize the districts for these new states in the 1991 census as their names and boundaries have remained the same. Between 1991 and 2011, some new districts were also carved out from the old ones in few of our sampled states. At present the eight states in our sample have 217 districts. Since we consider the political boundaries from 1991, we are left with 191 districts in our sample.

[22]www.satp.org

categorize. Third, the government forces (both police and central forces) are always reported to kill the Maoist. It is well documented by various human rights groups that several civilians have been falsely encountered by the government in this conflict (Balagopal, 1981). Fake encounters of trade union leaders or leaders of protest movement branding them as Naxalite cadre is also not uncommon. There is also scope for error in government reporting of Maoist casualties. The government has an incentive to overstate the number of Maoists killed since in some cases there are no dead bodies to identify.[23] Fourth, the dataset does not include casualties who do not immediately succumb to their injuries. Nevertheless, we feel that this dataset is currently the best source for measuring violence on both sides of the conflict. Table A1 compares our dataset with the official figures given by the Home Ministry of India. The last row gives the total casualties per year. There is a difference of around 50-100 casualties per year between the two datasets.

To control for endogeneity, we need instruments that affect *local_forces* nontrivially but do not directly affect *rebellion*. These are proportion of tribal population in the district and the interaction of tribal population with iron dummy, coal dummy, bauxite dummy and forest cover rate. Data on mineral deposits are from the 2009 Annual Report published by the Ministry of Mines, Government of India. We focus on three key minerals: iron ore, coal and bauxite, as these are closely related to protests against displacement, land acquisition, environment degradation, etc. going on across these states. We do not use production figures, which are liable to be endogenous. Information on proportion of tribal population is from the 1991 census. We take values from the 1991 census and not the 2001 census in order to alleviate any endogeneity issues for the variable tribal population, which might be affected by the displacement of people resulting from the conflict. Map 3 gives district-wise proportion of tribal population and deposits of our key minerals – iron, coal and bauxite. Forest cover

---

[23]In some cases, the Maoist drag the bodies of their dead comrades inside the forest areas to prevent them from being taken away by the police.

data is from the *India state of Forest report 2009* published by the Forest of India (FSI), an organization under the Ministry of Environment and Forest. Map 4 presents a pictorial view of the forest cover data with minerals iron, coal and bauxite.

Census data from 2001 provides us with our key control variables: proportion of rural population, proportion of villages in the district with bus service and proportion of literates with no formal education level[24]. Data on proportion of people not getting two square meals a day, gross enrolments in elementary level and female literacy are taken from the dataset compiled by Debroy and Bhandari (2004). The data on crime rate (number of violent crimes per 1000 of population[25]) is from the 2002 Annual report *Crime in India* published by the National Crime Records Bureau (NCRB). This variable will serve as a proxy for the state of law and order in the district. Information on net area sown in the district is from the website Indiastat.com. It is for the year 1997-98 except Andhra Pradesh (1996-97), West Bengal (1998-99), Karnataka (1999-2000) and Chhattisgarh (2002-03). Data on district-wise density of population is from the 1991 census. All our variables are dated at least 5 years before the start of our conflict data. This is done to lessen any endogeneity problems that might accrue. Table A2 in the Appendix gives the summary statistics for our variables.

5: Findings

5.1 Baseline Model

Table 1 presents the result of our two-stage estimation of equation (11). Column 1 is the first-stage OLS regression of *local_forces* on the vector of instruments and the remaining exogenous variables. Proportion of tribal population alone has a negative significant

---

[24] The Indian Census defines *literate* as a person who can read and write with some understanding in any language. Here we take a subset of literates who have never been to school, college or attended any technical course.

[25]Violent crimes include attempt to commit murder, rape, kidnapping and abduction, dacoity, robbery, burglary, theft, riots, criminal breach of trust, cheating, counterfeiting, arson, hurt, dowry death, molestation, sexual harassment, cruelty by husband and relatives, importation of girls, causing death by negligence and other IPC crimes. We have left out murder as this will overlap with the killings committed by the Maoists.

coefficient but when it is interacted with iron, bauxite and forest cover rate, the coefficients are positive and significant. This implies that resource-rich tribal-dominated districts are facing on average more violence by police forces.

Column 2 is the empirical counterpart of our structural equation $R* = R(\mu, A)$. As predicted by our model, *rebellion* is indeed increasing in *local_forces* and minerals *iron*, *coal*. Moreover, in order to test for endogeneity of *local_forces* we include the residuals from column (1), labeled *Residual*1. This variable is significant at the 6.4% level, providing some support for our theoretical framework. Table 2 gives the percentage change in expected count for all significant regressors. For a unit change in *local_forces* the expected number of killings by Naxalites increases by 7.9%, holding all other variables constant. Districts with *iron* deposit increase the expected number of killings by Naxalites by 252%, ceteris paribus and districts with *coal* deposit increase the expected number of killings by Naxalites by 139%, ceteris paribus. The insurgency is really strong in areas with iron ore and coal. These two results support predictions (i) and (ii) of our theoretical model.

The coefficient on the variable *bus service* is negative and significant implying that districts which are remote and inaccessible face on average more attacks by Naxalites ceteris paribus. The coefficient of *rural* is positive and statistically significant. A one percent increase in the rural population in a district leads to an expected increase in the number of Naxalite attacks by 4.3%, ceteris paribus. Districts with population facing hunger also see more Naxalite violence. The three variables *bus service*, *rural* and *hunger* capture the accessibility and development level of the district. It is a well documented fact that the Naxalites have targeted remote, inaccessible, poor, rural areas as part of their official agenda to wage a protracted people's war. So we are likely to observe more rebellion in these areas.

Column 3 of Table (1) presents the reduced-form equation for the variable M or *central_forces.* The tribal-dominated resource-rich regions face more violence by central government forces also. In column 4, we add the variable *central_forces* along with the residuals from column 3 to our structural equation $R^* = R(\mu, A)$. The coefficient of *central_forces* is not significant and this is in line with our theoretical model from Section 2 or prediction (iii). The local government and the rebels play first and the latter respond to provocation by the local forces; they do not respond to the violence perpetrated by the central forces, but determine instead their rebellion intensity in the light of their expected probability of central government's intervention. The coefficient on *local_forces* remains significant at 10%. Thus we do not see a simple aggression/retaliation cycle but a more strategic play by the rebels.

5.2 Robustness check: Adding other controls

Our provocation result is very robust. The result holds true even after adding several district-specific controls for socio-economic conditions and state of law and order. Table 3 presents the two-stage estimation results when we add different controls to our structural equation $R^* = R(\mu, A)$. In column 1, we add the variables proportion of net area sown and crime rate. Crime rate does not include murders, and it acts as a proxy for the law and order situation in the district and net area sown captures the condition of agriculture in the district. We get a positive and significant coefficient for *local_forces*. The coefficient for crime rate is negative and significant implying that districts with higher rates of crime face on average less Naxalite violence controlling for other things. One possible explanation for this is that districts with higher crime rates may have less efficient or less numbered police force, resulting in less provocation. In column 2, we use *female literacy* and *enrollment rate* in place of proportion of literates with no education to test if education has some effect on the

conflict. Both variables are not significant. In column 3, we add proportion of tribals in the district and *forest cover rate* to our equation $R* = R(\mu, A)$. Both variables are insignificant, justifying our exclusion restriction used at table 1 column (2) and (4). As mentioned earlier the distinction between Naxalites and Adivasis is not clear cut. So the expected sign or significance for proportions of tribals in a district is not evident. However the coefficient for *local_forces* and minerals remain significant and the included residuals confirm the endogeneity assumption. Finally we add population density in 1991, *pop_den* in column 4 to check if densely populated districts see more violence other things being equal. The variable *pop_den* is not significant.

5.3 Robustness check: Adding political variable

We test whether the type of political party governing at the state level has an impact on the conflict. The two major political parties in India are the Indian National Congress (INC) (centre left) and Bharatiya Janata Party (BJP) (centre right). The INC abetted and supported violence against the Sikh community in 1984 but thereafter it has maintained a clean profile. The BJP with its extreme right wing political associates like RSS (Rashtriya Swayamsevak Sangh), Bajrang Dal and VHP (Vishwa Hindu Parishad) has indulged in repeated incidences of communal violence like the demolition of Babri Mosque (1992), Gujarat Riots (2002) and Kandhamal Riots (2008). Moreover, the BJP government in Chhattisgarh attempted to arm civilians with weapons (*Salwa Judum*) and pit them against Naxalites. Therefore it is reasonable to expect states with BJP influence to see more violence.

We consider the period from January 2004 to December 2011. India has a multi-party system with elections at the Centre and State level every five years. During our sample period, the government at the Centre was a coalition with INC being the dominant party. At the state level between 2004-2011, Andhra Pradesh and Maharashtra had coalition

governments with INC, Chhattisgarh remained a BJP ruled state, Orissa had a coalition government with BJP. Karnataka, Jharkhand and Bihar had coalition governments with both INC and BJP at different times and West Bengal was ruled by the Communist party (Marxist) until May 2011 when a coalition government with INC support came to power. We create two variable *bjp_days*: the number of days BJP was part of the ruling government at state level and *inc_days*: the number of days INC was part of the ruling government at state level. We may have an endogeneity problem as there can be unobserved variables which affect both *bjp_days* and *rebellion* simultaneously. For example, if a mining firm desperately wants some piece of land, it can give campaign contributions which will affect *bjp_days* and it can start building its plant or put more experts on the field which will anger the rebels. To control for endogeneity, we use the two-stage estimation technique outlined earlier. Table 4 shows the results from adding *bjp_days* to equation $R^* = R(\mu, A)$. Column (1) and (2) show the first stage regression of the endogenous variables on all exogenous variables. Column (3) adds the residuals from the first-stage regressions to control for endogeneity. The coefficient on *bjp_days* is positive but not significant. The coefficient on *residual3* is also not significant questioning our endogeneity assumption of *bjp_days*. Repeating the procedure with *inc_days* gives us a negative and insignificant coefficient for the *inc_days* (regression table not included in paper). Thus both our political variables are insignificant suggesting that the political party ruling the state has no significant impact on violence. This corroborates our hypothesis that this violence is an economic problem unrelated to ideology or religion. It is due to economic reasons and hence both INC and BJP are behaving in a similar way.

5.4 Robustness check: Spatial dependence

One concern when dealing with geographical data is spatial dependence. This refers to a situation where values observed at one location depend on the values of neighbouring

observations at nearby locations. Map 5 shows a Moran scatter plot (upper centre) of the dependent variable *Rebellion* (in deviation from means form) against a weighted average of the neighbouring values or spatial lag, W*Rebellion on the vertical axis. The four quadrants reflect different types of association. The upper right and lower left quadrants represent positive spatial association whereas upper left and lower right quadrants represent negative spatial association. Most of our observations fall in the lower left quadrant. This quadrant shows districts with *Rebellion* below the mean with the average of neighbouring districts' *Rebellion* also below the mean. Points with high influence measures are labelled in the scatter plot. We apply standard regression diagnostics for leverage to the scatter plot and 3 observations (19_15, 22_15 and 22_16) stand out. The respective diagonal entries in the Hat matrix for these three observations are larger than the usual cutoff of $2(p+1)/n$ (where p is the number of explanatory variables in the regression) or 0.073. These districts are Midnapore (0.134), Bastar (0.128) and Dantewada (0.585). Whereas Bastar and Dantewada lie in the positive spatial association quadrant, Midnapore is in the lower right quadrant reflecting negative spatial association.

The other two plots in Map 5 are a LISA cluster map (lower left) and Significant LISA (Local Indicators of Spatial Association) cluster map (lower right). LISA is a local version of Moran's I where the statistic is calculated for each district in the data (Ancelin, 1995). For each district, an index is calculated based on neighbouring districts with which it shares a border. These measures are then mapped to see how spatial autocorrelation varies over the region (lower left map). The L-L districts in the cluster map represent regions with lower than average violence where the neighbouring districts' violence is also below the mean. The H-L districts represent areas with higher than average violence where the neighbouring districts' violence is below the mean. Since each index has an associated test statistic, we can also map which of the districts have a statistically significant relationship with its neighbours (lower

right map). Bastar, Dantewada, Gadchiroli, Khamman, Kanker, Malkangiri, East Singhbhum, Bankura and Palamu show a H-H significant relationship with their neighbors whereas Midnapur, Lohardurga, Mayurbhanj, Balasore, Karimnagar and Warangal exhibit a L-L significant relationship with their neighbours.

It is useful to analyze if our negative binomial regression model takes care of the spatial dependence exhibited by our dependent variable above. For this, we run our regression model and then test the residuals for spatial autocorrelation. If there is no spatial autocorrelation, the residuals should not be distinguishable from random noise. Map 6 shows the Moran scatter plot for residuals (upper centre), a LISA cluster map (lower left) and Significant LISA cluster map (lower right). From the Significant LISA cluster map, we can see that the pattern of spatial dependence has shifted. Our model takes care of the spatial dependence shown by the variable *rebellion*. Districts like Bastar, Dantewada, Gadchiroli, Palamu, Malkangiri and Midnapore which have high levels of violence, no longer exhibit spatial dependence. This implies that our results are not being driven by a few districts with high casualties. However we still have spatial dependence in residuals in 8% of our districts. Nalgonda, Mehbubnagar, Medak, Guntur, Puraliya, East and West Singhbum, Vijayanagar, Luckesarai, Jehanabad, Munger and Jamui have a significant High-High relationship with their neighbors and Bhadrak, Jajapur, Kendrappa, Purnia, Katihar and Sahibganj have a significant Low-Low relationship with their neighbours. These districts have very low levels of violence with many having zero casualties in the last five years.

6: Conclusion

The key predictions derived from our theoretical model have been supported by our econometric analysis of the violent activity of the Naxalite insurgents in eight states of India. We find that the level of violence perpetrated by the local government's police force has a

significantly positive impact on the level of violence perpetrated by the Naxalites. Moreover, the assumption that this violence by the police is endogenous cannot be rejected. These two predictions turned out to be quite robust to some checks performed by varying the list of control variables included. These two findings tend to vindicate the diagnosis of provocation on the part of the local governments in the affected states. We can also reject the view that the Naxalites respond to this violence by drifting into a simple cycle of aggression and retaliation that some observers seem to diagnose. This interpretation is precluded by the asymmetric response of the Naxalites to the violence perpetrated by the armed forces of the local and the central governments, respectively. This finding suggests instead that a more subtle strategic analysis is borne out by the data, and captured in our theoretical model by the assumed time line of the game. According to this interpretation, the Naxalites determine their level of violence with a view to affect the probability of an intervention by the central government's armed forces. Our model then predicts that the latter probability would also be influenced by the economic value at stake in the affected districts and this seems to be supported by the significance of some mineral deposits as significant arguments in the Naxalite estimated best-response function. Nevertheless, our findings do not exclude the assumption that these deposits might also fuel some greed on the part of the Naxalites, but such an assumption is not required for producing the prediction about these deposits. It may thus safely be ignored by invoking Occam's razor.

These findings shed some intriguing light on the political economy of Naxalite violence in India, suggesting that the local governments bear a share of responsibility for the violent insurgency. The Indian democracy seems to face a serious challenge for reconciling its thirst for natural resources entailed by its sustained economic growth with its founding humanistic values. While provocation might succeed in putting the blame on the rebels for the violence and thus might seem to justify the heavy-handed intervention in the eyes of

naïve observers, our deeper econometric analysis squarely rejects this view. Our results provide some scientific backing for the arguments of the strong Indian civil society which tries to defend its democratic founding values by denouncing the massive violations of the constitutional rights of the Adivasis or "scheduled tribes" perpetrated by governmental armed forces. Our findings suggest that these violations are motivated by pure economic motives, behind a veil of ideological struggle, and this suggests that some efficient solutions could be found without wasting so many lives and so much property in the conflict.

Appendix

Proof of proposition 1: A glance at (6) shows that the potential rebels minimize their loss by choosing $R^* = 0$ if $A = 0$, because the constitutional constraint deters the central government from intervening in this case, yielding $L_T^* = 0$. Looking again at (6) shows that setting $R = 0$ when $A > 0$ would not minimize the potential rebels' loss as this would make $L_T \to \infty$.

Now, in order to prove that R^* is an increasing function of A and μ as soon as A is strictly positive, we can compute the first-order condition for problem (6), taking due account of (5), which yields:

$$\gamma R^{2+\xi} - \xi R\left((1-p)A^{\xi} + p(A+M^*)^{\xi}\right) - \left((A+M^*)^{\xi} - A^{\xi}\right)\delta h(\mu, A) = 0. \quad \text{(A.1)}$$

For the sake of saving notation, define:

$$B \equiv \delta\left((A+M^*)^{\xi} - A^{\xi}\right) > 0,$$
$$C \equiv (A+M^*)^{\xi} > 0,$$
$$D \equiv A^{\xi-1} > 0,$$
$$E \equiv \xi\delta h(\mu, A)(C-D) > 0.$$

Then, taking the total differential of (A.1) and rearranging the terms yields:

$$\frac{dR^*}{dA} = \frac{\xi^2 R\big((1-p)D + \delta(\alpha C + A^\xi h/R)\big) + B\,\partial h/\partial A + (E + \xi^2 R\,p\,C)\partial M/\partial A}{(1+\xi)\gamma R^{1+\xi} + B\,h(\mu, A)/R} , \text{(A.2)}$$

and:

$$\frac{dR^*}{d\mu} = \frac{B(1+\xi)\partial h/\partial\mu + \xi C(\xi R\,p + \delta h)\,\partial h/\partial\mu}{(1+\xi)\gamma R^{1+\xi} + B\,h(\mu, A)/R} . \qquad \text{(A.3)}$$

It is easily checked that these two derivatives are positive.

Map 1: States in the Data Set
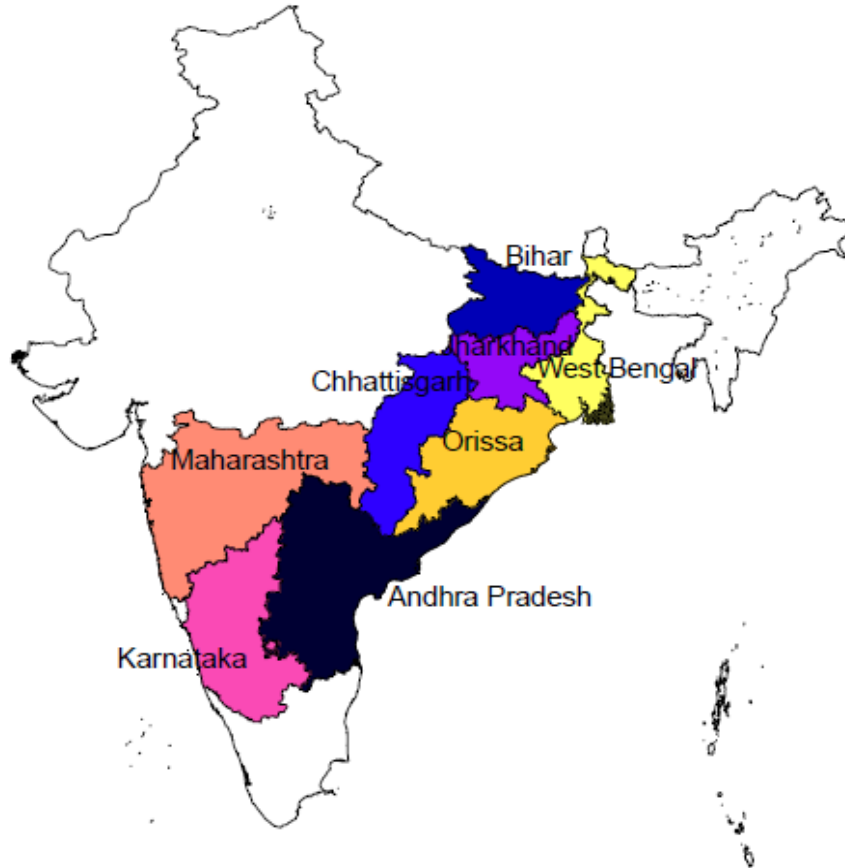
Map 2: Naxalite Affected districts
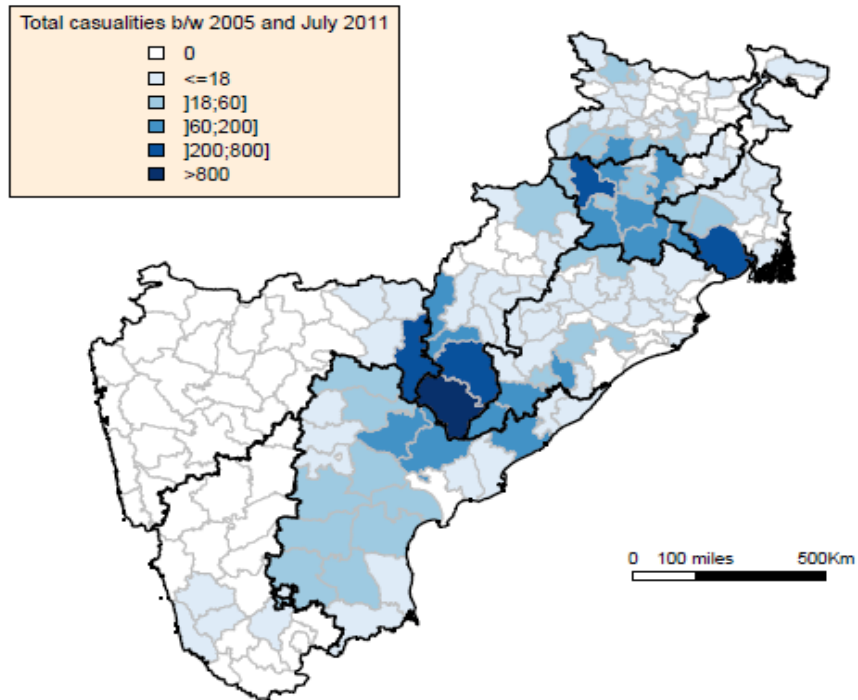
Map 3: District wise Tribal Population and key Mineral Deposits

Proportion of Tribals
- □ <=7
- □]7;20]
- ▨]20;40]
- ▧]40;60]
- ■ >60

- ▲ Iron
- × Bauxite
- ○ Coal

0   100 miles   500Km
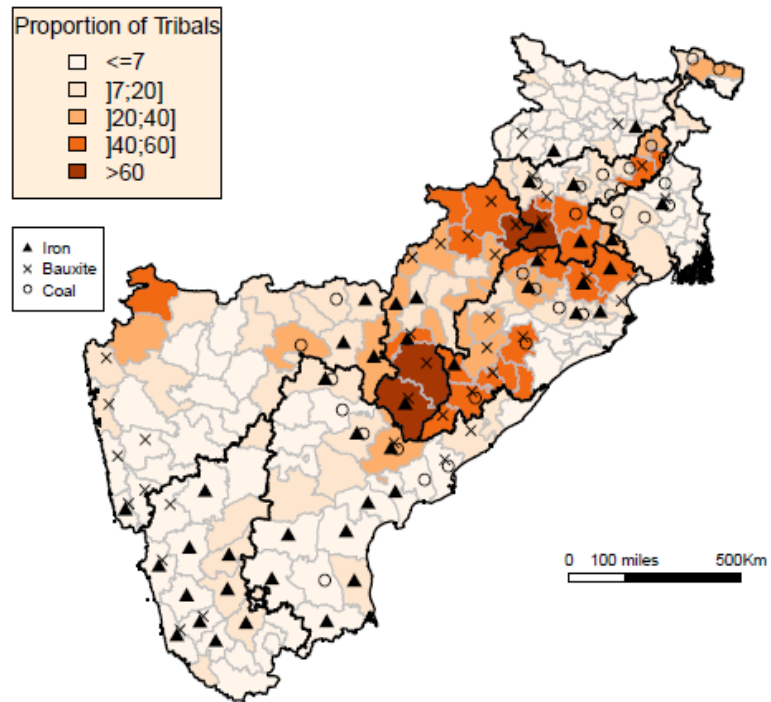
Map 4: District wise Forest cover and key Mineral Deposits
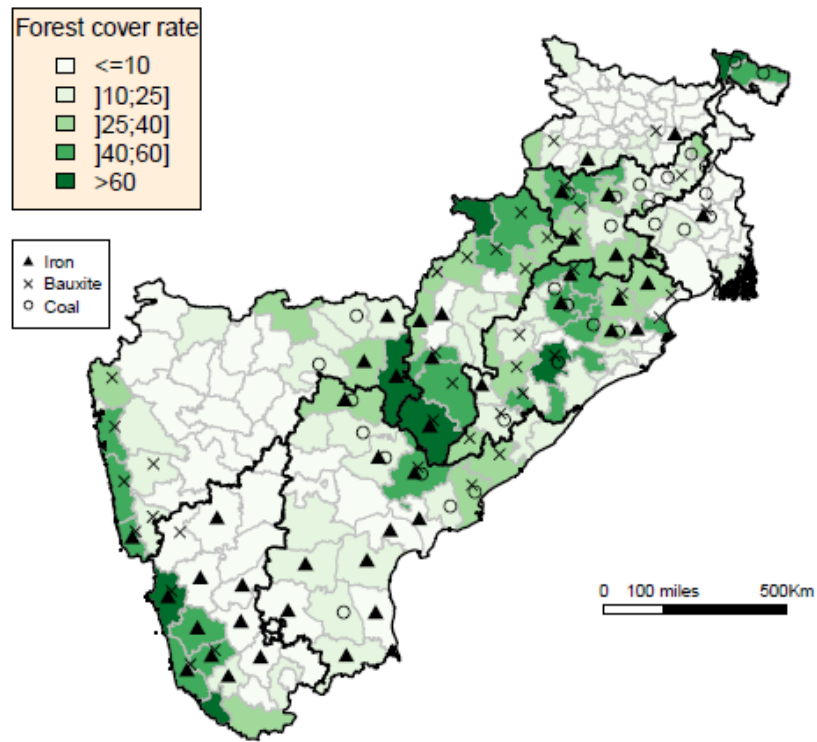
Map 5
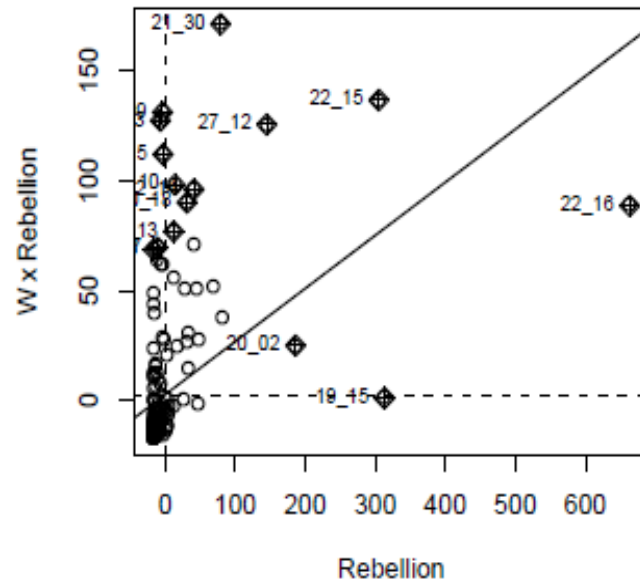
Moran scatter plot of dependent variable Rebellion

LISA Cluster map

Significant LISA cluster map

Map 6

Moran scatter plot of the residuals
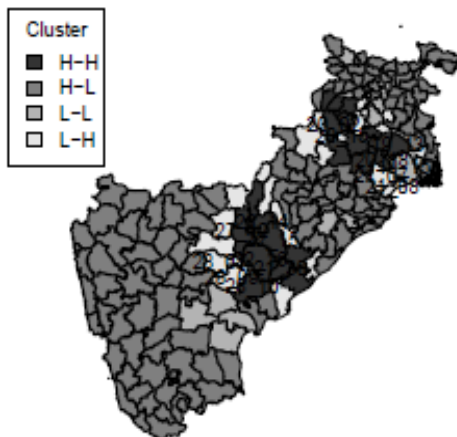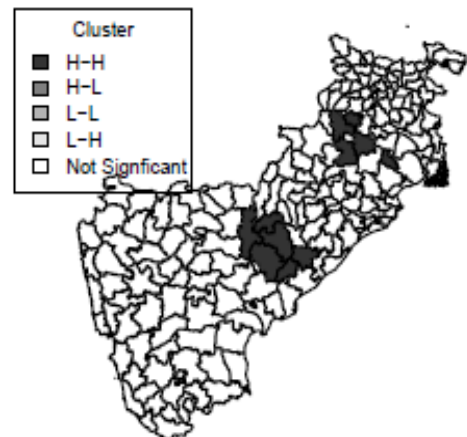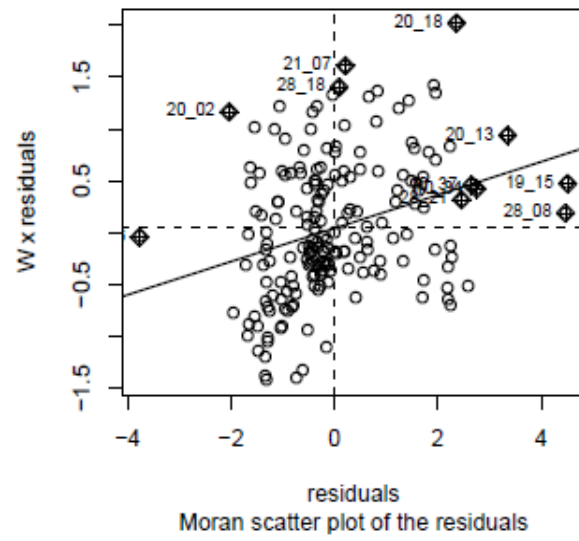
LISA Cluster map

Significant LISA cluster map

Table A1: State-wise total casualties in the Naxalite conflict as reported by Ministry of Home Affairs (MHA) and South Asia Terrorism Portal (SATP)

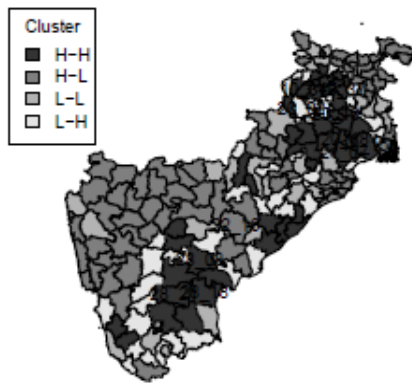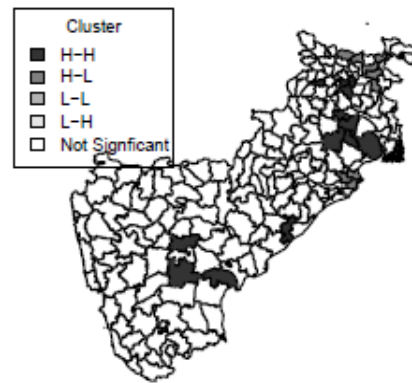| States	2005		2006		2007		2008		2009		2010	
	MHA	SATP	MHA	SATP	MHA	SATP	MHA	SATP	MHA	SATP	MHA	SATP
Andhra Pradesh	208	205	47	159	45	67	46	65	28	71	33	87
Bihar	96	98	45	30	67	32	73	61	78	75	98	87
Chhattisgarh	168	126	388	341	369	353	242	159	345	366	327	326
Jharkhand	119	99	124	109	157	135	207	144	217	261	147	169
Karnataka	na	14	na	0	na	8	na	7	na	0	na	0
Maharashtra	53	21	42	50	25	20	22	16	87	99	40	37
Orissa	14	17	9	24	17	21	101	121	81	65	108	95
West Bengal	7	10	17	16	6	15	26	20	158	150	425	259
Other states(4)	8	na	-	na	5	na	4	na	-	na	1	na
Uttar Pradesh	1	na	5	na	3	na	-	na	3	na	0	na
Total	677	590	678	729	696	651	721	593	997	1087	1180	1060

na: Not Available

Table A2: Summary Statistics

Variable Name	Mean	Std. Dev	Min	Max
rebellion	17.13	63.10	0	680
local_forces	5.45	17.16	0	177
central_forces	3.55	21.48	0	285
tribal	13.60	17.57	0	78.83
bus service	38.95	30.84	0	97.66
crime rate	14.75	8.33	1	76
rural	79.76	17.25	0	96.76
forest cover rate	18.84	18.58	0	81.4
female literacy	66.05	11.82	39.5	92.7
enrollment rate	78.50	19.76	9.7	100
hunger	4.94	6.64	0	38.3
proportion of net area sown	46.19	20.72	0	120.55
prop_no_educ	1.67	1.20	0.4	10.69
tribal_iron	4.38	12.99	0	78.83
tribal_coal	2.97	8.90	0	51.51
tribal_bauxite	5.83	15.96	0	78.83
tribal_forest	433.43	815.59	0	5073.50

Note:

rebellion: Number of civilians, security forces and police killed by the Maoist from Jan 2005-July 2011;

local_forces: Number of Maoist killed by police forces of state government from Jan 2005-July2011;

central_forces: Number of Maoist killed by Central forces from Jan 2005-July2011;

bus service: Proportion of villages with bus service (2001 census data);

tribal: Proportion of scheduled tribes in the district (1991 census data);

crime rate: Number of violent crimes (excluding murder) per 1000 of adult population (2002);

rural: Proportion of rural population (2001 census data);

forest cover rate: Proportion of area covered by forest (2007);

female literacy: Proportion of literate females in the population (2001);

enrollment rate: Ratio of total no. of enrolled students in classes I to VIII to the total population in the age group assumed to be attending (2001);

hunger: Proportion of people not getting two square meals a day. This information is recorded as answer to a one shot question (with yes or no answer) from the respondents during the survey, regarding whether each member of the household had 'two square meals a day' in the past week. (1999-2000);

prop_no_educ: Proportion of population aged 7 and above who report that they know how to read and write and have basic understanding but have never gone to school or undertaken any degree or any technical education (2001);

tribal_iron: interaction term between *tribal* and dummy variable *iron*;

tribal_coal: interaction term between *tribal* and dummy variable *coal*;

tribal_bauxite: interaction term between *tribal* and dummy variable bauxite;

tribal_forest: interaction term between *tribal* and proportion of forest cover in the district.

Table 1: Two-stage estimation of *rebellion* on *local_forces*

VARIABLES	(1) local_forces	(2) rebellion	(3) central_forces	(4) rebellion
local_forces		0.076**		0.081*
		(0.011)		(0.081)
tribal	-0.609***		-0.811***	
	(0.000)		(0.000)	
Iron	2.860	1.259***	-6.912	1.140***
	(0.398)	(0.001)	(0.109)	(0.003)
Coal	10.423**	0.873**	4.266	0.810*
	(0.019)	(0.015)	(0.447)	(0.076)
forest cover rate	-0.116		-0.175*	
	(0.152)		(0.090)	
tribal_iron	0.361***		0.771***	
	(0.006)		(0.000)	
tribal_coal	-0.097		-0.058	
	(0.612)		(0.812)	
tribal_bauxite	0.231**		0.241*	
	(0.021)		(0.058)	
tribal_forest	0.018***		0.022***	
	(0.000)		(0.000)	
bus service	0.022	-0.027***	-0.039	-0.026***
	(0.574)	(0.000)	(0.419)	(0.000)
Rural	0.081	0.043***	0.060	0.039***
	(0.168)	(0.000)	(0.420)	(0.000)
Hunger	-0.367**	0.036**	-0.472**	0.034*
	(0.036)	(0.045)	(0.034)	(0.056)
prop_no_educ	-0.903	0.137	-2.627**	0.157
	(0.309)	(0.192)	(0.021)	(0.223)
central_forces				0.007
				(0.868)
Residual1		0.025*		0.006
		(0.063)		(0.896)
Residual2				0.012
				(0.738)
Constant	-0.793	-2.097**	8.102	-1.934**
	(0.886)	(0.011)	(0.253)	(0.030)
lnalpha		1.086***		1.070***
		(0.000)		(0.000)
Observations	191	191	191	191
Psuedo R-squared		0.106		0.107
F statistic (prob>F)	11.46		10.54	
	(0.000)		(0.000)	

pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Unit of observation is a district

iron: dummy variable which takes the value of 1 for districts with iron ore deposit;

coal: dummy variable which takes the value of 1 for districts with coal deposit;

tribal_iron: interaction term between *tribal* and *iron*;

tribal_coal:interaction term between *tribal* and *coal*;

tribal_bauxite:interaction term between *tribal* and dummy bauxite;

tribal_forest:interaction term between *tribal* and forest cover in the district;

lnalpha: This is the estimate of the log of the dispersion parameter, **alpha.**The LR test of alpha=0, gives significant evidence of overdispersion and hence we use NBRM instead of Poisson regression model.

Pseudo-Rsquared: This is McFadden's pseudo R-squared. It is calculated as 1 - ll(model)/ll(null).

Table 2: Percentage change in expected count

rebellion	b	%	SDofX	%StdX
local_forces	0.076	7.9	17.16	266.4
bus service	-0.027	-2.7	30.84	-56.7
rural	0.042	4.3	17.25	108.3
hunger	0.035	3.6	6.64	26.6
iron dummy	1.259	252.2	0.42	69.4
coal dummy	0.872	139.3	0.36	37.5

b = raw coefficient

z = z-score for test of b=0

P>|z| = p-value for z-test

% = percent change in expected count for unit increase in X

%StdX = percent change in expected count for SD increase in X

SDofX = standard deviation of X

Table 3: Robustness check: Adding various control variables to $R^*=R\,(\mu, A)$

VARIABLES	(1) rebellion	(2) rebellion	(3) rebellion	(4) rebellion
local_forces	0.071**	0.076**	0.065*	0.072**
	(0.026)	(0.010)	(0.092)	(0.024)
iron	1.198***	1.464***	1.262***	1.129***
	(0.002)	(0.001)	(0.001)	(0.005)
coal	0.732*	0.828**	0.897**	0.776**
	(0.051)	(0.028)	(0.014)	(0.029)
bus service	-0.024***	-0.027***	-0.026***	-0.030***
	(0.000)	(0.000)	(0.000)	(0.000)
hunger	0.025	0.021	0.031*	0.028
	(0.185)	(0.241)	(0.088)	(0.112)
rural	0.035***	0.037***	0.043***	0.034***
	(0.001)	(0.001)	(0.000)	(0.003)
prop_no_educ	0.179*		0.124	0.123
	(0.081)		(0.225)	(0.230)
prop_nas	-0.009			
	(0.245)			
crime rate	-4.969**			
	(0.043)			
female literacy		-0.018		
		(0.318)		
enrollment rate		-0.006		
		(0.427)		
forest cover rate			0.002	
			(0.853)	
tribal			0.006	
			(0.552)	
pop_den				-0.001
				(0.182)
residual	0.027*	0.024*	0.034*	0.027*
	(0.054)	(0.062)	(0.075)	(0.050)
lnalpha	1.066***	1.097***	1.081***	1.071***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.529	0.138	-2.203***	-0.991
	(0.666)	(0.943)	(0.006)	(0.399)
Observations	191	191	191	191
Psuedo R-squared	0.108	0.105	0.106	0.107

pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: *prop_nas*: Proportion of net area sown in the district;
pop_den: Density of population in the district.

Table 4: Robustness check: Adding political variable to $R^*=R\ (\mu, A)$

VARIABLES	(1) local_forces	(2) bjp_days	(3) rebellion
local_forces			0.067**
			(0.029)
bjp_days			0.000
			(0.936)
tribal	-0.609***	-5.505	
	(0.000)	(0.564)	
Iron	2.860	610.603***	1.287***
	(0.398)	(0.008)	(0.001)
Coal	10.423**	-911.300***	0.968*
	(0.019)	(0.002)	(0.079)
forest cover rate	-0.116	7.687	
	(0.152)	(0.160)	
tribal_iron	0.361***	-12.487	
	(0.006)	(0.152)	
tribal_coal	-0.097	10.513	
	(0.612)	(0.413)	
tribal_bauxite	0.231**	7.206	
	(0.021)	(0.282)	
tribal_forest	0.018***	-0.033	
	(0.000)	(0.890)	
bus service	0.022	-22.262***	-0.027*
	(0.574)	(0.000)	(0.050)
Rural	0.081	13.398***	0.039***
	(0.168)	(0.001)	(0.001)
Hunger	-0.367**	-32.205***	0.038
	(0.036)	(0.007)	(0.184)
prop_no_educ	-0.903	34.057	0.152
	(0.309)	(0.569)	(0.148)
Residual1			0.024*
			(0.057)
Residual3			-0.000
			(0.674)
Constant	-0.793	1,274.941***	-1.966*
	(0.886)	(0.001)	(0.077)
lnalpha			1.070***
			(0.000)
Observations	191	191	191
R-squared	0.436	0.439	
Pseudo R-squared			0.107

pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: bjp_days: the number of days BJP was part of the ruling government at state level

References

Anselin, L. (1995). 'Local indicators of spatial association – LISA', *Geographical Analysis*, vol. 27, pp. 93-115.

Balagopal, K. (1981). 'Revival of encounters in Andhra', *Economic and Political Weekly*, vol. 16 (38),

Bardhan, P. (1984). *The Political Economy of Development in India*, Oxford: Blackwell.

Blundell, R.W. and Smith, R.J. (1986). 'An exogeneity test for a simultaneous equation Tobit model with an application to labor supply', *Econometrica*. Vol. 54, pp. 679–685.

Blundell, R.W. and Smith, R.J. (1993). 'Simultaneous microeconometric models with censored or qualitative dependent variables', in (G.S. Maddala, C.R. Rao and H.D. Vinod, eds), *Handbook of Statistics*, vol. 2. pp. 1117–1143, Amsterdam: North Holland Publishers.

Cameron, A.C. and Trivedi, P.K. (2005). *Microeconometrics: Methods and Applications*, Cambridge: Cambridge University Press.

Cameron, A. C. and Trivedi, P. K. (2009): *Microeconometrics Using Stata*, College Station: Stata Press.

Debroy, B. and Bhandari, L. (eds) (2004). *District Level Deprivation in the New Millennium*, New Delhi: Rajiv Gandhi Institute for Contemporary Studies.

DiLorenzo, T.J. (2003). *The Real Lincoln. A New Look at Abraham Lincoln, His Agenda, and an Unnecessary War*, New York: Three Rivers Press.

Hausman, J.A. (1978). 'Specification tests in econometrics', *Econometrica*, vol. 46, pp. 1251–1271.

Hilbe, J. (2011). *Negative Binomial Regression,* 2nd ed., Cambridge: Cambridge University Press.

Newey, W.K. (1987). 'Efficient Estimation of Limited Dependent Variable Models with Endogenous Explanatory Variables', *Journal of Econometrics*, vol. 36, pp. 231–250.

Nussbaum, M.C. (2007). *The Clash Within. Democracy, Religious Violence, and India's Future*, Cambridge: Harvard University Press.

Padel F., and Das, S. (2010). *Out of this Earth. East India Adivasis and the Aluminium Cartel*, New Delhi: Orient Blackswan.

Rivers, D. and Vuong, Q.H. (1988). 'Limited information estimators and exogeneity tests for simultaneous probit models', *Journal of Econometrics*, vol. 39, pp. 347–366.

Rocco, L. and Ballo, Z. (2008). 'Provoking a civil war', *Public Choice*, vol. 134, pp. 347-366.

Sen, A. K. (1999). 'Democracy as a universal value', *Journal of Democracy*, vol. 10(3), pp. 3-17

Sen, A.K. and Scalon, T. (2004). 'What's the point of democracy?' *Bulletin of the American Academy of Arts and Sciences*, vol. 57(3), pp. 8-11.

Shah, A. (2010). *In the Shadows of the State. Indigenous Politics, Environmentalism, and Insurgency in Jharkhand, India,* Durham and London: Duke University Press.

Subramanian, K.S. (2007). *Political Violence and the Police in India,* New Delhi: Sage Publications India.

Vanden Eynde, Oliver (2011) 'Targets of Violence: Evidence from India's Naxalite conflict'*,* paper presented at the Lisbon Meeting on Institutions and Political Economy 2011, unpublished: London School of Economics.

Wooldridge, J.M. (2002). *Econometric Analysis of Cross Section and Panel Data.* Cambridge: MIT Press.