ON GOVERNMENT-INDUSTRY NEXUS AND INDIGENOUS ARMED RESISTANCE

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Abstract. This paper proposes a simple game-theoretic framework (building on the setting proposed by Grossman and Helpman [17] in the context of special interest politics) for analyzing the relationship between the government, industry and indigenous community, especially in the context of mounting violence surrounding displacement of indigenous communities by governments for the purposes of commercial use of their habitat. It specifically takes into account the possibility of alleged 'nexus' between the government and the industry and explores its implications on the levels of conflict and utilities of the players. We find that the bias in allocation that occurs when the government and the industry enter a 'nexus' can be rectified when there is resistance from the indigenous groups. Moreover, we find that the counter-offensive launched to oppose indigenous resistance is higher when undertaken by the industry than when undertaken by the government. The Nash equilibrium occurs when there is no 'nexus' between the government and the industry and no resistance by the indigenous groups. We also explore a few extensions of the basic model.

1. Introduction

> There is an MoU on every mountain, river and forest glade. We're talking about social and environmental engineering on an unimaginable scale.(From 'Mr. Chidambaram's War' in Roy [25])

Modern world is replete with armed conflicts and about 90 per cent of them has been intra-state (Chenoy and Chenoy [10], Collier and Hoeffler [13]). Each of these insurgencies and conflicts have different features and histories but often patterns and trends can be identified among them. For example, there is empirical evidence that abundance of mineral resources is positively and significantly related to armed conflict (Soysa [29]). And often this arises from forced displacement of indigenous communities whose habitats get increasingly encroached upon by large corporates trying to gain access to the minerals (see Blaser et al. [4] for an account of such resistance in North and South America, and Somayaji and Talwar [31], Anderson and Huber [1], and Sarkar [27] for the case in India, to name a few). The government[1] also plays a key role, in both providing the nod to the private

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[1]In reality, depending on the question and context at hand, it might be important to make a distinction between state and central governments. For example, in Indian states, mining royalties benefit the states,

players in going ahead with operations in such resource-rich areas, as well as rehabilitation measures of the displaced communities (see Cernea [9], and Dasgupta [14], for example). Allegations of mutually convenient arrangements, monetary and otherwise, between the government and corporate houses at the cost of further deprivation and humiliation of the indigenous communities are also not uncommon, which leads to further conflagration, armed resistance and gory outcomes. This paper is an attempt to provide an analytical framework for exploring this tripartite relation between the government, profit-seeking identities like MNCs etc., generically called the industry, and the local indigenous community.

Modern businesses are typically large corporate houses or multinational corporations which often operate in developing countries using resources from these countries[2]. In India, for instance, huge mineral deposits in the hills of Eastern and Central India have attracted tremendous corporate interest but has unfortunately seen some ghastly bloodshed as well (Chenoy and Chenoy [10], Roy [25]). The situation gets compounded with the local inhabitants (tribals or adivasis) getting help from and often identifying themselves with Maoists who in turn fortify their ranks with the help of these disgruntled tribals[3]. In fact the Maoist insurgency in India (aided and abetted by the tribals and hence forming an amorphous insurgent group) has turned much more bloody relative to 1960's when Maoism first gained ground and momentum in India. The annual number of victims in this conflict is now close to a thousand (Gayer and Jaffrelot [15]).

Moreover, it is often alleged that governments join hands with these large corporates who are mostly MNCs to facilitate their operations in spite of such hostile local environments (see

but they are set by the central government. Moreover states and central governments are responsible for counter-insurgency operations. Such issues naturally generate a plethora of incentives for various actors like possible provocation by the local government to start and continue a conflict with the rebels (Azam and Bhatia [3]) or effect of inclusion of indigenous people in village-level governments on violence (Pasquale [22]) or various kinds of fiscal incentives facing states (Vanden Eynde [33]). In our context, since we are mainly concentrating on *total* counter-resistance efforts launched against the indigenous communities, it is not necessary to distinguish between which government has undertaken it, the state, the centre or local. Hence 'government' here refers to all levels of the government clubbed together who undertake counter-resistance measures.

[2]According to recent data, out of 100 largest "economies" in the world, only 47 of them are nation states, the other 53 are MNCs. Exxon Mobil Corporation, for example, has annual revenues that exceed the GDP of all but 20 of the world's 220 nations. (Carroll [8])

[3]In India, the rise of Maoism or Naxalism (after the place Naxalbari where the movement first begun) has come to be entangled with armed resistance of the displaced communities. The areas that are Naxalite-affected are part of the 187 forest districts that cover 63% of dense forests (covered by the Fifth and Sixth Schedules of the Constitution) and which are home to major mineral deposits like coal, tin, bauxite and iron ore (Chenoy and Chenoy [10]). Exploitation of forest produce and mining of minerals are certainly at the heart of Maoist insurgency. In 2008 an expert group appointed by the Planning Commission submitted a report called Development Challenges in Extremist Affected Areas, which said "the Naxalite (Maoist) movement has to be recognised as a political movement with a strong base among the landless and poor peasantry and adivasis. Its emergence and growth need to be contextualized in the social conditions and experience of people who form a part of it. The huge gap between state policy and performance is a feature of these conditions. Though its professed long-term ideology is capturing state power by force, in its day-to-day manifestation, it is to be looked upon as basically a fight for social justice, equality, protection, security and local development."

more details and examples below). During 1970's and early 1980's, national governments often opposed MNC entry (Calvano [7]). However, with economic globalization of the 1990's, we see increased cooperation between MNCs and national governments (Luo [18]). Luo succintly put it as follows, "MNCs and governments are interdependent on each other for critical resources in today's world economy. Sharing resources cooperatively creates more payoffs for both than controlling privately. This cooperation can create synergies because their resources are often complementary and their interests compatible." He elaborates how governments and MNCs especially strengthen their long-term relations once the MNC has begun operations since "governments themselves can also be important customers, suppliers, or partners of large transactions conducted by MNCs". Moreover, he recognizes how this continued cooperation leads to a shift in the paradigm of regulation of the MNC by the government "from overt to covert and from direct to indirect".

1.1. **Framework.** With such a background in mind, we propose a framework to analyze various issues concerning the players. To begin with, we have adapted the framework proposed by Grossman and Helpman [17] in the context of special interest politics, where interest groups contribute in order to influence policy outcomes. Their starting point is simply a division of a public good between two groups by a benevolent social planner when one of the groups can organize into a lobby. Hence they study the outcome (division) when lobbying takes place vis-a-vis that which would have occurred in its absence and points to the 'bias' that creeps in due to lobbying. However in these settings, since the focus is on the interest group, not much attention is paid to behavior of the unorganized group, against whom such 'biased' allocations are likely to act. Our attempt here is to extend such an analysis to include the possibility of the hitherto unorganized group to rise in armed rebellion against such allocations under alleged nexus.

Given that the unorganized group rises in rebellion, we have analyzed two models - one where there is alleged 'nexus' between the government and the industry in the form of joint maximization of objectives in return of monetary favors being bestowed by the industry on the government, and the other where such a nexus is absent. In the 'nexus' model, the industry makes a monetary contribution to the government and then the government chooses a level of allocation of a public resource between the industry and the indigenous group. In the next stage of the game, the indigenous group resists such allocation of the natural resource and rises in armed resistance against allocation decisions of the government. That is, the indigenous group makes investments in conflict which are countered by the government with its own investments in counter resistance measures. Such steps are costly for the government to undertake and so are resistance measures of the indigenous groups.

Outcomes are probabilistic and probabilities depend on investments made by the parties in conflict (in this case the government and the indigenous community).

As opposed to this model, in the 'no-nexus' model (that is where there is resistance of the indigenous groups but no monetary dealings of the corporates with the government), we assume that the government decides on a level of allocation of the public good without being subject to any kind of influence from any of the parties. However whenever there is allocation/redistribution of the public good, there is resistance by the indigenous group since it means taking away of resources over which they have been enjoying undivided ownership rights. Moreover, in the no-nexus situation, we assume that counter-resistance measures are mainly undertaken by the industry (as opposed to them being undertaken primarily by the government under nexus)[4]. Hence in the next stage of the no-nexus game, the indigenous group and the industry invest in costly conflict. simultaneously. Again, outcomes are probabilistic and probabilities depend on investments made by the parties in conflict (in this case the industry and the indigenous group).

To summarise the nature of our contribution, the following 2X2 representation, called 'M', might be useful. Here groups 1 and the government move along the rows and can either choose to be in 'nexus' or not. Group 2 moves along columns and can either resist or not. The analysis of Grossman and Helpman (called 'GH' in the table below) focussed on the first column corresponding to no resistance by the indigenous group, whether or not there is nexus (between government and corporates)[5]. This paper essentially augments the analysis to include resistance by the indigenous group and its repercussions on allocations and utilities of the parties, both under nexus and no-nexus between corporates and the government.

$$M = \begin{bmatrix} & & \text{Resistance (Gr. 2)} & \\ & & \text{No} & \text{Yes} \\ \text{Nexus (Gr 1, Govt.)} & \text{No} & \text{GH} & \text{No-nexus-resistance} \\ & \text{Yes} & \text{GH} & \text{Nexus-resistance} \end{bmatrix}$$

Grossman and Helpman get the expected result of bias in allocation of the public good once the industry and the government enter into nexus. However by introducing resistance by the indigenous community, we obtain the extremely interesting result that distortion in allocation can actually be rectified and allocation can be brought back to the no-nexus

[4]The industry in principle, can undertake counter-resistance measures even when it is in nexus with the government, but to keep things simple, we assume that in case of nexus government undertakes the bulk of counter-resistance measures while in its absence, the industry shoulders the onus. In short, given resistance by the indigenous group, government confronts rebellion under nexus while the industry confronts them when there is no nexus.

[5]Though, by assuming specific functional forms, we have worked out utilities etc. in much greater details.

level. That is, allocation in the no-nexus-no-resistance regime is same as that in the nexus-resistance regime. The result seems to capture many real-life situations where allocation decisions have been halted owing to mass demonstrations etc., by indigenous communities.

Moreover, compared to the situation of no-nexus-no-resistance, in the nexus-resistance scenario, utility of the indigenous group is higher, government is equally well-off and the industry is worse off. Compared to the situation of nexus and no-resistance too, we get the following: government is equally well off; indigenous group is better off and industry is worse off. In general that is, resistance leaves the indigenous community better off and the industry worse off (leaving government's utility unchanged), irrespective of whether group 1 and the government had been in nexus or not. (Detailed utility comparisons between possible regimes are given in Proposition 9.) However, the only Nash equilibrium occurs when there is no nexus between the government and the corporates and no resistance by the indigenous communities.

Also, retaliation measures of the industry (in the no-nexus-resistance model) are always higher than that of the government (as in the nexus-resistance model). In other words, counter-resistance measures faced by the indigenous group are higher in the no-nexus-resistance regime relative to the nexus-resistance regime. Commensurately, the rebellion by the indigenous community is higher in the no-nexus regime versus that in the no-nexus regime. Also, no-nexus regimes with resistance sees greater violence since both the offensive by the industry is higher relative to that of the government (in the nexus-resistance regimes), and so is the resistance by the indigenous group in response to it.

Related Thoughts and Literature. The topic of the paper borders on several strands of literature and disciplines. Firstly, it belongs to the economics literature that models conflicts and civil wars. Much research, for example, talks about the economics behind civil strife which essentially says that rebellion happens when its benefits outweigh its costs (see Azam [2], Collier and Hoeffler [12], Grossman [16], and Reuveny and Maxwell [26], to name a few). Collier and Hoeffler [13] try to analyze civil wars according to its root cause. The idea is that some wars arise primarily due to greed in the sense of some agents wanting to capture valuable resources for purposes of trade and export thereby causing grievance in the process leading to rebellion of the affected people. On the other hand, some civil strife are grievance-driven like revolts of ethnic or religious minorities against some decision/behavior of the majority group for example. Our model definitely has the flavor of the first category though our model is quite different overall. Interestingly, our model can also be related to the second category since the people who are "wronged" in some sense, from whom the valuable resource is being taken away, also happen to be the indigenous community,

who are ethnically different and often form a minority that are typically backward and underdeveloped as well. As Collier and Hoeffler empirically show, most civil strife is best explained by a model that combines the two sources of strife - greed and grievance. Our model can also be related to the "resource-curse" literature which says that the greater is natural resource abundance, the higher is the probability of conflict (see Wick and Bulte, [35], for example). Of course, the model starts with the presence of a resource which is hitherto in the control of an indigenous community, and its redistribution causes conflict in the model. However, that is not the only cause. The novelty of the model lies in that it shows how a possible nexus between the industry and the government can further exacerbate this conflict.

Recently there has been a burgeoning (mostly empirical) literature specifically looking at violence in the mining regions of India. For example, Vanden Eynde [33] looks at how changes in tax regimes affect violence in these areas. Again in [32], he looks at how rural income shocks affect violence. In a similar spirit, Pasquale [22] studies why inclusion of indigenous people (tribals) in local governments significantly reduce violence in these strife-torn regions. Azam and Bhatia [3] explore a theory of provocation by state governments to trigger insurgency thereby seeking intervention by central government to help them gain greater access to mineral resources. The closest model is perhaps that of Steinberg [30] which has three players, government, firm and the local population and she studies conditions under which the government represses local protests or aids them on one hand and also when firms make transfers to local populations. However none of these specifically deals with modelling nexus or its absence with the corporates which play significant roles in such scenarios. The present paper is an attempt to theoretically analyse such a possibility.

The model, at some intrinsic level, rests on the philosophical plane that discusses rights of indigenous people. See Nozick [20], for example for a classic reference of such views that encompass the struggles of the indigenous people, inevitably enmeshed in pressures from the government and the market-place[6]. See also Oldham and Frank [21], Quane [24].

Alleged nexus between the industry and the government and resistance by affected groups. Major pillars of the formal game-theoretic model is the alleged nexus between the government and the industry which is often at the root of indigenous resentment and violent manifestations of protests. Let us now present some narrative evidences pertaining to this alleged nexus, and armed rebellion (which are often intertwined), and also point to specific cases in certain countries that have come to the fore in recent times.

[6]Two noteworthy implications of Nozick's philosophy are that the state may not use its coercive apparatus for the purpose of getting some citizens to aid others, or in order to prohibit activities of the people for their *own* good or protection.

The management literature has brought to the front many global business ethics issues plague modern businesses today. Ethical issues surrounding MNCs fall into at least eight major categories: "bribery and sensitive payments, employment issues, marketing practices, impact on the economy and development of host countries, effects on the natural environment, cultural impacts of operations, relations with host governments, and relations with home countries." (Carroll [8]) Especially with spread of business in developing economies since the 1980s, there have been frequent complaints that companies exploit the social and environmental conditions of such countries echoing Milton Friedman's famous statement that there is "only one social responsibility of business: to use its resources and engage in activities designed to increase its profit". Hence it is now widely recognized that often some of the people in developing countries (the local indigenous communities, for example) are ignored or marginalized by CSR, "because they were either not acknowledged or were too difficult to manage". In fact, the question that Blowfield and Frynas sound out remains unanswered in the management literature, "Can corporations, built on a western economic model, recognize values rooted in other cultures?" Within its narrow limits, this paper however, concentrates on one particular malady that plagues MNC operations in distant locations - that of a nexus with the host government.

This nexus has, recently, come to the centre stage in the management literature. "There are many instances in which multinationals have used their muscle to push through sensitive policies and gain preferential benefits in ways that have been deeply resented in the countries concerned. Multinational corporations, as much as governments, are therefore often seen to reflect alien cultures and interests which become a threat to the identity and independence of people in the countries where they operate." Such a sense is definitely prevalent in many places where they operate like in India. The attitude of the host government seems to be "that the benefits to their country's interests, and sometimes their own pockets, outweigh a consideration of what their citizens think." (Child [11]) Next we present specific countries and cases where such allegations of nexus has surfaced and armed rebellion has been witnessed.

India. In India, there are allegations of widespread favors being bestowed on MNCs arising out of government-MNC nexus. For example, the signing of contracts worth $1.6 billion with power industries by the Chhattisgarh government coincided with the launch of Salwa Judum, which allegedly helped to forcefully evict tribals from their villages. Similarly, the Jharkhand government has signed contracts with the Tata, Birla, Essar and other groups for aluminum and iron-ore plants. According to the Planning Commission report in 2008, whereas tribals constitute 8.08% of the country's population, they form 40% of the displaced. In Andhra Pradesh, for example, where contracts for bauxite-mining has been given to the

Jindals and the Anrak Group, mining operations will displace about 100,000 tribals and employ only 400 of them.

In another instance for example, the government has alleged that 'Greenpeace' and other NGOs were using anti-nuclear, anti-genetic modified food and anti-coal agitations to negatively impact GDP growth in the country. In a second report, it recommended cancellation of the permission given to Greenpeace for collecting funds abroad. "We have in our campaigns made enough stakeholders extremely uncomfortable. The nexus between industry and government is a well-known plot....some people are really upset." The NGO said it was specifically targeted for having emerged as one of the primary voices against coal mining and nuclear projects (which are MNC operated) in India.

Counter-insurgency operations in India have also assumed gargantuan proportions. The Indian government, for example, deploys huge military and para-military forces in areas where such operations take place. There are other covert operations like 'Salwa Judum' as well - according to Wikipedia, "Salwa Judum (meaning "Peace March" or "Purification Hunt" in Gondi language) was a militia mobilised and deployed as part of anti-insurgency operations in Chhattisgarh, India, aimed at countering Naxalite violence in the region.".

Ghana. We see such instances extensively in Latin America as well. Resistance by indigenous groups often lead to violence and death like in Ghana where "in November 2005, police officers in the Brim North District of Ghana's Eastern Region shot and killed a resident and injured three others during a protest against Newmont Mining Company's proposed method to compensate local farmers for economic losses." (Calvano [7]) Again, "the government of Ecuador declared a state of emergency in northeastern Napo province to quash violent protests by indigenous communities aimed at disrupting Occidental Petroleum's production in the rainforest." (Calvano [7])

Brazil. According to Ward [34], "From the mid-1960s the Brazilian government introduced a system of subsidies and fiscal incentives which particularly favoured large-scale Amazonian cattle ranching. ... Corporate enterprises,... secured extensive land grants, and displaced, often violently, considerable numbers of peasant settlers who had occupied small holdings without legal title. ... Settler penetration into Amazonia was helped by government road construction, and the logging trails established to extract timber." No doubt the government was a helpful ally in such corporate initiatives and expansion. He also notes, specifically with respect to mining, "Mining development also occurred on a large-scale capitalist basis, most notably through the undertaking formed to exploit the Carajas iron ore deposits, discovered in 1967. ... By the mid-1980s... Amazon tree cover was being lost through felling and burning at an accelerating rate, and suggesting that much of the region would be entirely

deforested within a few years ... and contribute to 'greenhouse effect'. ... There was concern too over the threatened loss of potentially valuable biological species."

The rest of the paper is organized as follows: section 2 presents the two models; section 3 derives the main implications of the models regarding levels of conflict and welfare of the parties; section 4 looks at two possible extensions of the basic model and; section 5 concludes.

2. The Model

> The low, flat-topped hills of south Orissa have been home to the Dongria Kondh long before there was a country called India or a state called Orissa. The hills watched over the Kondh. The Kondh watched over the hills and worshipped them as living deities. Now these hills have been sold for the bauxite they contain. For the Kondh it's as though god has been sold. (From 'Mr. Chidambaram's War' in Roy [25])

The starting point of this paper is a public good allocation problem of allocating a public good between two groups as presented in Grossman and Helpman [17]. Grossman Helpman considers the possibility of one of them being organized (a special interest group or a lobby) and then studies the allocation scenario etc. We present their benchmark case (when one of the groups is not organized) and the case when one of them is organized, below, for easy reference and comparison with our models later on. We then add an additional complexity to the existing framework where the unorganized group can now resist government allocations. More formally, there are three players/parties - the government, the industry and the indigenous community. Let the government be denoted by player G, the corporation be player 1 and the indigenous community be player 2. Player G has to allocate a natural resource of amount g between players 1 and 2 (this and the notation denoting the utilities of the players have been borrowed from Grossman and Helpman [17]). Assume that the natural resource is initially within the custody of player 2 (the indigenous community). Let g_1 be the amount of g that the government announces to allocate to player 1. Hence player 2's share is $g - g_1$ amount of the public good. Let us first consider the benchmark situation (call it the 'No nexus no resistance' case and how we introduce 'nexus' and/or 'resistance' will become clear in later variations of this benchmark case).

2.1. **Benchmark case: No government-industry nexus, no indigenous resistance.**

Let the government allocate a public good between two groups and suppose there is no other tension in the economy (this is directly drawn from Grossman and Helpman [17] and represented here for the convenience of the readers). Suppose that the government is equally concerned about the welfare of both the groups. Government's problem is as follows:

$$\max_{g_1} V_1(g_1) + V_2(g - g_1). \tag{1}$$

First order condition for maximization implies

$$V_1'(g_1) = V_2'(g - g_1). \tag{2}$$

That is, the good is allocated between the two groups till the marginal benefit from the good is equalized across the groups[7]. Let the resulting g_1 be denoted as $\hat{g}_1$. SOC requires $V_1''(\hat{g}_1) + V_2''(g - \hat{g}_1)$ to be ≤ 0. We can plug back the optimal allocation, $\hat{g}_1$ in (21) and find the reservation utility level of the government, call it $\hat{U}_G$ where

$$\hat{U}_G = V_1(\hat{g}_1) + V_2(g - \hat{g}_1). \tag{4}$$

Now, to get closed-form predictions, we consider specific functional forms of the Cobb-Douglas type for the functions V_1 and V_2. Let

$$V_1(x) = x^{\beta}, \tag{5}$$

$$V_2(x) = x. \tag{6}$$

Hence (2) yields

$$\hat{g}_1 = \beta^{\frac{1}{1-\beta}}.$$

SOC holds for $\beta < 1$. Moreover we can check that $\partial \hat{g}_1 / \partial \beta > 0$ so that as β increases the allocation of good 1 to group 1 increases. And at the optimum

$$\hat{U}_G = g + (1 - \beta)\beta^{\frac{\beta}{1-\beta}}; \tag{7}$$

$$\hat{U}_1 = \beta^{\frac{\beta}{1-\beta}}; \tag{8}$$

$$\hat{U}_2 = g - \beta^{\frac{1}{1-\beta}}; \tag{9}$$

where $\hat{U}_1$ and $\hat{U}_2$ are the equilibrium utility levels of groups 1 and 2 respectively in this model. The following proposition summarizes the findings:

Proposition 1. *Let $V_1(x) = x^{\beta}$ and $V_2(x) = x$. Then $\hat{g}_1 = \beta^{\frac{1}{1-\beta}}$; $\hat{U}_G = g + (1 - \beta)\beta^{\frac{\beta}{1-\beta}}$; $\hat{U}_1 = \beta^{\frac{\beta}{1-\beta}}$; and $\hat{U}_2 = g - \beta^{\frac{1}{1-\beta}}$.*

To facilitate comparisons, let us also look at the allocation in the case comprising of campaign emoluments but no resistance from the indigenous groups (the Grossman Helpman formulation of special interests). Here is a brief reproduction of Grossman Helpman's model.

[7]Notice that in the special case of $V_1 = V_2$, (2) can be solved to yield

$$\hat{g}_1 = g/2. \tag{3}$$

Hence the optimal allocation of the public good entails an equal distribution of the good among the two groups. And the utility of the government at the optimal solution in this special case, can be calculated to be $2V(g/2)$. In the more general case, when the two groups evaluate the resource using different functions, the distribution need not be equal. Refer to Grossman and Helpman [17] for a graphical depiction of the problem and for more detailed description of the model. However using specific functional forms to get closed-form solutions from the general model has not been done in [17] and is our contribution.

2.2. **Government-industry nexus, no indigenous resistance:** We model nexus in the following way (again borrowing notation and idea from Grossman and Helpman [17]): Group 1 makes monetary transfers to the government that are valuable to it. Let us call it 'campaign contributions' and denote it by c. Moreover the government and group 1 jointly decide on the level of g_1 and c (see footnote 13). Let government weigh welfare of the two groups with weight α_G and campaign contributions with weight $(1-\alpha_G)$. Then government's problem is as follows:

$$\max_{g_1} \alpha_G(V_1(g_1)+V_2(g-g_1))+(1-\alpha_G)c, \tag{10}$$

where c is such that the government is not worse-off than when it did not receive campaign funds. Hence c is such that $U_G \geq \hat{U}_G$. Also

$$U_1 = V(g_1) - c.$$

Hence joint maximization of the government and the industry implies solving the following problem:

$$\begin{aligned} &\max_{g_1,c} U_1 \\ &\text{subject to } U_G \geq \hat{U}_G. \end{aligned} \tag{11}$$

Since c is purely a deduction from the utility of group 1, it will try to make c as small as possible without violating the individual rationality (IR) constraint of the government. Therefore, it must be the case that at the optimal solution IR will bind, that is $U_G = \hat{U}_G$. This then yields that

$$c = \frac{1}{1-\alpha_G}\hat{U}_G - \frac{\alpha_G}{1-\alpha_G}(V_1(g_1)+V_2(g-g_1)). \tag{12}$$

Hence (11) reduces to an unconstrained maximization as follows (call the objective function k):

$$\max_{g_1} k = \{V_1(g_1) - \frac{1}{1-\alpha_G}\hat{U}_G + \frac{\alpha_G}{1-\alpha_G}(V_1(g_1)+V_2(g-g_1))\}. \tag{13}$$

Differentiating k w.r.t. g_1 yields the FOC for the allocation of the resource among the two groups as follows:

$$V_1'(g_1) = \alpha_G V_2'(g-g_1). \tag{14}$$

Let the resulting g_1 be denoted as $\bar{g}_1$. Since $V_1'(\bar{g}_1) < V_1'(\hat{g}_1)$ (since $\alpha_G < 1$), and $V_1''(.) \leq 0$ (from SOC for maximization), we get $\bar{g}_1 \geq \hat{g}_1$. Hence there is distortion of allocation of good 1 in favor of group 1. Using specific functional forms like before, we can compute this explicitly. Here

$$\bar{g}_1 = \left(\frac{\beta}{\alpha_G}\right)^{\frac{1}{1-\beta}} > \hat{g}_1 = \beta^{\frac{1}{1-\beta}}. \tag{15}$$

Hence smaller is α_G, that is lower is the weight on welfare, the higher $\bar{g}_1$ and so higher is the distortion. Moreover, since $\bar{U}_2 = g - \bar{g}_1$ while $\hat{U}_2 = g - \hat{g}_1$ and $\bar{g}_1 > \hat{g}_1$, we have

$\bar{U}_2 < \hat{U}_2$. That is, group 2 is worse off when group 1 donates c to the government. Also, the government is equally well-off since, by construction of c, $\bar{U}_G = \hat{U}_G$. Substituting $\bar{g}_1$ and $\hat{U}_G$ in (12) we get

$$c = \frac{1}{1-\alpha_G}\left[g + (1-\beta)\beta^{\frac{\beta}{1-\beta}}\right] - \frac{\alpha_G}{1-\alpha_G}\left[\left(\frac{\beta}{\alpha_G}\right)^{\frac{\beta}{1-\beta}} + g - \left(\frac{\beta}{\alpha_G}\right)^{\frac{1}{1-\beta}}\right].$$

Also

$$\bar{U}_1 = \left(\frac{\beta}{\alpha_G}\right)^{\frac{\beta}{1-\beta}} - c.$$

It is complicated to compare in these general terms, hence, to facilitate comparison with the benchmark case of no campaign contribution, we let $\alpha_G \to 0$ (as also considered by Grossman and Helpman), that is government puts a lot of weight on campaign contributions and little weight on the sum of the welfares of the two groups. In this case, $\bar{g}_1$ tends to be the maximum possible, i.e. g, $c \to \hat{U}_G$. The following proposition summarizes the findings of this model:

Proposition 2. *Let $V_1(x) = x^\beta$ and $V_2(x) = x$. Then $\bar{g}_1 = \left(\frac{\beta}{\alpha_G}\right)^{\frac{1}{1-\beta}}; \bar{U}_G = g - \beta^{\frac{1}{1-\beta}}$; $\bar{U}_1 = \left(\frac{\beta}{\alpha_G}\right)^{\frac{\beta}{1-\beta}} - c$ and $\bar{U}_2 = g - \left(\frac{\beta}{\alpha_G}\right)^{\frac{1}{1-\beta}}$, where*

$$c = \frac{1}{1-\alpha_G}\left[(1-\beta)\beta^{\frac{\beta}{1-\beta}} + g\right] - \frac{\alpha_G}{1-\alpha_G}\left[\left(\frac{\beta}{\alpha_G}\right)^{\frac{\beta}{1-\beta}} + g - \left(\frac{\beta}{\alpha_G}\right)^{\frac{1}{1-\beta}}\right].$$

Moreover as $\alpha_G \to 0$, $\bar{g}_1 = g$, $c \to \hat{U}_G$, and $\bar{U}_1 = g^\beta - c = g^\beta - (1-\beta)\beta^{\frac{\beta}{1-\beta}} - g$, $\bar{U}_2 = 0$.

Proof. See appendix A. ■

We have already seen that as α_G falls, the allocation of g goes more and more in favor of group 1 and against that of group 2. In the extreme case, the whole of g is allocated in favor of group 1 and group 2 receives nothing. It will therefore be extremely interesting to see whether resistance by group 2 (which the nexus model will deal with) can check this tendency.

Notice also that the government is equally well-off (by hypothesis since $\bar{U}_G = \hat{U}_G$). Group 2 is worse off (assuming $g > \beta^{\frac{1}{1-\beta}}$, $\hat{U}_2 > 0$ whereas $\bar{U}_2 = 0$) and so is group 1 ($\bar{U}_1 < 0$ whereas $\hat{U}_1 > 0$).

We now analyze the possibility of resistance by group 2. Two basic models in this context - a model where there is an alleged nexus between the government and the industry (group 1) and the other where there is none, but both with the possibility of the indigenous group resisting to allocation of g away from them.

2.3. **Government-Industry Nexus, Indigenous Resistance.** Like before, we model nexus in the following way of group 1 making monetary transfers, c, to the government that are valuable to it. Moreover the government and group 1 jointly decide on the level of g_1 and c (see footnote 13).

Now given any level of g_1, group 2 can engage in conflict and let f_2 be the amount it invests in conflict[8]. Government can retaliate using force or placating measures (fair compensation, employment etc.) and let that be denoted by f_G. Hence the timeline for this model (call it Game 1) will be as follows:

Stage 1: Government and group 1 jointly decide on the levels of g_1 and c.
Stage 2: Group 2 chooses f_2 and government chooses f_G simultaneously.

Given f_2 and f_G, let the probability of success be given by the usual ratio-form contest success function (see Skaperdas [28], for example). That is, the probability that group 2 wins is given by $f_2/(f_2 + f_G)$ while the government wins with the remaining probability. Assume moreover, that if 2 wins, it can retain the entire amount of g (that is group 1 gets nothing) while if it loses, it gets the share that government allocates to it in stage 1 of the game $(g - g_1)$. Assume also that both group 2 and the government evaluate costs of conflict using an increasing and convex cost function of the form $f_i^2/2$ for conflict investment of an amount f_i, $i = G, 2$. Let the government's utility be a weighted sum of utilities of the two groups as well as campaign contributions. Let us now specifically write down the utility functions of the parties.

The expected utility of player 1 is given by

$$\begin{aligned} U_1 &= \frac{f_2}{f_2 + f_G}\left(V_1(0) - c\right) + \frac{f_G}{f_2 + f_G}\left(V_1(g_1) - c\right) \\ &= \frac{f_2}{f_2 + f_G}V_1(0) + \frac{f_G}{f_2 + f_G}V_1(g_1) - c. \end{aligned} \tag{16}$$

That is, if group 2 wins, then group 1 gets nothing of the public good while if the government wins, it gets g_1 amount, and it incurs the payment c irrespective of the outcome of the government-group 2 conflict in stage 2. Similarly, the expected utility of player 2 is given by

[8]Notice that we explicitly do not consider budget of any of the players, the indigenous group, the government or the industry (which invests in counter resistance in the next model). In part this may reflect the fact that the players have enough resources to finance their optimal resistance to each other which certainly seems to be true for the government and the industry. For the indigenous group, this may in fact, be driven by Naxalite help to indigenous groups in the resistance against displacement, and Naxalites are definitely much networked and organised and also financially more sound and hence able to counter and withstand aggression for long periods of time. This also keeps the analysis somewhat parsimonious and helps me concentrate on other variables of interest like conflict levels and welfare of the players in the two regimes. However, see Vanden Eynde [32] for how Naxalite violence varies with income shocks to rural India.

the following (here the cost of conflict is being borne by group 2 irrespective of the outcome):

$$U_2 = \frac{f_2}{f_2+f_G}V_2(g) + \frac{f_G}{f_2+f_G}V_2(g-g_1) - \frac{f_2^2}{2}. \tag{17}$$

The expected utility of the government is given by

$$\begin{aligned} U_G =& \frac{f_2}{f_2+f_G}\left(\alpha_G(V_1(0)+V_2(g)) + (1-\alpha_G)c - \frac{f_G^2}{2}\right) \\ &+ \frac{f_G}{f_2+f_G}\left(\alpha_G(V_1(g_1)+V_2(g-g_1) + (1-\alpha_G)c - \frac{f_G^2}{2}\right) \\ =& \frac{f_2}{f_2+f_G}\left(\alpha_G(V_1(0)+V_2(g))\right. \\ &+ \frac{f_G}{f_2+f_G}\left(\alpha_G(V_1(g_1)+V_2(g-g_1)) + (1-\alpha_G)c - \frac{f_G^2}{2}\right. \end{aligned} \tag{18}$$

Here α_G is the weight government attaches to the sum of the utilities of the two groups while $(1-\alpha_G)$ is the weight it assigns to the contribution it receives from the industry[9]. Hence in the event that group 2 wins, it puts weight α_G on $V_1(0)+V_2(g)$ which is the sum of the resulting utilities of the two groups when group 2 has won, while it puts weight α_G on $V_1(g_1)+V_2(g-g_1)$ which is the sum of the resulting utilities of the two groups when the government has won. It incurs the cost of conflict in all scenarios.

We use backward induction to solve the model. Hence given levels of g_1 and c, we first solve for the optimal levels of conflict, that is, government chooses f_G to maximize (18) and group 2 chooses f_2 to maximize (17), simultaneously. The following proposition summarizes the findings:

Proposition 3. *Let $V_1(g_1)-V_1(0)=v_1$, $V_2(g)-V_2(g-g_1)=v_2$. Moreover, let $v_1>v_2$. Then the optimal levels of conflict in stage 2 of Game 1 are given by*

$$f_2^* = \frac{v_2^{3/4}(v_1-v_2)^{1/4}\alpha_G^{1/4}}{\sqrt{\alpha_G(v_1-v_2)}+\sqrt{v_2}} \tag{19}$$

$$f_G^* = \frac{v_2^{1/4}(v_1-v_2)^{3/4}\alpha_G^{3/4}}{\sqrt{\alpha_G(v_1-v_2)}+\sqrt{v_2}}. \tag{20}$$

Idea of proof: Differentiating (18) w.r.t. f_G and (17) w.r.t. f_2 and setting the FOCs equal to 0, yield the above expressions. ■

Here v_1 can be interpreted as 'what is at stake' for group 1 while v_2 can be interpreted as 'what is at stake' for group 2 and we have assumed that $v_1>v_2$, that is, 'what is at stake' is higher for group 1 than group 2.

[9]There has been varied attempts at modelling the objective function of a government. Broadly speaking, either the government has been depicted as a (benevolent) social planner maximizing some welfare criterion (Pigouvian view) or it has been portrayed as an entity who might be self-interested and hence is not free from influence of political rivals, lobbies, and one who can therefore be bribed and bought out ('public choice' view). We stick to the modelling of Grossman and Helpman [17] in this case where the government is of the latter type, caring both about the welfare of its citizens (industry and indigenous group) and also campaign contributions. See Munshi [19] for some more discussion on possible alternative government objective functions.

Now let us turn to stage 1. In this stage, joint maximization of the government and the industry entails a level of campaign contribution which leaves the government indifferent between accepting and not accepting the contribution[10]. In other words, the industry will not offer any more than it has to in order to influence the policy (g_1). We assume, for simplicity, that this 'reservation utility' level of the government, that is the utility which the government enjoyed in the benchmark case of no nexus and no resistance, i.e. $\hat{U}_G$ as given in (7).

Now recall the objective function of the government as given in (18). Hence government's problem for this model will be as follows:

(21)
$$\max_{g_1}\left[\frac{f_2}{f_2+f_G}\left(\alpha_G(V_1(0)+V_2(g))+\frac{f_G}{f_2+f_G}\left(\alpha_G(V_1(g_1)+V_2(g-g_1))+(1-\alpha_G)c-\frac{f_G^2}{2}\right]\right.,$$

where c is such that the government is not worse-off than when it did not receive campaign funds. Hence c is such that $U_G \geq \hat{U}_G$. Also recall the objective function of group 1 as given in (16). Hence joint maximization of the government and the industry implies solving the following problem:

(22)
$$\begin{aligned}&\max_{g_1,c} U_1\\ &\text{subject to } U_G \geq \hat{U}_G.\end{aligned}$$

Since c is purely a deduction from the utility of group 1, it will try to make c as small as possible without violating the individual rationality (IR) constraint of the government. Therefore, it must be the case that at the optimal solution IR will bind, that is $U_G = \hat{U}_G$. This then yields that

(23)
$$c=\frac{1}{1-\alpha_G}\hat{U}_G+\frac{1}{1-\alpha_G}\frac{f_G^{*2}}{2}-\frac{\alpha_G}{1-\alpha_G}\frac{f_2^*}{f_2^*+f_G^*}(V_1(0)+V_2(g))-\frac{\alpha_G}{1-\alpha_G}\frac{f_G^*}{f_2^*+f_G^*}(V_1(g_1)+V_2(g-g_1)),$$

when computed at the optimal conflict levels as given in Proposition 3. Hence (22) reduces to an unconstrained maximization as follows (call the objective function K):

(24)
$$\begin{aligned}\max_{g_1} K =\{&\frac{f_2^*}{f_2^*+f_G^*}V_1(0)+\frac{f_G^*}{f_2^*+f_G^*}V_1(g_1)-\frac{1}{1-\alpha_G}\hat{U}_G-\frac{1}{1-\alpha_G}\frac{f_G^{*2}}{2}\\ &+\frac{\alpha_G}{1-\alpha_G}\frac{f_2^*}{f_2^*+f_G^*}(V_1(0)+V_2(g))+\frac{\alpha_G}{1-\alpha_G}\frac{f_G^*}{f_2^*+f_G^*}(V_1(g_1)+V_2(g-g_1))\}.\end{aligned}$$

Differentiating K w.r.t. g_1 yields the FOC for the allocation of the resource among the two groups as follows:

(25)
$$\frac{\partial K}{\partial g_1}=\frac{1}{1-\alpha_G}\left[\frac{\partial}{\partial g_1}\left(\frac{f_G^*}{f_2^*+f_G^*}\right)(v_1-\alpha_G v_2)+\frac{f_G^*}{f_2^*+f_G^*}(v_1'-\alpha_G v_2')-f_G^*\frac{\partial f_G^*}{\partial g_1}\right].$$

[10]In principle, how exactly campaign contributions are determined is a moot question. There could be a process of bargaining or the government could in fact, present to or be presented with a menu of offers by the industry. The joint determination presented here corresponds closely to the treatment presented in Grossman and Helpman [17] and Persson and Tabellini [23].

Given optimal conflict levels in stage 2 as in Proposition 3, the optimal allocation of g in stage 1, say g_1^*, is given by the following proposition:

Proposition 4. *Let* $\alpha_G \to 0$. *Then* $g_1^* \to \hat{g}_1$; $U_G^* = \hat{U}_G$; $U_1^* = -c$; $U_2^* = g$; $c = \hat{U}_G$.

Proof. See appendix B. ■

Hence we obtain the extremely interesting result that resistance by group 2 can actually thwart distortion of allocation by the government when group 1 transfers funds to the government to influence allocation. That is, due to resistance by group 2, allocation is in fact, forced down to the level of welfare-maximizing government. The result seems to capture many real-life situations where allocation decisions have been halted owing to mass demonstrations etc., by indigenous communities. Moreover, compared to the situation of no nexus and no resistance, utility levels also move in favor of group 2 ($U_2^* = g > \hat{U}_2 = g - \beta^{\frac{1}{1-\beta}}$), government is as well-off as before ($U_G^* = \hat{U}_G$) and the industry is worse off ($U_1^* = -\hat{U}_G < 0 < \hat{U}_1 = \beta^{\frac{\beta}{1-\beta}}$). Compared to the situation of nexus and no resistance too, we get the following: government is as well off as before ($U_G^* = \bar{U}_G$); group 2 is better off ($U_2^* = g > 0 = \bar{U}_2$) and group 1 is worse off ($U_1^* = -c < \bar{U}_1 = g^\beta - c$ where $c = \hat{U}_G$). To summarize, resistance leaves the group 2 better off and group 1 worse off (leaving government's utility unchanged), irrespective of whether group 1 and the government had been in nexus or not.

In contrast, let us now turn to a model where there is no nexus between the government and industry (that is there is no campaign contribution) but still there is resistance to redistribution by indigenous communities.

2.4. **No government-Industry-Nexus, Indigenous Resistance.** We model no nexus in the following way: There is no payment which the industry makes to the government. So the government announces an allocation that is not 'biased' to begin with. But since there is some reallocation of g away from group 2 there is conflict and assume now that the industry itself bears costs of resistance from group 2. Hence let given any level of g_1, group 2 invest $\tilde{f}_2$ in conflict while let industry retaliate using counter-resistance measures and let that be denoted by $\tilde{f}_1$. Hence the timeline for this model (call it Game 2) will be as follows:

Stage 1: Government chooses g_1.
Stage 2: Group 1 chooses $\tilde{f}_1$ and Group 2 chooses $\tilde{f}_2$ simultaneously.

We will naturally be interested to see how f_2^* and $\tilde{f}_2$ compares - that is whether conflict is likely to be higher or lower when there is alleged nexus between the government and the

industry. It will also be interesting to see how retaliation efforts (of the government and the industry) compare across the nexus versus the no-nexus regimes.

The expected utility of player 1 is given by

$$U_1 = \frac{f_1}{f_1+f_2}V_1(g_1) + \frac{f_2}{f_1+f_2}V_1(0) - \frac{f_1^2}{2}. \tag{26}$$

That is, if it wins, it gets the allocation provided by the government but if it doesn't, then it gets nothing. Similarly, the expected utility of group 2 is being given by

$$U_2 = \frac{f_1}{f_1+f_2}V_2(g-g_1) + \frac{f_2}{f_1+f_2}V_1(g) - \frac{f_2^2}{2}. \tag{27}$$

The expected utility of the government is given by

$$U_G = \frac{f_1}{f_1+f_2}(V_1(g_1)+V_2(g-g_1)) + \frac{f_2}{f_1+f_2}(V_1(0)+V_2(g)). \tag{28}$$

Notice that now the government does not incur any cost of counter-resistance measures. We use backward induction to solve the model. Hence given level of g_1 from stage 1 of Game 2, we first solve for the optimal levels of conflict investments made by the two groups in stage 2, that is, group 1 chooses f_1 to maximize (26) and group 2 chooses f_2 to maximize (27), simultaneously. The following proposition summarizes the findings:

Proposition 5. *Let $V_1(g_1) - V_1(0) = v_1$, $V_2(g) - V_2(g-g_1) = v_2$. Moreover, let $v_1 > v_2$. Then the optimal levels of investments in conflict in stage 2 of Game 2 are given by*

$$\tilde{f}_1 = \frac{v_1^{3/4}v_2^{1/4}}{\sqrt{v_1}+\sqrt{v_2}} \tag{29}$$

$$\tilde{f}_2 = \frac{v_1^{1/4}v_2^{3/4}}{\sqrt{v_1}+\sqrt{v_2}}. \tag{30}$$

Idea of proof: Differentiating (26) w.r.t. f_1 and (27) w.r.t. f_2 and setting the FOCs equal to 0, yield the above expressions. ■

In stage 1 of Game 2, the government takes the conflict investment levels as given in proposition 5 and maximizes (28). Let the resulting optimal g_1 be denoted by $\tilde{g}_1$. Given optimal conflict levels in stage 2 of Game 2 as in Proposition 5, the optimal allocation of g in stage 1, $\tilde{g}_1$, is as given in the following proposition:

Proposition 6. *Let $V_1(x) = x^\beta$ and $V_2(x) = x$. Then*

$$\begin{aligned}
\tilde{g}_1 =& \left(\frac{2\beta}{\beta+1}\right)^{\frac{2}{1-\beta}},\\
\tilde{U}_G =& g + \frac{(1-\beta)(2\beta)^{\frac{2\beta}{1-\beta}}}{(1+\beta)^{\frac{1+\beta}{1-\beta}}},\\
\tilde{U}_1 =& \left(\frac{2\beta}{\beta+1}\right)^{\frac{3\beta-1}{1-\beta}} \frac{(4\beta+2)\beta}{(3\beta+1)^2},\\
\tilde{U}_2 =& \frac{(2\beta)^{\frac{3-\beta}{1-\beta}}}{2(\beta+1)^{\frac{1+\beta}{1-\beta}}} \frac{2\beta+1}{3\beta+1}.
\end{aligned}$$

Proof. See appendix C. ∎

Next we turn to an analysis of our results in the previous models.

3. Analysis

> Now that mining companies have polluted rivers, mined away state boundaries, wrecked ecosystems and unleashed civil war, the consequences are playing out like an ancient lament over ruined landscapes and the bodies of the poor. (From 'Trickledown Revolution' in Roy [25])

In this section we will see how conflict levels and welfare of the players vary across the two regimes.

3.1. Comparison of allocation levels.

Let us compare the levels of public good which are distributed to player 1 across various regimes. The following proposition summarises the findings:

Proposition 7. *Let $\alpha_G \to 0$. Then $\bar{g}_1 > \hat{g}_1 = g_1^* > \tilde{g}_1$.*

Proof. Now, as $\alpha_G \to 0$, we have seen that $\bar{g}_1 \to g$ (by proposition 2) and $g_1^* \to \hat{g}_1$ (by proposition 4). Also, recall that $\tilde{g}_1 = \left(\frac{2\beta}{\beta+1}\right)^{\frac{2}{1-\beta}}$ and $\hat{g}_1 = \beta^{\frac{1}{1-\beta}}$. Comparing we see that $\hat{g}_1 > \tilde{g}_1$. Combining we get, $g = \bar{g}_1 > \hat{g}_1 = g_1^* > \tilde{g}_1$. ∎

Hence we see, not surprisingly perhaps, that the allocation in favor of group 1 is highest when there is nexus between the industry and the government and no resistance from the indigenous group ($\bar{g}_1$). It is the lowest when there is no nexus between the industry and the government and also resistance from the indigenous groups ($\tilde{g}_1$). These constitute the two extreme cases. And allocation is somewhere in between when either (a) there is both nexus between the industry and the government as well as resistance by indigenous groups (g_1^*) or (b) there is absence of both nexus and resistance ($\hat{g}_1$).

3.2. **Comparison of conflict investment levels.** Let us now compare the levels of investment in conflict technology by the indigenous resistance group, group 2. That is, let us compare f_2^* (the level of investment with government-industry nexus) and $\tilde{f}_2$ (the level sans any nexus but with retaliation measures undertaken by the industry). It is also interesting to compare the levels of counter-resistance measures of the government to that of the industry in the two models. That is, how does f_G^* compare with $\tilde{f}_1$? Then the following proposition summarizes the findings:

Proposition 8. *Let $\alpha_G \to 0$, then $f_2^* < \tilde{f}_2$ and $f_G^* < \tilde{f}_1$. Also, $\frac{f_2^*}{f_2^*+f_G^*} > \frac{\tilde{f}_2}{\tilde{f}_1+\tilde{f}_2}$ and $\frac{\tilde{f}_1}{\tilde{f}_1+\tilde{f}_2} > \frac{f_G^*}{f_2^*+f_G^*}$.*

Proof. See appendix D. ■

The above proposition implies that the rebellion by the indigenous community is always higher in the no-nexus-resistance regime than in the nexus-resistance regime. Commensurately, the retaliation measures of the industry (in the no-nexus-resistance model) are always higher than that of the government (as in the nexus-resistance model). However, in relative terms, indigenous resistance is higher in nexus-resistance regime than in no-nexus resistance regime while the industry's retaliation in the no-nexus resistance regime is relatively higher when compared to government's retaliation in nexus-resistance regime. Moreover, overall resistance levels (sum of the conflict investments: $\tilde{f}_1 + \tilde{f}_2 > f_G^* + f_2^*$) are higher in the no-nexus than in the nexus regimes. In other words, no-nexus regimes with resistance sees greater violence since both the combat by the industry is higher relative to that of the government (in the nexus-resistance regimes), and so is the resistance by the indigenous group in response to it.

3.3. **Comparison of utility levels.** Let us now compare the utility levels of the government, industry and group 2 across the two models of nexus and no-nexus. Now substituting the values of f_G^* and f_2^* (from equations (20) and (19) respectively) in U_G (18), we get the utility level of the government in the nexus model, call it U_G^*. Similarly, by substituting the values of $\tilde{f}_1$ and $\tilde{f}_2$ (from equations (29) and (30) respectively) in U_G (28), we get the utility level of the government in the nexus model, call it $\tilde{U}_G$. We can do similar exercises for groups 1 and 2. The following proposition summarizes the findings:

Proposition 9. *(a) No-nexus-no-resistance versus Nexus no-resistance: $\hat{U}_G = \bar{U}_G$; $\hat{U}_2 > \bar{U}_2$. As $\alpha_G \to 0$, $\bar{g}_1 = g$, $c \to \hat{U}_G$, and $\hat{U}_1 > \bar{U}_1$.*

(b) No-nexus-no-resistance versus No-nexus resistance: $\hat{U}_G > \tilde{U}_G$; $\hat{U}_1 > \tilde{U}_1$; $\hat{U}_2 > \tilde{U}_2$ if $\beta > \beta_0$, $\hat{U}_2 < \tilde{U}_2$ for $\beta < \beta_0$ where $\beta_0 \approx 0.78$.

(c) Nexus-resistance versus No-nexus-no-resistance: $U_G^* = \hat{U}_G$; $U_1^* < \hat{U}_1$; $U_2^* > \hat{U}_2$.

(d) Nexus-resistance versus Nexus-no-resistance: $U_G^* = \bar{U}_G$; $U_1^* < \bar{U}_1$; $U_2^* > \bar{U}_2$.
(e) Nexus-resistance versus No-nexus resistance: $U_G^* > \tilde{U}_G$; $U_1^* < \tilde{U}_1$; $U_2^* > \tilde{U}_2$.
(f) Nexus-no-resistance versus no-nexus-resistance: $\bar{U}_G > \tilde{U}_G$; $\tilde{U}_1 > \bar{U}_1$; $\tilde{U}_2 > \bar{U}_2$.

Proof. See appendix E. ■

Part (a) of the above proposition tells us that sans resistance, both the indigenous community and the industry are better-off under the no-nexus regime than the nexus regime (when $\alpha_G \to 0$).

Part (b) of the proposition tells us that sans nexus, both the government and the industry are unambiguously better off in the absence of resistance from the indigenous community. However, the indigenous community itself can be better or worse off depending on β. If β is low (implying the utility of the resource to the industry is lower compared to its utility to the indigenous group), then the group is better off resisting redistribution whereas if β is high (that is the industry and the group have comparable utilities arising from the resource), then the group is better off not resisting redistribution.

Parts (c), (d), and (e) all have comparisons with the situation when there is both nexus and resistance. In part (c), we compare this with the absence of both nexus and resistance - the government is as well-off as before, group 1 is worse off, and group 2 is better off. In part (d), the utilities are compared with the situation of nexus but no resistance - government is as well-ff, group 1 is worse off and group 2 is better off. In part (e), the utilities are compared with the situation of no-nexus but resistance by the indigenous group, and we have the following: the government and group 2 is better off whereas group 1 is worse off.

Part (f) of the proposition compares the extremes of there being nexus between the government and the industry (the Grossman-Helpman formulation) but there being no resistance from the indigenous people versus that of there being no collusion between the government and the industry but nevertheless there being resistance from the indigenous inhabitants. We see that only the government is better off and both the industry and the indigenous groups are worse off when there is nexus between the government and the industry but no resistance.

Instead of regime-wise comparison of utilities of all players, let us represent regime-wise comparison of utilities of each player, like the following matrix G for the government.

$$G = \begin{bmatrix} & & \text{Resistance} & & \\ & & \text{No} & & \text{Yes} \\ \text{Nexus} & \text{No} & \hat{U}_G & > & \tilde{U}_G \\ & & \| & & < \\ & \text{Yes} & \bar{U}_G & = & U_G^* \end{bmatrix}$$

In short, the government is equally well-off in all the regimes except for when there is no nexus yet the indigenous groups revolt where it is worse off than in any other regime. In other words, if there is no resistance, then the government is equally well-off not being in nexus with the industry or being in nexus with the industry ($\hat{U}_G = \bar{U}_G$), whereas if there is resistance, the government is better-off being in nexus ($\tilde{U}_G < U_G^*$). For the industry, player 1, we have the following:

$$1 = \begin{bmatrix} & & \text{Resistance} & & \\ & & \text{No} & & \text{Yes} \\ \text{Nexus} & \text{No} & \hat{U}_1 & > & \tilde{U}_1 \\ & & > & & > \\ & \text{Yes} & \bar{U}_1 & > & U_1^* \end{bmatrix}$$

Hence the industry is unambiguously better off under no nexus, irrespective of whether there is resistance or not ($\hat{U}_1 > \bar{U}_1$ under no resistance while $\tilde{U}_1 > U_1^*$ under resistance). In other words, it is a dominant strategy for player 1, not to be in nexus with the government. For the indigenous group, player 2, we have the following:

$$2 = \begin{bmatrix} & & \text{Resistance} & & \\ & & \text{No} & & \text{Yes} \\ \text{Nexus} & \text{No} & \hat{U}_2 & > & \tilde{U}_2 \\ & & > & & < \\ & \text{Yes} & \bar{U}_2 & < & U_2^* \end{bmatrix}$$

Hence the best response of the indigenous groups depend on whether there is alleged nexus or not. If there is nexus, then resisting gives it higher utility, whereas if there is no nexus then not resisting gives it higher utility. However since no nexus is a dominant strategy player 1, which are also best responses for the government and player 2, the unique Nash equilibrium of this game is where there is no nexus between players 1 and 2 and there is no resistance by group 2.

Notice that even in the Grossman-Helpman world of nexus without resistance, moving from no-nexus to nexus, makes both groups 1 and 2 worse off and leaves government equally well-off, so that overall, it is Pareto-inferior. However, given nexus, group 2 is better-off resisting, group 1 is worse-off, and the government is equally well-off. However we can check that the sum of the utilities is lower than under the no-nexus-no-resistance regime but is

greater than under nexus-no-resistance regime[11]. In other words, given nexus, the economy as a whole is better off when group 2 resists rather than not.

4. Extensions

We consider the following two variations of the basic framework without going into too much details of each.

4.1. **Rehabilitation.** There has been many instances of industries actually trying to pacify the displaced/disgruntled local communities by providing them developmental projects like hospitals, schools, etc. In fact, in recent times, such expenses have been made mandatory under the term 'corporate social responsibility' (CSR) whereby a certain percentage of the profits of the corporates has to be kept aside and returned to the affected people in various forms[12]. The World Business Council for Sustainable Development (WBCSD) has defined CSR as "the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large" (Blowfield and Frynas [6]). Hence in theory, CSR is an umbrella term to cover basic rules of operation of MNCs in distant locations. For example, a few norms are as follows: "MNCs should do no intentional, direct harm; produce more good than bad for the host country; contribute to the host country's development; respect human rights; pay their fair share of taxes; respect the local culture; and cooperate with the host government in developing ethical background institutions (e.g., health and safety standards)." (Carroll [8]) In India, companies operate under the provisions of the Companies Act 2013 which explicitly recognizes a basic moral and social responsibility of companies towards the society in which they operate. Under this Act, mid and large companies have to spend 2 percent of their three-year annual average net profit on CSR activities. The Indian government is expecting considerable outlay of such expenses.

For example, NALCO (National Aluminum Company Limited) engages in the following CSR activities: The Company has four mobile health units, which organized 1357 camps in 2010-11 and treated 65340 patients with free medicines. During 2011-12, till December 2011,

[11] $\hat{U}_1 + \hat{U}_2 + \hat{U}_G = 2(g + \beta^{\frac{\beta}{1-\beta}} - \beta^{\frac{1}{1-\beta}})$ whereas $U_1^* + U_2^* + U_G^* = g$. Also $\bar{U}_1 + \bar{U}_2 + \bar{U}_G = g^\beta$.

[12] Such measures to placate restive groups by providing them compensation, rehabilitation and so on are also undertaken by the government. In the case of India, for example, the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, called the Land Acquisition Act 2013, in short, allows state governments to fix compensation for rural and semi-urban areas between two and four times the land value. The Maharashtra government has gone ahead with land acquisition by offering the maximum compensation allowed, four times the price of land, for rural areas. (See more at: http://indianexpress.com/article/cities/mumbai/land-acquisition-government-offers-farmers-maximum-compensation/sthash.84nc5rpD.dpuf) The state government has decided to fix a compensation 3.2 times the land value for semi-urban areas and a compensation of two times the land value for urban areas. Furthermore, according to the LARR (Land Acquisition, Rehabilitation, and Resettlement) Amendment Bill 2015, government is supposed to provide employment to at least one member of the affected family of a farm laborer.

769 camps have been organized and 36043 patients have been treated with free medicines. Moreover, NALCO Foundation has come forward to set up an Industrial Training Institute (ITI) at Marichamal village in the tribal-dominated Koraput, under the aegis of district administration. To run the mobile health units more professionally, the organization has taken up a project with Wockhardt Foundation. Similarly, for the formal education of tribal children, NALCO Foundation is sponsoring 250 children to Kalinga Institute of Social Sciences (KISS), Bhubaneswar. To mitigate the menace of malaria and many water-borne diseases, projects have been taken up to distribute mosquito nets and water filters in 18 villages of Damanjodi sector.

From a modeling perspective, though such expenses will still be a cost to the industry, these will enter as benefits in the utility function of the indigenous communities. So we introduce this aspect in the simplest possible way as follows: Assume the industry gives r (denoting rehabilitation) amount of money (analogous to the amount c that it gave to the government in the nexus models) to the indigenous group which is valued by the group. There is no conflict and the government is again a maximizer of the sum of the utilities of the two groups and allocates g_1 to group 1. The utility functions will be as follows:

$$U_1 = V_1(g_1) - r, \tag{31}$$

$$U_2 = \alpha_2 V_2(g - g_1) + (1 - \alpha_2)r, \tag{32}$$

$$U_G = V_1(g_1) - r + \alpha_2 V_2(g - g_1) + (1 - \alpha_2)r, \tag{33}$$

where α_2 is the weight that the indigenous group puts on the welfare from the resource g which is up for divide, and $1-\alpha_2$ is the weight with which it evaluates r, the contribution of the industry towards their benefit. Assume also that U_2 must be such that the indigenous group is as well off as prior to any divide of its resources was initiated by the government or contribution towards its welfare was made by the industry, i.e., let the reservation utility of group 2 be $V_2(g)$, in other words, when the entire resource g was being enjoyed by the indigenous groups without any interference of the government or the industry. Hence it must be the case that,

$$\alpha_2 V_2(g_2) + (1 - \alpha_2)r \geq V_2(g). \tag{34}$$

Notice that, just like c, r is purely a deduction from player 1's utility, so the industry will not give any more than it has to, so that in equilibrium, we will have (34) hold with equality, thereby yielding,

$$r = \frac{1}{1-\alpha_2} V_2(g) - \frac{\alpha_2}{1-\alpha_2} V_2(g - g_1). \tag{35}$$

Substituting r in (40) and taking derivative w.r.t. g_1, we get the following F.O.C.

$$V_1'(g_1) = \frac{\alpha_2}{1-\alpha_2} V_2'(g - g_1). \tag{36}$$

Let g_1^R be the solution to the above equation. Using functional forms for V_1 and V_2 like before, we can explicitly solve for g_1^R as follows:

$$g_1^R = \left(\frac{\beta(1-\alpha_2)}{\alpha_2}\right)^{\frac{1}{1-\beta}}. \tag{37}$$

Comparing FOCs (14) and (36), and solutions given in (15) and (37), we see that if $\frac{\alpha_2}{1-\alpha_2} < \alpha_G$, then $V_1'(g_1^R) < V_1'(\bar{g}_1)$. Given $V_1'' < 0$, we can conclude that $g_1^R > \bar{g}_1$. In other words, if the indigenous community places relatively lesser weight on welfare from the resource vis-a-vis that on rehabilitation efforts of the industry, in relation to how the government weighs the sum of the utilities of the two groups, (i.e. $\frac{\alpha_2}{1-\alpha_2} < \alpha_G$), then the industry gets a higher share of the pie by rehabilitating the indigenous masses than by entering into a nexus with the government ($g_1^R > \bar{g}_1$).

Conversely, if the opposite were true, then entering into a nexus would give a higher share of the pie to the industry. In fact, as $\alpha_G \to 0$ (which we have assumed for many of the comparative statics), it is likely to be the case that $\frac{\alpha_2}{1-\alpha_2} > \alpha_G$ in which case $g_1^R < \bar{g}_1 \to g$. In other words, as government gives more and more importance to campaign contributions by the industries relative to welfare of the groups, the industry gets a higher share of the resource by entering into nexus with the government than by rehabilitating the affected communities.

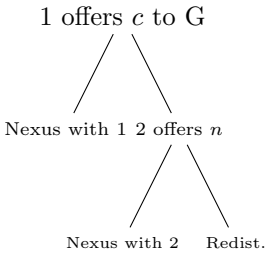
4.2. **Bargaining.** There has been several instances of indigenous communities peacefully trying to lobby with the government via NGOs etc. This section considers such a possibility by assuming some kind of sequential bargaining going on between the three players. Assume that the industry moves first and offers being in nexus with the government through a payment c, i.e., they offer to play the game as described in section 2.2 (and there is no resistance from group 2). If the offer is accepted, then the game ends there. If not, then the game moves on to period 2 when the indigenous community can offer a settlement n to the government which the government can again accept or reject. If the government accepts then, similar to the utilities in 2.2, the payoffs are as follows:

$$U_1 = V_1(g_1), \tag{38}$$

$$U_2 = V_2(g - g_1) - n, \tag{39}$$

$$U_G = \alpha_G(V_1(g_1) + V_2(g - g_1)) + (1 - \alpha_G)n. \tag{40}$$

where the indigenous communities offer to be in nexus with the government by offering them an amount n via the NGOs. Assume, for simplicity, that if all offers are rejected, then the status quo, as given in the benchmark case of 2.1 (which considers pure redistribution in the absence of nexus and resistance) is obtained. Since the formulation is one of a sequential game of perfect information, we can use backward induction to solve it.



Consider the second period subgame where the government has already rejected period 1 offer. Since the reservation utility of the government is $\hat{U}_G$, player 2 will offer him n such that

$$\alpha_G(V_1(g_1) + V_2(g - g_1)) + (1 - \alpha_G)n \geq \hat{U}_G.$$

Since n is purely a deduction from 2's utility, it will want to make n as small as possible as still make n acceptable to G. Assume (as is standard), that government accepts when it is indifferent. Hence we get

$$n = \frac{1}{1 - \alpha_G}\hat{U}_G - \frac{\alpha_G}{1 - \alpha_G}(V_1(g_1) + V_2(g - g_1)). \tag{41}$$

Hence joint maximization of the government and the industry implies solving the following problem:

$$\begin{aligned} &\max_{g_1, n} U_2 \\ &\text{subject to } \; U_G \geq \hat{U}_G. \end{aligned} \tag{42}$$

Substituting n from (41), problem (42) reduces to an unconstrained maximization as follows (call the objective function m):

$$\max_{g_1} m = \{V_2(g - g_1) - \frac{1}{1 - \alpha_G}\hat{U}_G + \frac{\alpha_G}{1 - \alpha_G}(V_1(g_1) + V_2(g - g_1))\}. \tag{43}$$

Differentiating m w.r.t. g_1 yields the FOC for the allocation of the resource among the two groups as follows:

$$V_1'(g_1) = \frac{1}{\alpha_G}V_2'(g - g_1). \tag{44}$$

Let the resulting g_1 be denoted as g_1^n. Since $V_1'(g_1^n) > V_1'(\bar{g}_1)$ (since $\alpha_G < 1$), and $V_1''(.) \leq 0$ (from SOC for maximization), we get $g_1^n < \bar{g}_1$. Hence there is lesser share of pie going to group 1 as compared to what they were getting when they were in nexus. Using specific functional forms like before, we can compute this explicitly. Here

$$g_1^n = (\beta\alpha_G)^{\frac{1}{1-\beta}} < \bar{g}_1 = \left(\frac{\beta}{\alpha_G}\right)^{\frac{1}{1-\beta}}. \tag{45}$$

Hence smaller is α_G, the bigger is the gap between what the industry gets from the government when it is in nexus versus when the indigenous group is in nexus. In the limiting case when $\alpha_G \to 0$, $g_1^n \to 0$ (whereas $\bar{g}_1 \to g$).

Hence, in period 1, the industry looks ahead and gets its offer accepted as described in the subsection 2.2. On the other hand, if we let the indigenous group mobilize and lobby before the industry, then they could get their offer accepted right away and hence allocation would be g_1^n as described above and hence more in favor the indigenous group. In short, whoever gets to lobby first gets to move allocation in its favor. Of course, the order in which players move is a moot question.

5. Conclusion

> Historically, mining companies have almost always won their battles against local people. When people say '*Jaan denge par jameen nahin denge'*[We'll give away our lives, but never our land], it probably bounces off them like a light drizzle on a bomb shelter. They've heard it before, in a thousand different languages, in a hundred different countries. (From 'Mr. Chidambaram's War' in Roy [25])

To the best of our knowledge, this paper is one of the first theoretical attempts at incorporating possible nexus between the government and the industry leading to armed upheaval of the affected group. We have proposed a simple set-up, based on Grossman and Helpman [17], to see the ramifications of alleged nexus between the government and the industry in the context of allocation of a public resource and under the possibility of armed resistance by the indigenous group who are initially the primary users of the resource. We get the interesting finding that allocation decision of the government (taken under nexus with the industry) can be forced back to the initial no-nexus-no-resistance level when we allow the possibility of resistance. In fact, given nexus, group 2 is better-off resisting, while group 1 is worse-off and government equally well-off when facing resistance.

Overall, conflict/resistance levels are higher in the no-nexus regime where insurgency operations by the rebel groups are countered by the industry. Both offensives by the tribals and counter-offensives by the industry are each higher compared to the levels when such operations are undertaken by the government in the nexus regimes. In other words, government counter-insurgency operations are lower than the industry's and commensurately, so are the resistance efforts by the indigenous masses. Nexus regimes, even without resistance, is welfare-decreasing for the economy as a whole, while adding resistance makes group 2 better-off, group 1 worse off, and leaves government equally well-off. We also find that, given nexus, the economy as a whole is better off when group 2 resists rather than not. However, the Nash equilibrium occurs when there is no nexus and no resistance.

We also look at two possible extensions of the basic model (without resistance) - one where the industry doesn't confront the indigenous groups militarily but rather through pacifying measures leading to utility enhancement for the indigenous groups, were they to accept such in-kind offers. In this case, we find that the industry could end up having more or less of the

pie compared to its share when in nexus with the government. Another extension considered the possibility of the indigenous group entering into some sort of nexus with the government (presumably via NGOs) in a sequential bargaining game. Like in 2-stage bargaining games, we find that whoever entered the got the opportunity to lobby with the government first, stood better chance of swaying negotiations in its favor.

For future research within the existing framework, we can think of 'campaign contribution' as government revenue, at least part of which is spent on public goods or transfers elsewhere, in a context where the government faces a revenue constraint[13]. So, if we do admit the possibility of higher c improving social welfare, at least for the non-tribal population (not explicitly modeled here), we move into a different set of public policy trade-offs. In fact, one could interpret the state's valuation of c in terms of some kind of relative state capture by non-tribals so that a more democratic state would then go for higher expropriation of tribals. We could do some explicit welfare comparisons between tribals and non-tribals as well: a utilitarian social welfare function could easily mandate high expropriation of tribals despite higher conflict, whereas a Rawlsian one might mandate otherwise.

There is also possibility of further research in empirical directions. For example, we might compare CSR levels of industries in violence-affected regions, government interventions, and also resistance levels by indigenous communities in regions where there is 'alleged' nexus versus those in which such allegations are somewhat mitigated and see how well the predictions of the model hold out. However, since these are very murky waters and a lot of deals are unreported, getting precise predictions and explanations empirically would clearly be an uphill task.

Appendix A. Proof of proposition 2

Assuming Cobb-Douglas functional forms for V_1 and V_2, and letting $\alpha_G \to 0$, we get $\bar{g}_1 = g$, and substituting in (12), we get $c = \hat{U}_G$. Hence we get

$$\bar{U}_1 = g^{\beta} - (1-\beta)\beta^{\frac{\beta}{1-\beta}} - g.$$

Comparing with $\hat{U}_1$, we see that $\bar{U}_1 < \hat{U}_1$. ■

[13]For example, fiscal transfers in India tend to be disjoint from the financial contribution by a region. For instance, the revenue generated from mining and natural resources is generally used for large social and infrastructure needs, but not necessarily in that region where the revenue is raised. There are different arguments in support of this practice the foremost being that the central government has a larger development responsibility as natural resources are unevenly distributed across states. (Political Economy of Land Acquisition and Resource Development in India by Shashi Ratnaker Singh. Paper presented in the'Political Economy of Development' conference at IGIDR, Mumbai, during November 2014.

Appendix B. Proof of proposition 4

Assuming $V_1 = x^\beta$, and $V_2 = x$, we get the following for resistance levels:

$$f_G^* = \frac{{\alpha_G}^{3/4}\sqrt{g_1}\left(g_1^{\beta-1}-1\right)^{3/4}}{1+\sqrt{\alpha_G}\sqrt{g_1^{\beta-1}-1}},$$

$$\frac{f_G^*}{f_G^*+f_2^*} = \frac{\sqrt{\alpha_G}\sqrt{g_1^{\beta-1}-1}}{1+\sqrt{\alpha_G}\sqrt{g_1^{\beta-1}-1}}.$$

Using these we estimate each of the terms of the FOC (25) as $\alpha_G \to 0$ and get the following:

$$\frac{\partial K}{\partial g_1} \approx \sqrt{\alpha_G}\left[\frac{g_1^\beta(\beta-1)g_1^{\beta-2}}{2\sqrt{g_1^{\beta-1}-1}} + \sqrt{g_1^{\beta-1}-1}.\beta.g_1^{\beta-1}\right]. \tag{46}$$

Simplification yields

$$\frac{\partial K}{\partial g_1} \approx \frac{\sqrt{\alpha_G}.g_1^{\beta-1}}{2\sqrt{g_1^{\beta-1}-1}}\left[\beta-1+\beta(g_1^{\beta-1}-1)\right].$$

Now, $\frac{\partial K}{\partial g_1} = 0 \implies g_1^* = \beta^{\frac{1}{1-\beta}}$ which is equal to $\hat{g}_1$. ■

Appendix C. Proof of proposition 6

Using functional forms, $V_1(x) = x^\beta; V_2(x) = x$, we can calculate the optimal conflict investments as given in proposition 5, as follows:

$$\tilde{f}_1 = \frac{g_1^{\frac{3\beta-1}{4}}}{1+g_1^{\frac{\beta-1}{2}}};$$

$$\tilde{f}_2 = \frac{g_1^{\frac{\beta+1}{4}}}{1+g_1^{\frac{\beta-1}{2}}}.$$

Moreover, using the above, we can get the following:

$$\frac{\tilde{f}_1}{\tilde{f}_1+\tilde{f}_2} = \frac{g_1^{\frac{\beta-1}{2}}}{1+g_1^{\frac{\beta-1}{2}}};$$

$$\frac{\tilde{f}_2}{\tilde{f}_1+\tilde{f}_2} = \frac{1}{1+g_1^{\frac{\beta-1}{2}}}.$$

Substituting these we can compute the objective function as given in (28) can be calculated to be the following:

$$U_G = g + g_1^\beta - g_1^{\frac{1+\beta}{2}}. \tag{47}$$

Differentiating w.r.t. g_1, we get, $\tilde{g}_1 = \left(\frac{2\beta}{\beta+1}\right)^{\frac{2}{1-\beta}}$. SOC for maximization holds at this value. Substituting $\tilde{g}_1$ in (47) and simplifying, we get

$$\tilde{U}_G = g + \frac{(1-\beta)(2\beta)^{\frac{2\beta}{1-\beta}}}{(1+\beta)^{\frac{1+\beta}{1-\beta}}}.$$

■

Appendix D. Proof of proposition 8

Substituting the functional forms, we can get the following conflict investments:

$$f_2^* = \frac{(\alpha_G(1-\beta))^{1/4}\beta^{\frac{3-\beta}{4(1-\beta)}}}{\sqrt{\beta}+\sqrt{\alpha_G}\sqrt{1-\beta}};$$
$$\tilde{f}_2 = \frac{(2\beta)^{\frac{3-\beta}{2(1-\beta)}}}{(1+\beta)^{\frac{1+\beta}{2(1-\beta)}}(3\beta+1)}.$$

Now as $\alpha_G \to 0$, $f_2^* \to 0$ while for a fixed β, $\tilde{f}_2 > 0$. Hence we can conclude that $f_2^* < \tilde{f}_2$. Similarly, we can compute that $\tilde{f}_1 > 0$ while $f_G^* \to 0$ as $\alpha_G \to 0$ (and the rate at which it converges to 0 is faster than that of f_2^* since α_G occurs with a higher power in f_G^* than in f_2^*). Hence $f_G^* < \tilde{f}_1$.

Moreover we can compute the relative conflict levels as follows:

$$\frac{f_2^*}{f_2^*+f_G^*} \to 1;$$
$$\frac{f_G^*}{f_2^*+f_G^*} \to 0.$$

Moreover $\frac{\tilde{f}_1}{\tilde{f}_1+\tilde{f}_2} > 0$ and $\frac{\tilde{f}_2}{\tilde{f}_1+\tilde{f}_2} < 1$. Hence we can conclude that $\frac{f_2^*}{f_2^*+f_G^*} > \frac{\tilde{f}_2}{\tilde{f}_1+\tilde{f}_2}$ whereas $\frac{\tilde{f}_1}{\tilde{f}_1+\tilde{f}_2} > \frac{f_G^*}{f_2^*+f_G^*}$ asymptotically. Moreover $\tilde{f}_1+\tilde{f}_2 > f_2^*+f_G^*$ (since the RHS $\to 0$ and LHS is positive). ■

Appendix E. Proof of proposition 9

We can compute that as $\alpha_G \to 0$, $\bar{U}_1 = -c = -\hat{U}_G$, $\bar{U}_2 = g$ and $\bar{U}_G = \hat{U}_G$. Since $\hat{U}_G > 0$, we get $\hat{U}_1 > \bar{U}_1$. Straightforward comparison also yields that $\bar{U}_2 < \hat{U}_2$. Similarly we can algebraically compute the utilities for the players across different regimes to get the result of this proposition. ■

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