Droughts, Land Appropriation, and Rebel Violence in The Developing World*

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Abstract

Scholars note that rebel atrocities against civilians often arise within rural areas in the developing world. This characterization is not far-fetched, and recent data show that rebel atrocities do predominately occur within rural agricultural regions. Yet, the frequency of such incidents also varies substantially across different agricultural regions and years. What accounts for this observed variation in rebel-perpetrated atrocities against civilians within agricultural areas in developing countries? We develop a formal model to address this question, which contends that severe droughts can decrease food availability, prompting civilians to allocate food for immediate consumption and become increasingly willing to defend their diminishing supplies against rebels. This leads rebels to preempt the civilians' defensive efforts by committing atrocities, which forcibly separate civilians from their lands and food stockpiles. In empirically testing this hypothesis at the sub-national level across the developing world, we find robust support for our game-theoretic model's predictions.

Keywords: Droughts, Atrocities, Civil War, Rebel Violence, Croplands

The killing of civilians by armed combatants—which when done intentionally for political motives we term "atrocities"—is widely considered to be one of the most pernicious attributes of modern warfare. It is therefore not surprising that researchers extensively analyzed the potential determinants of this violence within the context of civil conflicts (e.g., Azam and Hoeffler, 2002; Kalyvas, 2006; Wood, 2010; Fjelde and Hultman, 2014). Building upon this body of research, our paper focuses on one key mechanism that we believe may drive rebel groups to perpetrate violence against civilians within rural regions across the developing world: severe droughts. Understanding these dynamics is important given that micro-level evidence (presented below) reveals that atrocities are often committed by rebel groups in rural regions where local food production is more susceptible to the negative effects of drought.

Scholars of rebel violence have used a variety of different approaches to evaluate their theories, including country-year or conflict-year data (Azam and Hoeffler, 2002; Eck and Hultman, 2007), carefully designed case studies (e.g. Kalyvas, 2006; Weinstein, 2007), and grid-cell data from Africa (Fjelde and Hultman, 2014; Wood and Sullivan, 2015). Yet, despite these important contributions, the effect of food production shocks on rebel groups' strategic incentives to victimize civilians has not been carefully analyzed. This is surprising as empirical evidence suggests that rebel violence against civilians tends to concentrate not only in rural areas, as current theories might predict, but specifically in areas that produce food for proximate consumption. Indeed, a close examination of a *global sample* of newly released data on rebel atrocities at the *disaggregated* within-country "grid-cell year" level (PITF, 2009),[1] which also includes rebel atrocities in locations not currently experiencing active fighting between rebels and government forces, reveals two intriguing details that current theories of rebel violence do not adequately explain. Rebel-perpetrated atrocities in the developing world (i) *predominately* arise not only in rural regions, but in agricultural areas specifically (99.6% of all incidents); and (ii) often occur during periods that do not experience active fighting between rebels and government forces within these same agricultural regions (26.4% of all incidents). This evidence suggests that a critical component is missing from

[1] I.e., "cells" of approximately 55km x 55km around the equator (Tollefsen et al., 2012).

our understanding of strategic rebel violence: rebel groups' reliance upon local agricultural resources for their operations and survival. Anecdotal evidence supports this interpretation. For instance, Naxalite rebels in the Bastar, India used violence to expropriate food supplies from the local population during 2004, a year with exceptionally low food production, but did not do so in other years with more abundant food production (Gregory, 2013; Singh, 2006). We argue that this spatiotemporal variation in atrocities is a symptom of one specific, yet understudied, incentive for rebel violence: guaranteeing food security in response to food production shocks.

More specifically, the global grid-cell variation and anecdotal examples discussed above lead to two important and related questions explored here: What drives rebel groups to commit atrocities against civilians as a result of food security concerns in agricultural regions? More broadly, what accounts for the observed variation in the frequency of atrocities committed by rebels across agricultural areas in developing countries? To answer these questions, we develop a game-theoretic model that analyzes strategic interaction between two players: (i) a rebel group and (ii) a group of civilians that reside and work in a region where agricultural (food) production is the main source of income and sustenance. This model thus examines an important dynamic that to our knowledge has not received sufficient attention in extant research, namely, the "strategic competition" over croplands between the rebel group and civilians who farm the land to produce food.

We explain rebel violence against civilians by modeling atrocities as a rationally employed "eviction strategy" under the straining conditions of drought. Treating drought as a causal mechanism for violence has precedence in studies of conflict (e.g., Burke et al., 2009), but has not yet been applied to the empirical study of atrocities. Building on this premise, we examine how severe droughts, which have substantial negative effects on cropland production in developing countries where they commonly occur, affect the strategic calculi of both (i) rebels, and (ii) the civilian population. Our formal model posits that severe droughts diminish agricultural resources, which in turn increases the rebels' incentives to seize food

resources *and* the civilians' incentives to defend their dwindling food supplies. In equilibrium, the rebels expect that over time seizing agricultural resources may become too costly. This compels them to *preempt* defensive efforts by using atrocities *as a strategy* to forcibly evict the civilians from their homes and croplands, as atrocities compel civilians to flee their lands or otherwise give up agricultural resources. We broadly evaluate these expectations by examining agricultural production and violence in Thailand and India; and then empirically validate these contentions using spatially disaggregated atrocities data for the entire developing world.

Our focus on strategic interaction between rebels and civilians during times of drought makes several contributions to the literature. First, our formal model explains why rebels in developing countries often commit atrocities against civilians not only in the countryside—as current theories (e.g., Kalyvas, 2006; Weinstein, 2007) may predict—but specifically in "croplands," where agriculture (i.e., food production) is the main source of income and consumption. In treating cropland as a vital natural resource, we uncover an important mechanism that explains why violence against civilians is more likely in the countryside: production and consumption of agricultural produce. This treatment of cropland as a natural resource is consistent with Wood's findings that some rebels "engage in violence against civilians...to acquire necessary resources and prevent collaboration with government forces" (2010, 612); *and* with Weinstein's contention that violence may occur "[w]here groups lack economic endowments, [and] rebel leaders can promise to provide private rewards expecting that the group will gain access to material resources at some point" (2005, 605). Our drought-based theory also relates to research showing that asymmetric reductions in rebel capabilities, for example via military interventions (Wood, Kathman and Gent, 2012), lead rebels to pursue violence against civilians; Hultman's (2007) finding that battlefield losses compel rebels to commit violence against civilians; and finally to past characterizations of atrocities as arising due to civilians' control over agricultural lands and the disconnect that this causes between these civilians and invading rebel movements (Mkandawire, 2002).

Lastly, our subnational developing country assessment of the above claims demonstrates that food resources-related rebel atrocities are not only confined to African countries—which are the primary focus of current spatially disaggregated studies of atrocities (Azam and Hoeffler, 2002; Fjelde and Hultman, 2014; Wood and Sullivan, 2015)[2]—but also occur with alarming regularity in developing states in Asia, the Middle-East, and Latin America. Hence, this paper advances the study of rebel-perpetrated atrocities by highlighting a crucial, yet understudied, dynamic of violence, and by assessing its effect on a spatially disaggregated *global* sample.

Background Discussion

Numerous studies highlight the negative effects of drought on consumption in developing countries (e.g., Roncoli, Ingram and Kirshen, 2001; Cutler, 1986). This change in consumption habits, alongside civilians' (Burke et al., 2009) and rebels' (Henk and Rupiya, 2001) reliance on locally produced food,[3] suggests that there will be increased competition over these resources. With developing country croplands expected to experience the worst of global warming's drought-associated effects (Vidal, 2013; Burke et al., 2009), our central question is thus: *when* will strategic interactions related to the use of cropland for food consumption between rebels and civilians in developing countries induce rebels to commit atrocities? To answer this question, our model assumes that rebels and civilians interact in rural cropland regions, and that both players (i) value this cropland for consumption and (ii) must account for the effect of possible negative shocks such as a severe drought on their cropland.

These very features have been observed in the Horn of Africa, where structural constraints on farmers' and pastoralists' capital stocks, when combined with droughts, have generated increased risks of widespread violence, social breakdown, and formations of self-defense groups (Mkutu, 2001). Droughts also intensified competition over agricultural output

[2]Note that a number of insightful *non-spatially disaggregated* global studies of atrocities do exist (e.g., Wood, 2010; Wood and Kathman, 2013; Valentino, Huth and Balch-Lindsay, 2004).

[3]Which is especially likely in developing countries where the infrastructure in rural areas is may be frail.

and croplands between farmers and rebel groups like the Naxalites, Janashakti, and Agami Yug in India (Gregory, 2013; Singh, 2006); and the Barisan Revolusi Nasional-Coordinate [BRN-C] in Thailand (Davis, 2005; Srirai, 2008). Further, these dynamics often lead rebels to perpetrate atrocities in these agricultural regions (Singh, 2006; Srirai, 2008).

The above examples highlight how violent interactions between civilian farmers and rebel groups often unfold. With the onset of drought, rebel groups are driven to expropriate the land of local civilian farmers to obtain the output stored on these lands and assure a steady supply of food. In anticipation of this, the farmers can form self defense militias, as happened, for instance, in India (Singh, 2006), Somalia (Hansen, 2013), Sierra Leone (Keen, 2005), Uganda (Mkutu, 2001), and Peru (Gitlitz and Rojas, 1983). Aware of this possibility, the rebels have increased incentives to prevent militia formation and to facilitate expropriation using violence (Singh, 2006; Srirai, 2008). Our model illustrates how these dynamics lead to atrocities against civilians during severe droughts.

The idea that rebels strategically commit atrocities against civilians to attain specific goals is well established in extant studies (e.g., Kalyvas, 2006; Weinstein, 2007; Wood, 2010; Salehyan, Siroky and Wood, 2014; Fjelde and Hultman, 2014).[4] We contend that securing sustenance in the face of sudden scarcity is one goal that justifies such violent means. Our model further shows that atrocities perpetrated by rebels are most likely in rural regions where the government's security presence is negligible (e.g., Kalyvas, 2006; Mkandawire, 2002), especially considering that, as Hendrix and Brinkman (2013, 4) note, "[r]ebel movements typically do not grow their own food and depend on voluntary or *coerced contributions* from the population" (emphasis added). The rebels' strategy of expropriating the civilians' arable land for the purpose of consumption, and the civilians' strategy of defending their land, leads to a "contest" over the latter's agricultural property in our game model. We show that drought *intensifies* this contest, inducing rebels to use atrocities to maximize their chances of successful land-grabbing. This competition can be especially pronounced if

[4]While some studies focus on atrocities perpetrated by state actors (e.g., Valentino, Huth and Balch-Lindsay, 2004; Koren, 2014), analyzing state-led atrocities is beyond the scope of this paper.

rebel groups move into areas where they do not enjoy traditional authority. In these cases, as Mkandawire argues, "[h]aving little in common with the peasantry, and nothing to offer it, they resort to violence as the only way to control it" (2002, 181). We confirm these dynamics below in demonstrating that, to deter civilians from forming defense militias and thus increase the probability of successfully evicting the civilians expropriating their croplands, the rebels are more likely to resort to atrocities during periods of severe drought.[5]

Our broader argument is also consistent with studies that emphasize the importance of "greed" within civil conflicts, especially the contention that armed actors might use violence to secure valuable resources (e.g., Azam and Hoeffler, 2002; Wood, 2010). For instance, rebels in Somalia and Burundi have expropriated agricultural land from local farmers both for consumption and as a "reward" to attract volunteers (Hansen, 2013). Our model highlights the resource-based motivations of *agents*, specifically rebels and civilians, to secure sustenance during droughts, focusing on food access as a mediating factor as suggested by past research (e.g., Theisen, Gleditsch and Buhaug, 2013). Assuming that "[e]very rebel movement aspires to some form of sedentary existence or respite in 'liberated zones"' (Mkandawire, 2002, 200), we hypothesize that the opportunity costs of migration in response to drought are typically high, and entail abandoning stockpiled food or switching from cattle to other forms of livestock that are more transportable across long distances. Rebel groups might thus prefer to operate locally, and supplement their dwindling stocks by extracting additional supplies from the local population, especially as the value of crop stocks rises.

The Model

Assume two players who interact in the rural area of a developing country: a rebel group r (that consists of group members) and a set of rural civilians b (i.e., workers)[6] who work as agricultural labor. The rural civilian laborers b work on their land L to cultivate crops—

[5]We provide additional anecdotal evidence of these dynamics in the Supplemental Appendix.

[6]The rebel group is fully denoted as r_j where $j = \{1, 2, 3...m\}$ and the rural civilian workers as b_i where $i = \{1, 2, 3...n\}$; subscripts i and j are suppressed for notational convenience. Given our theoretical goals, we focus on strategic interaction between r_j and b_i ("r and b") the civilians working on the cropland.

L is hereafter labeled as cropland—to produce food for consumption. "Total production of food" comes from the Constant Elasticity of Substitution (CES) production function $\pi(L, b, K) = [\gamma(\alpha L^{\rho} + (1-\alpha)b^{\rho} + \beta K^{\rho})^{\frac{1}{\rho}}]$[7] which includes three factors of production: cropland L; physical capital K (farm machinery, plows, houses where crops are stored); and rural civilian labor b. In this CES function, $\alpha \in [0, 1]$ is the relative weight of production inputs cropland L and labor b; $\beta \in [0, 1]$ is the weight attached to capital K; $\rho \leq 1$ is the elasticity of substitution; and $\gamma > 0$ the productivity parameter. Let $\phi \in \{0, 1\}$ be the incidence of drought where $\phi = 1$ denotes severe drought; hence the *remaining* share of cropland the civilians use for production and consumption when drought occurs is $(1-\phi)L$. The marginal productivity of this remaining cropland is $(1 - \phi)\pi(L, b, K)$. The rate at which the civilian workers stockpile agricultural produce (i.e., food) generated from their remaining cropland for consumption is s. The total cropland produce stockpiled by b for consumption is thus $s(1 - \phi)\pi(L, b, K)$.

The rebels r seek to expropriate the civilians' cropland L to (i) gain access to the agricultural produce (for consumption)[8] that the civilians b store/hide in houses located on the cropland; and (ii) control the cropland. Expropriating and controlling L also gives the rebels access to the civilians' b labor. The rebels r decision of whether or not to keep the workers on their cropland during a drought is crucial as they are aware *ex ante* that the civilians may oppose $r's$ goal of expropriating and controlling L. Thus, as anecdotal evidence suggests, the rebels may strategically employ atrocities a (e.g., killings) against the civilian workers b to forcibly expropriate their cropland, while the civilians' may form a militia m of forces drawn from b to defend against expropriation and potential atrocities. Let p be the probability with which the civilian labor b successfully defend against r. Given m and a, we let p follow a standard "contest success function", $p = \frac{m}{m+a}$ (e.g., Skaperdas, 1996). The probability with which the rebels (civilians) successfully (fail to) expropriates (defend) the rural civilians'

[7]Developed by Arrow et al. (1961). This CES function is described further in the Supplemental Appendix.

[8]Conversely, if r chooses to migrate to other areas when $\phi = 1$, then r is likely to move away from the local cropland L, reducing their prospects of expropriating and gaining access to food stockpiles. Migration is thus a risky strategy for r, who need the stockpiled food on L for consumption when $\phi = 1$.

(their) cropland is $(1-p) = 1 - \frac{m}{m+a}$.

Let f_r be the rebel group's financial resources used for different activities, including expropriation. If r succeeds in expropriating the civilians' cropland with probability $(1-p)$, they obtain the benefit $s(1-\phi)\pi(L,b,K)$ as controlling L provides r with access to b and the stockpiled food located on L. The rebels incur costs ac_r for committing atrocities a.[9] The rebels' costs of retaining the workers b on the expropriated cropland is given by the convex function $c_r(\frac{1}{2}\theta b^2)$, where $\theta > 0$ is the weight r places on the costs of retaining b.[10] The rebel group's total cost is thus $c_r(a + \frac{1}{2}\theta b^2)$ and their net utility function is

$$u_r = f_r - c_r(a + \frac{1}{2}\theta b^2) + (1-p)[s(1-\phi)\pi(L,b,K)] \tag{1}$$

The rebel group's optimization problem is to maximize (1) with respect to a subject to the constraint $c_r(a + \frac{1}{2}\theta b^2) \leq f_r$. Let mc_b be the civilian workers' costs of forming a self-defense militia m. f_b is the civilians financial resources used for food production. $s(1-\phi)\pi(L,b,K)$ is the total cropland output stockpiled for consumption. Since the civilians successfully defend their cropland from r with probability $p = \frac{m}{m+b}$, their net utility function is

$$u_b = f_b - mc_b + p[s(1-\phi)\pi(L,b,K)] \tag{2}$$

The rural civilians optimization problem is to maximize (2) with respect to m, subject to $mc_b \leq f_b$. The sequence of play, influenced by the examples of rebel group-rural civilian interaction discussed below, is as follows. A severe drought ϕ occurs that is observed by r and b. Having observed ϕ, the civilians stockpile food s from their surviving cropland for consumption. The rebels then choose whether or not to expropriate the civilians' cropland using atrocities a given ϕ, while the civilians choose m given r's choice of a. The players' actions influence p and $(1-p)$, and subsequently their realized payoff.

[9] Includes operational costs (e.g. mobilization costs of recruiting individuals) to carry out atrocities.
[10] That is, the costs of keeping the workers as bonded or regular wage-earning workers.

Equilibrium Result and Comparative Statics

Lemma 1: *In the subgame perfect Nash equilibrium of the game between* r and b*, the (i) optimal agricultural produce (food) generated from the cropland* L *and stockpiled by the rural civilian labor* b *for consumption is* $s^* = \frac{f_r}{(1-\phi)\gamma(\alpha L^\rho+(1-\alpha)b^\rho+K^\rho)^{\frac{1}{\rho}}}$*. The optimal militia size* b *can form for defense against the rebels* r *is* $m^* = \frac{s(\phi[(L+K)-\phi b]^2)}{4a(1+\phi)}$ *while the marginal productivity of* b *working on* L *is* $(1-\phi)\left[\gamma(\alpha L^\rho + (1-\alpha)b^\rho + K^\rho)^{\frac{1}{\rho}-1}\right](1-\alpha)b^{\rho-1}$*. (ii) The optimal atrocities level committed by* r *is* $a^* = \sqrt{\frac{m}{\phi}s}(\phi[(L+K)-\phi b]^2) - \frac{m}{\phi}$*.*

The **formal proof** of Lemma 1 is provided in the Supplemental Appendix. Two sets of comparative static results derived from the subgame-perfect Nash equilibrium in Lemma 1 explain when and why the rebel group will commit atrocities against the workers b. The first set of comparative static results are

Proposition 1: *When severe drought occurs* ($\phi = 1$), (i) *the rural civilian labor will stockpile in equilibrium agricultural output* $s^* > 0$ *from their cropland for consumption and* (ii) *the rebels' strictly dominant strategy is to expropriate the civilians' cropland.*

The logic behind Proposition 1 (the propositions' **formal proof** is in the Supplemental Appendix) that provides the foundation for Proposition 2's prediction (stated below) is as follows. First note that when severe drought occurs ($\phi = 1$), it adversely affects the civilians' consumption habits (formally proven in "proof of claim 1" in Supplemental Appendix). The civilians compensate for this adverse effect by stockpiling food $s^* > 0$ generated from their surviving arable cropland (part (i), Proposition 1); this action ($s^* > 0$) is common knowledge to all the players. In response, the rebels r seek to expropriate the civilians' remaining arable cropland if $s^* > 0$ to gain *direct access* to s^*, since the stockpiled food is located on the cropland itself. Indeed, the opportunity to gain direct access to s^* is a powerful motivation to expropriate the cropland, as the rebels require the food stockpiled on L for their own immediate consumption in a drought.[11]

[11] Conversely, transporting the stockpiled food from the cropland to another location imposes transaction costs on the rebels, and also increases the possibility that the food may rot during the process. This further incentivizes the rebels to obtain and consume stockpiled food.

Further, expropriating the civilians' cropland allows the rebels not only to control the physical source of the stockpiled food, but also the surviving arable cropland. Controlling this land is crucial; it facilitates continuous access to the gathered food s^* for r and, as a result, helps the rebels to maintain their consumption levels during a drought and secure a steady supply of stockpiled food. This allows r's leaders to make credible promises to group members about their ability to obtain and (re)distribute the stockpiled food (see "proof of claim 2", Supplemental Appendix), which helps recruitment and fosters cohesion within r. Finally, a severe drought intensifies competition between the civilians and the rebels over consuming s^*, and sharply curtails r and b's incentives to share consumption of s^*, now a significantly *limited finite resource*. Such competition reinforces the rebels' need to control the cropland to exploit the civilians' land for their own consumption. It also ensures that cropland expropriation emerges as a strictly dominant—and cooperation with the civilians over sharing s^* strictly dominated— strategy for r when $\phi = 1$ (part (ii), Proposition 1).

Statistically evaluating our claim that rebels choose to expropriate croplands during droughts is difficult, because (to our knowledge) no cross-national data on food stockpiling and agricultural expropriation is publicly available. Yet the following examples described in detail in the Supplemental Appendix reveal the plausibility of these claims. Consider Bastar and Dantewada — agricultural districts in Chattisgarh, India where rice is the predominant crop — where Naxalite rebels actively operate (Singh, 2006; Pandita, 2011). When a severe drought struck Bastar and Dantewada in 2004, villagers in these two districts "accumulated rice in numerous *anaj ghars* located on their rice fields" (Singh, 2006, 71). As predicted by our theory, this induced the Naxalites to expropriate the villagers' rice fields to get food for sustenance, and to feed the rank and file of their group[12], and ensure a steady food supply given uncertainty created by the drought (Gregory, 2013). In Somalia, civilians in Lower Juba's rural agricultural region gathered and hid (in houses) food for consumption when this region was affected by a drought in 2011; this invited land-grabbing attempts by Al Shabaab

[12]Ministry of Home Affairs, *Annual Report* 2004—05 (Official Documents Section in the Library of the Central Secretariat—Shastri Bhawan), Government of India, New Delhi (2005: 39-40)

rebels (Hansen, 2013). Further, in the Songkhla province of Thailand — where rice is the predominantly cultivated crop — a comparable rebel group, the Barisan Revolusi Nasional-Coordinate (BRN-C), operates. During the intense drought of 2004, farmers working in the rice-producing areas of Rattaphum, Na Mom and Bang Klam in Songkhla province stored significant amounts of rice on their rice fields for future consumption (Srirai, 2008; Rattanachaya, 2004, 47-48). This influenced the BRN-C to decide to raid and capture rice fields in Rattaphum, Na Mom, Bang Klam to acquire, distribute among group members and eat rice stored by farmers in the rice fields (Rattanachaya, 2004; Srirai, 2008).

To provide more systematic quantitative evidence for the link between droughts and land expropriation by rebels we geocoded data on rainfall and agricultural land expropriation by rebels at the *district-level* in India and the *province-level* in Thailand. In India, rebel groups such as the Naxalites, Agami Yug, and Janashakti operate across the following seven states (where cropland expropriation and killing of civilians by rebels occur): Andhra Pradesh, Bihar, Chattisgargh, Jharkand, Madhya Pradesh, Orissa, West Bengal. As discussed in the Supplemental Appendix, we use these data to assess the link between severe drought and expropriation of cropland by rebels in 58 agricultural districts within the aforementioned seven Indian states between 2002 and 2009 (the years for which data were available) where rice, bajra, and kharif are produced for consumption (NREGA, 2010). Analysis of this district-year sample (see Supplemental Appendix) reveals that severe droughts *significantly increased* the extent of agricultural property expropriation by rebels in India during 2002-2009. These results are statistically significant, substantively sizable, and robust to many model specifications, including penalized maximum likelihood estimation.

We conducted a similar analysis for Thailand. Studies on rebel violence show that over 90% of the civilians killed by rebel groups (e.g., the Pattani United Liberation Organization and BRN-C) in rural areas resided in 18 provinces (plotted and listed in the Supplemental Appendix) (Davis, 2005; Helbardt, 2011). These provinces produce 80% of Thailand's five key crops: rice, sugarcane, rubber, corn, and maize.[13] Correspondingly, we geocoded data

[13]See National-Statistics-Office (1985). This source is listed in the Supplemental Appendix.

on rainfall, cropland expropriation by rebels, and other key indicators for each of these 18 Thai provinces from 2004 to 2010. As described in the Supplemental Appendix, statistical analysis from the Thailand province-year data reveals that the impact of drought on land expropriation by rebels in our Thailand province-year sample is again *positive and statistically significant* across many model specifications. Thus, our Thailand and India analysis, and anecdotal evidence, suggest that our argument that rebels expropriate agricultural land from civilians during severe droughts is plausible.

Yet note that in equilibrium the rebels recognize *ex ante* that when $\phi = 1$ they face a significant trade-off *ex post* in respect to expropriation. On the one hand, they can peacefully co-opt or capture the civilian workers b and use them as labor for agricultural production on these expropriated croplands. But retaining the workers b on L will compel r to share the food stockpiles with b, at least up to the amount necessary for survival. On the other hand, the rebels can *expel* these civilian workers from their land and consume the stockpiled food without sharing it. Our model suggests that when severe drought occurs, the rebels address this trade-off by choosing *not* to employ the civilians for agricultural production, expelling (i.e., evicting) them from the cropland instead. Further, as shown in Proposition 2, r will strategically employ atrocities against the civilians to evict them from L during a drought. Before proceeding to Proposition 2 however, we present three comparative statics derived from Lemma 1 to explain why the rebels will evict the civilian workers from L when $\phi = 1$.

First, during a severe drought, the civilian workers productivity exhibits sharp diminishing marginal returns ($\pi_b < 0$, $\pi_{bb} < 0$ for $\phi = 1$). The rebels thus understand *a priori* that their *returns* from keeping these workers on the expropriated croplands is *negative* in this context.[14] This is hardly surprising. Severe droughts erode the workers' physical ability to work owing to water shortages, which reduces their capacity to work in the fields. Based on this formal result, we argue that labor's declining productivity during droughts is a key reason for why rebels *would not* keep workers on the expropriated cropland, but instead evict them. Second, comparative statics show that during a severe drought, the finite stockpiled

[14]See Supplemental Appendix for formal proof of this claim.

food s^* available post-expropriation will shrink rapidly *if* the civilian workers stay on the expropriated cropland, because both the rebels and civilians will consume it (see Supplemental Appendix for proof of this claim). Hence the presence of civilians on the expropriated croplands substantially exacerbates population pressures with respect to consumption of the finite stockpiled food during a drought, thus prompting "food insecurity" (Urdal, 2008; Wischnath and Buhaug, 2014). Such population pressures on limited food supplies during drought engender more uncertainty about food consumption, which further incentivizes the rebels to evict the civilians from their cropland to ensure that there are less civilians to feed and thus more food available for r to consume (see Supplemental Appendix for proof of this claim).

Third, comparative statics show that the civilians recognize that the rebels cannot credibly commit to *not* forcibly seize $b's$ cropland L and evict workers from L when $\phi = 1$ as $r's$ incentives to do so is common knowledge. This encourages the civilians to form a militia m to defend their agricultural land from confiscation by r (rather than co-operate with the rebel group), as expropriation and eviction by r will deprive the civilians from consuming food stockpiles on L. Hence, the workers b cannot credibly commit not to form a militia. Correspondingly, the rebels recognize that *if* the civilians form a *sizable* militia to defend their stockpiled food and cropland from r,[15] then $r's$ costs from seizing and exploiting the civilians' cropland for food consumption will rise substantially and become prohibitive (see Supplemental Appendix for proof of this claim). Thus the rebels will have additional incentives to forcibly *evict* the civilian workers from their cropland L as these workers cannot form a militia to oppose r when they are forced to flee from L.

Historical evidence from the 2004 drought in the rice fields of Bastar and Dantewada (in India) and Songkhla in Thailand corroborate these three comparative static claims. For instance, India's Home Ministry reported that after the monsoon failed in 2004, farmers and *adivasis* residing in Bastar and Dantewada discussed formation of defense groups to defend

[15]Meaning that m reaches an upper threshold level $\overline{m}$ (formally characterized in Lemma 1's proof).

their agricultural land from being raided by the Naxalites.[16] As described in detail in the Supplemental Appendix, the Naxalite rebels believed that if the farmers in these two districts formed self-defense militias, then these farmers would make it difficult for the Naxalites to get access to the peasants' rice fields and crops stored in *anaj ghars*, militarily challenge them and deprive the Naxals of food for consumption[17] during the drought (Pandita, 2011; Singh, 2006, 31-32). The Naxalites in Bastar and Dantewada thus took the "critical decision" of expelling the peasants and adivasis from their farmlands[18] so that the farmers could *not* hinder their appropriation goals (Singh, 2006; Shankar, 2006). This eviction decision was further reinforced by their belief that owing to the drought the farmers would be an unproductive workforce who would not add much to crop production (Pandita, 2011; Singh, 2006).

Similarly, researchers and media sources suggest that farmers in Rattaphum, Na Mom and Bang Klam in Songkhla (Thailand) during the 2004 drought discussed among themselves to put together defense associations[19] to deter the BRN-C from appropriating their rice fields. The BRN-C felt that such self-defense militias would seriously impeded their goal of capturing and controlling rice fields in Rattaphum, Na Mom and Bang Klam[20] situated in Songkhla (see Supplemental Appendix for more details). The BRN-C leaders also viewed the continued presence of farmers in the rice fields of Songkhla province as a financial liability given their diminished capacity to work because of water scarcity[21] resulting from the failed 2004 monsoon (Janchitfah, 2004; Rattanachaya, 2004; Srirai, 2008). The BRN-C's view of farmers as a liability and threat to their land-grabbing goals influenced them to *expel* the peasants from the rice-fields of Rattaphum, Na Mom and Bang Klam[22] which they sought to appropriate (Janchitfah, 2004; Srirai, 2008). Farmers also sought to form self-defense groups

[16] *Ministry of Home Affairs*, "Status Paper on the Naxal Problem,"18 August 2004, Internal Security Division. Government of India, New Delhi; also see Shankar (2006).

[17] *Ministry of Home Affairs*, "Status Paper on the Naxal Problem," *Ibid.*, pp. 11-12.

[18] *Planning Commission of India*. 2008. "Development Challenges in Extremist Affected Areas: Report of an Expert Group." Government of India: New Delhi.

[19] Chongkittavorn (2004, 17).

[20] See Chongkittavorn (2004).

[21] Srirar (2008, 21).

[22] Srirai (2008).

to protect their agricultural land from rebels during intense droughts — which induced local rebels to seek to evict these farmers — in Lower Jubba (Somalia) during the 2011 drought (Hansen, 2013) and in Arequipa (Southern Peru) in 1982 (Gitlitz and Rojas, 1983).

Thus the preceding examples and comparative statics show that the declining productivity of labor, commitment problems between r and b, and the possibility that the civilian workers may form a militia to oppose r strongly encourages the rebels to evict rather than retain the workers on the cropland when $\phi = 1$.[23] Eviction also accomplishes another goal for the rebels which further encourages them to expel the workers: it reduces the rebels' costs of confiscating the cropland L as the workers cannot undertake the necessary organizational effort to develop m to defend L when forced to flee. Given the rebels' rationale for evicting the civilians from L and the result in Proposition 1, all of which arise when $\phi = 1$, the final set of comparative statics from our model (stated in Proposition 2) suggest that during a severe drought, the rebels will commit atrocities against the civilians to facilitate eviction and increase the probability of successfully grabbing cropland and food supplies.

Proposition 2: *During a severe drought* ($\phi = 1$), *the* (i) *equilibrium level of atrocities* a^* *committed by the rebel group* r *strictly increases; and* (ii) *probability* $(1 - p)$ *with which* r *successfully seizes the civilian workers' cropland strictly increases for* $a^* > 0$.

The intuition behind Proposition 2 (the proposition's **formal proof** is in the Supplemental Appendix) is as follows. To start, recall that the finite food stockpiles s^*will shrink rapidly in a severe drought if the civilian workers b remain on the expropriated cropland L as both b and r need to consume these stockpiles for survival. Hence if the civilian workers remain on L, then the available amount of stockpiled food obtained from L (post-expropriation) will be *insufficient* for basic sustenance required for survival by the rebel group, which r understands *ex ante*. As suggested by scholars, under severe drought conditions, insufficient crop stockpiles can engender and accentuate food insecurity and competition over finite food supplies between residents (civilian workers and the rebels in our case) in rural agricultural areas of developing states (Wischnath and Buhaug, 2014; Fjelde, 2015, 527). Building on

[23]See the Supplemental Appendix for formal proof of this claim.

this insight, our model suggests that such food insecurity and competition over finite food supplies encourages the rebels to not only evict the civilians b from L but also commit atrocities (during expropriation) against b — as these civilians are easy targets for predatory rebel groups— to facilitate eviction when $\phi = 1$ (part (i), Proposition 2). Three reasons derived from our model account for this claim.

The first reason is that killing civilian workers allows the rebels to reduce the number of civilians, thus helping r to curb population pressures on the finite stockpiled food resource. This ensures that the rebels can consume a greater share of the stockpiled food because a greater amount of s^* obtained from the cropland is available to r for consumption when the civilians are removed. The second reason is that killing the workers b allows the rebels to send a powerful *observable* signal to these workers that they (r) will *not* share the stockpiled food on L with b during the drought but rather evict b from the cropland. As such, the signal sent to the civilian workers during a severe drought — by $r's$ strategy of increasing the frequency of atrocities against the workers—helps the rebels to generate fear among b. This fear influences the civilians to flee from their cropland, which facilitates the rebel group's goal of forcible eviction and land expropriation, including the stockpiled food on L.

Third, r recognizes that committing more atrocities against the civilians b will allow the rebels to *credibly* threaten the civilians' physical integrity in equilibrium. The threat is credible since the rebels' *net utility* from committing atrocities a is higher than their benefits from retaining the civilians b on L during a drought which is reinforced by the workers' declining productivity (see Supplemental Appendix for formal proof of this claim). The credibility of the threat produced by committing atrocities helps r to compel b to flee from their cropland which makes it unlikely that the civilians will form a militia therein leading to a decrease in the possibility of m^*.[24] This increases the *ex post* probability $(1-p)$ with which r successfully seizes the civilians' cropland (part (ii), Proposition 2) and fully captures the consumption benefits of the surviving arable land, thus providing the rebels with additional incentives *ex ante* to increase atrocities against civilians.

[24]That is $\frac{\partial m^*}{\partial a} < 0$ as shown in the proof of part (i) proposition 2 in Supplemental Appendix.

Anecdotal evidence gathered from Bastar and Dantewada (in Chattisgarh, India) and Songkhla (in Thailand) further bolster our theoretical claims. To this end, first note that a report issued by India's Home Ministry in 2005 pointed out that when the monsoon failed in 2004 in Chattisgarh over a thousand people were killed by the Naxals in Bastar and over 3000 houses were burnt by the Naxalites circulate.[25] Another study posited that the Naxalites in Bastar and Dantewada committed atrocities against civilians during the 2004 drought which resulted in, "150,000 people have been displaced, approximately one-third of whom were officially living in camps as of February 2006; some 500 to 1000 people have been killed and over 3000 houses burnt" (Gregory, 2013, 18). Further, results from our India district-year sample reveals (discussed below) that the outbreak of severe drought in rural croplands of India leads to statistically positive increase in civilians killed by rebels (e.g., Naxalites) operating in these croplands.

Why did the Naxalites consistently carry out such indiscriminate acts of violence against farmers in Bastar and Dantewada during the 2004 drought? To answer this question, the print media and academics have suggested that during the 2004 drought, the Naxalites (as predicted by our theory) *indiscriminately killed* farmers living in Bastar and Dantewada in 2004 to prevent consumption of limited food by rural residents; indeed, the lesser the farmers living on arable lands, the greater the amount of crops that the Naxals could consume.[26] Another goal the Naxalites hoped to achieve by massacring farmers and tribals in Bastar in the 2004 drought was — also suggested by our theory — to send a clear message to the local farmers[27] that they would be physically harmed if they did not leave their rice fields[28]; this meant that the Naxals were strategically using acts of murder and brutality against villagers to generate fear among the villagers as such fear would compel the villagers to run away from their rice fields[29] and hide in neighbouring forests (Singh, 2006; Pandita, 2011). Finally, we

[25] *Ministry of Home Affairs*, "Revisiting the Naxal Problem,"14 July 2005, Internal Security Division (Shastri Bhawan). Government of India, New Delhi, pp. 3-4.

[26] Shankar (2006, 91); also, see "Maoist shadow over Chhattisgarh", *The Times of India*, 16 May 2005; Singh (2006).

[27] Shankar (2006,59). Also, *Ministry of Home Affairs*, *op.cit*, fn.26; Singh (2006).

[28] Shankar (2006); Singh (2006).

[29] Shankar (2006, 59-60).

describe in more depth in the Supplemental Appendix that the Naxalites in Bastar and Dantewada during the 2004 drought also recognized that forcing the civilians to flee from their fields by killing these civilians would help them to capture the rice fields, obtain stored food for consumption, and make it impossible for the farmers to build defence organizations that could challenge[30] the Naxalites' land appropriation goals (Singh, 2006; Shankar, 2006; Gregory, 2013).

Similarly, the BRN-C resorted to killing farmers in Rattaphum, Na Mom and Bang Klam (in Songkhla) as a tactic to evict these farmers from their rice fields when the region suffered from a serious drought in 2004 (Rattanachaya, 2004; Chongkittavorn, 2004; Srirai, 2008). In fact, the Government of Thailand's Ministry of Interior report in 2005 points out that there was a sharp (almost 90%) increase in villagers killed in Songkhla during the drought of 2004 and moreover, beheading, hangings and beatings of farmers in Songkhla became a frequent occurrence.[31] Some scholars also documented that during the 2004 drought in Songkhla the BRN-C killed over a thousand farmers in Rattaphum, forcefully displaced them from their fields,[32] and captured grain stockpiles (Chongkittavorn, 2004; Rattanachaya, 2004). Statistical estimates from our Thailand province-year sample discussed later show that intense droughts in rural crop producing regions lead to sharp increases in civilians killed by rebel groups in these regions.

Scholars and policy pundits in Thailand have suggested that the rampant killing of civilians in Songkhla during the 2004 drought was driven by strategic considerations. Indeed, as our theory predicts, the first objective behind the BRN-C led killing of civilians in Songkhla in 2004 was to send a clear signal to the farmers that their presence in the rice fields would not be tolerated; thus murdering the villagers would produce a deep-rooted fear among farmers that their lives would be in danger if they remained on their farms.[33] Generating fear among the farmers in Songkhla (by resorting to indiscriminate killings) to expel them from

[30] See Shankar (2006); Singh (2006).

[31] *Ministry of Interior*, July 2005,"Civilians Attacked and Villages Raided by BRN-C in Songkhla in 2004." Bangkok: Government of Thailand.

[32] Davis (2005); Srirai (2008).

[33] Ministry of Interior, July 2005, *op. cit*, fn.32; Also, see Chongkittavorn (2004).

their farms was seen — as suggested by our theory and as described in the Supplemental Appendix — by the BRN-C commanders as a tactic to discourage farmers from forming associations to defend their farmland and crops [34] and their property (Rattanachaya, 2004; Davis, 2005). The BRN-C's second objective for killing farmers in Rattaphum, Na Mom and Bang Klam in Songkhla was driven by the need to curtail the number of individuals who could consume the limited amount of rice stored by the farmers on their croplands in the 2004 drought (Chongkittavorn, 2004; Rattanachaya, 2004; Davis, 2005). As suggested in an interview given by a captured BRN-C leader "Hama", the BRN-C killed farmers in Rattaphum, Na Mom, Bang Klam to get them to leave their farms and prevent them from eating rice saved in *B̂ān k̄ĥāws* as the BRN-C wanted to consume this rice.[35]

Building on this detailed anecdotal evidence from Bastar, Dantewada and Songkhla, we conducted a brief statistical analysis of rebel-perpetrated atrocities within both our aforementioned district-year data for India (2002-09) and province-year data Thailand (2004-10) to evaluate key claims from our model. Our findings, discussed in full detail in the Supplemental Appendix, suggest a statistically significant positive association between severe droughts and rebel-perpetrated atrocities in these two cases. These results, and our model's predictions, suggest the following hypothesis, which is statistically evaluated below:

- **H:** Within rural cropland areas of developing countries, severe droughts will be associated with an increased frequency of rebel-perpetrated atrocities against civilians.

Empirical Analysis

Our hypothesis posits that drought-affected agricultural areas within developing countries will be more likely to experience rebel-perpetrated atrocities than will comparable areas that do not exhibit similar drought conditions. We test this hypothesis on a sample encompassing

[34] Chongkittavorn (2004, 12). Also see Janchitfah (2004); Srirai (2008).

[35] Hama's interview recorded and discussed in *Ministry of Defense*, March 2005, "Domestic Security Problems in Thailand" (White Paper), Bangkok: Supreme Command Headquarters.

14 years (1995-2008)[36] and 138 developing countries.[37] These data are first structured into a cell-year level dataset wherein cells — our cross-sectional unit of interest — are measured at the 0.5 x 0.5 decimal degree resolution[38] for our developing country land areas (Tollefsen et al., 2012). We then retain only those terrestrial cells that can be reasonably classified as pertaining to rural cropland areas. To achieve this, we first identify the extent of cropland within each of our developing country cells, as based upon the percentage of a cell's area whose land cover class was determined to be (irrigated and non-irrigated) cropland by the Globcover 2009 project's analysis of global satellite imagery data (Bontemps, Defourny and Van Bogaert, 2009), which are plotted for our developing country sample in Figure 1. We then omit all cells that were identified as having zero cropland, thereby ensuring that the remaining cells in our developing country sample most closely correspond to the "rural/agricultural" context that is assumed by our formal model.[39] There are approximately 26,860 total cells observed for any given year within our 1995-2008 sample period, with the average developing country in our sample containing roughly 197 cropland cells.

The dependent variable, atrocities_t, is operationalized as the yearly (t) count of atrocities committed against civilians by insurgents within a sample cell. This measure was coded from the PITF Worldwide Atrocities Dataset, which defines atrocities as "implicitly or explicitly political, direct, and deliberate violent action resulting in the death of noncombatant civilians" (PITF, 2009, 3). The PITF uses a primary set of seven international news and NGO sources[40] to collect and code a reasonably systematic sample of atrocities occurring worldwide, 1995-2014, and then uses human coders to accurately record each atrocity's geolocation. The resultant PITF data thereby limit the starting year for our sample to 1995.

[36]The total temporal range for which information on our variables was available.

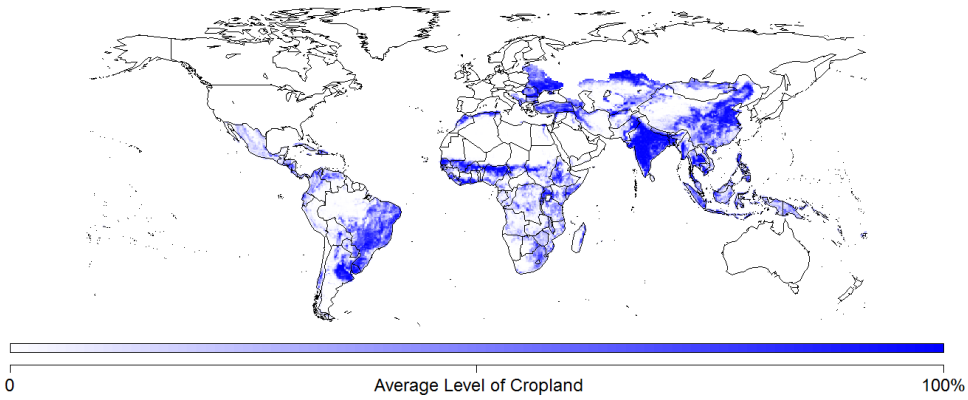
[37]We use the International Statistical Institute's threshold to identify our sample countries (ISI, 2012). The developing countries included in our sample are listed in the Supplemental Appendix.

[38]I.e., cells of approximately 55 x 55 kilometers at the equator (3025 square kilometers area).

[39]Note that we (i) control for the *extent* of cropland within these remaining cells in our analysis and (ii) examine alternate "rural/agricultural" criteria in our robustness section, including samples of all developing country cells with little to no urban land (Bontemps, Defourny and Van Bogaert, 2009).

[40]Specifically, Agence France Presse, Associated Press, New York Times, Reuters, CNN, BBC World Monitor, All-Africa, and `http://syrianshuhada.com/`—though additional local and NGO/IGO sources can appear as primary or secondary sources in the PITF data when quoted by the aforementioned sources.

Figure 1: Cropland Levels within Developing Country Sample (1995-2008)



The PITF records information on both atrocities campaigns and atrocity incidents where five or more noncombatant deaths occurred,[41] and we focus on incidents to ensure comparability across cases, and to facilitate temporal aggregation. Given that our theory pertains to rebel perpetrators exclusively, we further limit our atrocity cases to atrocity incidents arising from perpetrators identified as members of nonstate organizations or groups with no allegations of state support—which correspond to roughly 33% of all atrocity incidents for our years of interest—and then sum each cell's identified atrocity incidents to the yearly level. There are 2,446 incidents in our 1995-2008 sample, with an average cell-year count, standard deviation, and range of 0.007, 0.207, and 0-60. Additional summary statistics, histograms, and spatio-temporal plots of atrocities$_t$ appear in the Supplemental Appendix. For our sample, a total of 75 countries experienced at least one rebel-perpetrated atrocity, underscoring our earlier contention that rebel-perpetrated atrocities are not limited to active civil wars.

Given the event count nature of atrocities$_t$, we employ a negative binomial (NB) model in our baseline specification below. In doing so, we are relaxing the (Poisson) mean-variance equality assumption so as to allow for a conditional variance in our observed counts that

[41] An incident is defined as "[a]n atrocity perpetrated by members of a single organization or communal group, or by members of multiple organizations or groups reportedly acting in concert, in a single locality within a 24-hour period" (PITF, 2009, 6), whereas campaigns correspond to a residual category for atrocities that lack sufficient information for the identification of incidents.

is larger than our count measure's conditional mean. The observed values for atrocities$_t$ lend support to this decision, as the variance of this measure (0.042) is far larger than the corresponding mean (0.007). However, there are also a disproportionate number of zero count observations in our sample, relative to positive atrocities$_t$ count values, with over 99% of all observations recording a zero value on atrocities$_t$. Given this feature, as well as the actuality that, for many cells, atrocities were highly improbable due to either a stringent rule of law, a harmony of interests, or an absence of any human presence, many of our sample-zeroes are likely reflective of cell-years that could never have experienced atrocities under any circumstances, rather than count stage instances in which a rebel could have initiated an atrocity, but chose not to do so. Ignoring this feature, and treating all zero observations as true count stage zeroes, risks biasing our estimates. To avoid these biases, we must statistically account for the mixture of excess zeroes that exist within atrocities$_t$.

We use a zero-inflated negative binomial (ZINB) model to do so. This approach draws upon recent studies that have recognized the potential for zero-inflated count processes within event counts of similar phenomena, including domestic conflicts arising within subnational units (e.g., Hegre, Ostby and Raleigh, 2009) and instances of violence against civilians measured at a comparable (PRIO-GRID) level of aggregation to that used here (Fjelde and Hultman, 2014). Accordingly, we build upon our baseline NB specification with a series of ZINB specifications. The latter models allow us to evaluate the effects of our covariates upon the very cases that are of most interest to the study at hand: cell-years that are *potentially* atrocity-prone. The ZINB model specifically does so by combining the results from a binary logit equation testing for whether (or not) a zero observation is likely to have been produced by the zero-only data generating process (d.g.p.) with the results of a negative binomial count equation that tests for the effect of our covariates on the expected frequency of rebel-perpetrated atrocities$_t$, conditional on a case being non-zero inflated. We equate such a case in our application to a cell-year that is at least structurally able to experience an atrocity incident, which we can contrast with a cell devoid of any human presence or interaction due to

climate and geographic factors, or with a cell that simply lacks the opportunity for atrocities due to (i) an absence of conflict-prone social conditions or (ii) a harmony of interests.

Recall that our hypothesis expects drought-affected areas in developing countries to experience higher frequencies of rebel-perpetrated atrocities than areas not affected by drought. We thus construct a binary independent variable — drought_t — that is measured at the same 0.5 x 0.5 cell resolution as our dependent variable, and merge this to our cell-year global grid-sample. We operationalize drought_t using a Standardized Precipitation Index (SPI) that aggregates monthly precipitation data to the cell-year level (Tollefsen et al., 2012). Using monthly rainfall deviations from the local norm, the SPI classifies various forms of dryness, including (i) moderate dryness (cell-years that saw at least three consecutive months of moderate dryness) and (ii) severe dryness (cell-years that saw at least two consecutive months of severe dryness). We follow existing conventions (Tollefsen et al., 2012) and classify a "severe" drought_t as one in which both conditions i and ii are met, and code drought_t as 0 otherwise. We report summary statistics for drought_t in our Supplemental Appendix, and evaluate additional operationalizations of drought in our robustness section.

In addition to drought_t, several cell-year level controls are added to the count stage of our NB and ZINB model specifications. These variables are derived from either the PRIO-GRID (Tollefsen et al., 2012) or from the PITF's atrocities data. We lag all time varying political-economic controls (which could mediate the effects of droughts) by one year but maintain the current-year measures for our (largely time invariant and exogenous) geographic controls. Summary statistics for all control variables are listed in Table A.1 of the Supplemental Appendix. Several of our cell-level controls were included to ensure that any findings pertaining to drought_t are robust to proximate levels of conflict and social strife. Here we include cell-level one year lags of civil conflict_{t-1} presence, local ethnic diversity_{t-1},[42] and the spatial lag of atrocities_{t-1}. Our models also control for a cell's broader geographic characteristics by adding each cell's ln cell area_t, ln border distance_t, and the percentage of a cell's area denoted as urban and cropland (Bontemps, Defourny and Van Bogaert, 2009), each

[42] I.e., a count of the number of politically relevant ethnic groups in a particular cell (Tollefsen et al., 2012).

of which is time-invariant. We account for civilian population, as well as state-penetration and economic wealth more generally, by controlling for each cell's ln population$_{t-1}$, travel time$_t$ to the nearest major city (in logged minutes) and logged gross cell product (Nordhaus, 2006). Our robustness models then further isolate the effects of drought$_t$ by controlling for additional cell-level variables such as ln precipitation$_t$, and temperature$_t$, and drought$_{t-1}$.

In order to better ensure that it is indeed drought$_t$—and not the country-level political-economic conditions that could potentially exacerbate the effects of droughts—that are affecting atrocities$_t$, a larger specification presented below also includes a number of additional country-year level controls. We again lag each control by one calender year where appropriate. These country-year control variables first account for a country's political regime via an ordinal polity$_{t-1}$ indicator (Marshall, Jaggers and Gurr, 2013), as political regime-type is related to both atrocities against civilians (e.g., Ulfelder, 2012) and agricultural development (Bates and Block, 2013). Next, we add a country's overall ln GDP pc$_{t-1}$ (World Bank, 2012), given that aggregate economic development has been shown to be associated with atrocities (Ulfelder, 2012). We then cluster our standard errors on cell-id in all models below, and add cubic polynomials for time to account for temporal dependence in our largest specifications.

Lastly, we add several control variables to the inflation-stage of our ZINB models. Recall that this stage accounts for the factors that systematically predispose some cells to be structurally (non) atrocity-prone. As population presence is a necessary condition for a cell to have at least some opportunity for rebel-perpetrated atrocities, we include our three primary population measures, ln travel time$_t$ to the nearest major city, urban$_t$ land area, and ln population$_{t-1}$ within our inflation stage. We expect these to be positively (ln travel time$_t$) and negatively (urban$_t$ and population$_t$) associated with inflation. Our justification for including population-oriented variables in our inflation-stages is consistent with civil conflict research (Hegre, Ostby and Raleigh, 2009; Fjelde and Hultman, 2014). We argued more generally above that stable socio-political environments, harmonies of interests, and an absence of violence each limit the opportunities for atrocities to arise within some cells

and regions. Hence, we also include our cell-level civil conflict$_{t-1}$ measure, and later our country-level indicators of polity$_{t-1}$ and ln GDP pc$_{t-1}$, in our inflation stages. While we demonstrate above that civil conflict$_{t-1}$ does not predict rebel-perpetrated atrocities in a deterministic sense, we do believe it to affect atrocity-opportunity in a probabilistic sense. This is consistent with conflict studies employing ZINB models, which have demonstrated that past civil conflict is a robust predictor of zero-inflation in these contexts (e.g., Fjelde and Hultman, 2014; Bagozzi, 2015). Finally, while our theory contends that drought$_{t-1}$ will affect the *incidence* of atrocities$_t$, we additionally control for drought$_{t-1}$ in the inflation stage of our large ZINB specification so as to ensure that our primary findings are also robust to the inclusion of drought$_{t-1}$ in this stage.[43]

Results

Table 1 first reports a baseline NB model of rebel-perpetrated atrocities, which includes drought$_t$ and several key cell-level controls. This model is followed by a comparable ZINB model that includes our aforementioned cell-level inflation stage covariates, a medium ZINB specification that includes our full set of cell and country-level control variables, and then a full ZINB specification that all adds our spatial and temporal controls. All results strongly support the hypothesized effect of drought$_t$ on atrocities. The baseline NB model suggest that—controlling for a cell's recent levels of civil conflict, population, and geographic location—increases in drought$_t$ have a statistically significant positive effect on the frequency of rebel-perpetrated atrocities. Our baseline and medium ZINB specifications similarly indicate that once one has controlled for these factors, in addition to conditioning on an observation being a potential atrocity site in year t, drought$_t$ continues to have a positive and statistically significant effect on atrocities. The full ZINB model demonstrates that this statistically significant effect of drought$_t$ remains even after further controlling for a cell's potential spatial and temporal dependencies. Table 1 therefore supports our hypothesis and suggest that, (un)conditional on a cell being able to experience rebel-perpetrated atrocities in year t, the presence of droughts increases the rate at which civilians in that geographic

[43]We thank an anonymous reviewer for this suggestion.

area experience atrocities at the hands of rebels.

Next, we examine the inflation stages of Models 2-4 to verify that our decision to use zero-inflated models was defensible. As expected, the inflation stage estimate for civil conflict$_{t-1}$ is consistently negative and significant, suggesting that civil conflicts make a cell less likely to be inflated, and thus more likely to be able to experience rebel atrocities. Ln population is negative and significant in Model 2-4, implying that more populated cells are more able to experience rebel atrocities in year t. Urban$_t$ is negative and significant in Model 2, but insignificant in Models 3-4. The former result implies that, like population, more urbanized (i.e., populated) cells are more likely to be able to experience atrocities in the present year. Controlling for these population dynamics, the negative and significant coefficient estimate on ln travel time$_t$ in Models 3-4 implies that more rural cells are more apt to experience such conflicts. While ln GDP pc$_{t-1}$ is not consistently significant, Polity$_{t-1}$ is negative and significant in the ZINB stage of Models 3-4, indicating that more democratic countries are more able to experience rebel-perpetrated atrocities. Finally, drought$_t$ is insignificant in our inflation stages. In sum, our inflation stage generally performs as expected, which suggests that our decision to account for inflation was correct.

To assess the substantive impact of drought$_t$, we next turn to Table 2, which presents the percentage differences in expected values of rebel-perpetrated atrocities$_t$, given an increase in drought$_t$ from 0 (no drought) to 1 (severe drought), and compares this first difference to those derived from two additional highly significant predictors of atrocities$_t$ (i) a 0-to-1 change in civil conflict$_{t-1}$ and (ii) one standard deviation (SD) increase in splag atrocities$_{t-1}$. For each first difference, we hold all other variables at their means or modes.[44] The changes that we observe in a cell's estimated level of rebel-perpetrated atrocities in response to a extreme drought are substantial. Experiencing a severe drought is expected to lead to a 41.12% increase in the expected number of yearly rebel-perpetrated atrocities. This percentage change is (i) moderately larger to what we would expect to see given a 0-to-1 change 1SD

[44]These quantities were calculated from the outcome stage of our Model 4 estimates, and thus report the effects of each variable on an (already) atrocities-prone observation.

Table 1: **Count Model Estimates of Rebel-Perpetrated Atrocities, 1995-2008**

	Model 1: Baseline NB	**s.e.**	**Model 2: Baseline ZINB**	**s.e.**	**Model 3: Medium ZINB**	**s.e.**	**Model 4: Full ZINB**	**s.e.**
Count Stage								
Drought$_t$	0.313*	(0.127)	0.397*	(0.144)	0.508*	(0.218)	0.336*	(0.130)
Civil conflict$_{t-1}$	2.119*	(0.095)	0.825*	(0.250)	0.919*	(0.417)	0.238*	(0.076)
Ln travel time$_t$	0.016	(0.152)	-0.195	(0.261)	0.213	(0.353)	0.035	(0.099)
Ln cell area$_t$	0.050	(0.134)	0.0002	(0.135)	-0.170	(0.171)	-0.105	(0.111)
Ln population$_{t-1}$	0.605*	(0.064)	0.319*	(0.112)	0.588*	(0.238)	0.077	(0.064)
Ln GCP$_{t-1}$	.	.	.	.	-0.174	(0.136)	-0.019	(0.083)
Polity$_{t-1}$	.	.	.	.	-0.081	(0.029)	-0.001	(0.007)
Ln border distance$_t$	.	.	.	.	0.378*	(0.074)	0.025	(0.025)
Urban$_t$	.	.	.	.	0.033	(0.034)	0.019	(0.020)
Cropland$_t$	.	.	.	.	-0.009*	(0.003)	-0.001	(0.002)
Ethnic Diversity$_{t-1}$	.	.	.	.	-0.039	(0.075)	-0.044	(0.034)
Ln GDP pc$_{t-1}$	.	.	.	.	0.546*	(0.167)	-0.019	(0.072)
Splag Atrocities DV$_{t-1}$	.	.	.	.	.	.	0.645*	(0.149)
t	.	.	.	.	.	.	-40.149*	(0.134)
t^2	.	.	.	.	.	.	20.061*	(0.078)
t^3	.	.	.	.	.	.	-3.459*	(0.014)
Constant	-0.478	(0.779)	-6.361*	(1.955)	12.354*	(5.627)	0.016	(1.412)
Inflation Stage								
Ln population$_{t-1}$	.	.	-0.354*	(0.134)	-0.412*	(0.210)	-0.458*	(0.063)
Ln travel time$_t$	.	.	-0.333	(0.227)	-0.072*	(0.231)	-0.684*	(0.132)
Civil conflict$_{t-1}$	.	.	-1.827*	(0.198)	-2.727*	(0.282)	-5.408*	(0.097)
Urban$_t$	.	.	-0.124*	(0.041)	-0.123	(0.068)	-0.038	(0.022)
Ln GDP pc$_{t-1}$	.	.	.	.	1.146*	(0.467)	-0.186	(0.103)
Polity$_{t-1}$	.	.	.	.	-0.162*	(0.062)	-0.042*	(0.013)
Drought$_t$	.	.	.	.	0.307	(0.302)	-0.017	(0.228)
Constant	.	.	8.092*	(1.910)	-2.325	(7.664)	-10.814	(1.785)
Observations	366,124		366,124		333,243		333,243	
Log-psuedoikelihood	-9,593.36		-9,499.24		-7,197.42		-1,665.74	

Note: * indicates $p < 0.05$; values in parentheses are robust standard errors clustered by cell-id.

Table 2: **Percentage Change in Expected Atrocities Count in Year** t

Drought$_t$	**Civil conflict$_{t-1}$**	**Splag Atrocities DV$_{t-1}$**
+41.12%	+27.23%	+1.98%
(+8.64% ↔ +80.77%)	(+9.42 ↔ +47.03)	(+1.09% ↔ +2.87%)

Note: Drought$_t$ and civil conflict$_{t-1}$ were each changed from $0 \rightarrow 1$. Splag Atrocities DV$_{t-1}$ was increased 1SD above its mean. Values in parentheses are 95% confidence intervals.

increase in civil conflict$_{t-1}$ (+27.13%), and substantially larger than the effect of a 1SD change in a splag atrocities$_{t-1}$ (+1.98%). Hence, the first-differences presented in Table 2 indicate that the substantive effects of drought$_t$ are indeed sizable.

Robustness Tests

To evaluate the sensitivity of our findings, we examine a number of alternative specifications in the Supplemental Appendix. For these robustness tests, we estimate the "full" ZINB-specification presented in Table 1 and then assess the statistical significance of each drought coefficient estimate therein. To begin, we first separately verify that our results are robust to the inclusion of (i) year fixed effects and (ii) a spatially lagged dependent variable in inflation stage of our full ZINB-specification. We then assess whether our findings for drought$_t$ are arising due to omitted variable bias, with particular regard to a selection of additional controls for a country's degree of ethnic fractionalization, polity$^2_{t-1}$, a cell's annual temperature, each cell's (logged) level of annual precipitation, and cell-level government perpetrated atrocities$_{t-1}$. Our primary conclusions remain after adding these additional controls.[45] We next evaluate an alternative operationalization of drought$_t$ by including the complete SPI (discussed above) in place of drought$_t$. Our findings remain comparable when using this more graded measure of (extreme) local dryness.

Likelihood ratio tests favor the ZINB over the ZIP for all models in Table 1. Nevertheless, we also verify that our findings are robust to the latter. Our developing country sample is global, whereas the study of atrocities, as well as studies of the effects of climatic factors on political violence, have predominately focused on the African continent. Addressing this distinction, we find that our results are robust to an exclusive focus on the African continent. We likewise obtain positive and significant findings for drought$_t$ when using a dependent atrocities variable derived from the Georeferenced Events Dataset (GED; Sundberg and Melander, 2013) as opposed to our PITF-based measure. We next examine a model that uses a sample of all developing country "rural" grid-cells based upon whether urban land area

[45] Though drought$_t$ is now only significant at the $p < .10$ level.

is scarce to nonexistent, rather than based upon whether some positive amount of cropland is present. This robustness model indicates that our primary conclusions hold under this alternative threshold for a (rural) cell's inclusion in our sample. Lastly, we also evaluate the robustness of all models reported in Table 1 while including all developing country grid-cells—and find that our conclusions are robust to these adjustments as well.

Conclusion

This paper contends that droughts can increase the incidence of rebel-perpetrated atrocities against civilians in agricultural areas of developing countries. When severe droughts occur, our formal model posits that agriculture resources diminish, leading civilians to allocate more agricultural supplies for consumption, and to invest more in defending their diminishing supplies. In response, rebels will attempt to preempt civilians' defensive efforts by seeking to forcibly evict civilians from their homes and croplands. This strategy drives rebels to commit atrocities, as atrocities induce civilians to flee from their land or otherwise give-up food resources. After deriving these propositions formally, we empirically establish that droughts are a consistent positive indicator of rebel-perpetrated atrocities against civilians.

Our findings have a number of important implications for the study of violence against civilians. In recent years, the study of rebel-perpetrated atrocities has greatly benefited from numerous exceptional theories of the strategic dynamics underlying rebels' decisions to employ violence against civilians within conflict settings (e.g., Azam and Hoeffler, 2002; Wood, 2010; Fjelde and Hultman, 2014). Yet, as noted above, a high proportion of contemporary rebel-perpetrated atrocities not only occur predominantly within agricultural regions, but also transpire in locations that are not currently experiencing active fighting between rebels and government forces. To explain this variation, we develop a game-theoretic model that does not necessitate the existence of active civil conflict as a prerequisite for violence against civilians. Drawing on extant research concerned with the effects of climatic factors on conflict (e.g., Burke et al., 2009; Buhaug, 2010; Hendrix and Salehyan, 2012), we then find drought to be an important causal mechanism in promoting atrocities in rural developing areas.

These contributions represent an important step forward in advancing our understandings of political violence and the factors governing its variation.

Given the likelihood of more severe global droughts in future years due to climate change (Vidal, 2013), the identified linkages between droughts and atrocities also have important policy relevance. Indeed, this study has not only identified a salient predictor of atrocities, but has also illuminated a possible mechanism by which a subset of atrocities could be ameliorated; through better drought preparedness and agricultural assistance within atrocity prone regions of the world. Our findings also suggest that improved food security may more generally help regions avoid atrocities both during and between periods of active fighting. A key insight of our theory is that food insecurity, and drought-based shocks to food security, can undermine food access, which in turn increases rebel forces' pursuit of violence against civilians and the levels of civilian resistance in response to such tactics. These trends are apt to grow in the future, as the effects of climate change increasingly undermine food security in the developing world. As such, the study of climate change's varied effects on atrocities against civilians represents an especially compelling area for future research.

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Supporting Information For

"Droughts, Land Appropriation, and Rebel Violence in The Developing World"

Contents

This supplemental appendix proceeds in seven parts. In the section immediately below, we present the corresponding proofs to our game-theoretic model. The second section then provides detailed anecdotal evidence of the causal mechanisms discussed within our formal model for the following four cases: India, Thailand, Somalia, and Peru. In the third section, we fully discuss and assess our micro-level evidence for the effects of drought$_t$ on (i) expropriation$_t$ and (ii) civilian deaths$_t$ within the India (district-year) and Thailand (province-year) samples that were referenced within our main paper. In addition to summarizing these country-specific data, models, and results, we further plot the districts and provinces included within our respective Thailand and India samples, and present summary statistics (including figures and tables) and robustness models for the expropriation$_t$ dependent variable. The latter robustness models demonstrate that our findings for the positive effects of drought$_t$ on expropriation$_t$ (in both the India and Thailand analyses) are generally robust to an alternative estimation strategy that employs a penalized maximum likelihood logistic regression in place of the probit models reported in the main paper.

In the fourth section, we report a variety of graphical and tabular summary statistics for our global developing country grid-cell-year sample's atrocities$_t$ dependent variable, drought$_t$ independent variable, and control variables. Next, we provide the full robustness model estimates for the global sample's alternative model specifications discussed in the main paper. This is followed by a fifth section, which provides a collection of additional anecdotal evidence pertaining to the various causal mechanisms discussed in the main paper's theory section.

In the sixth section below, we first list in Table **A.9** the 58 districts (2002-09) and 7 states that constitute the India district-year sample. We then list the primary and secondary data sources employed to operationalize the following dependent and independent variables for the India district-year sample: *expropriation*, *civilians killed* and *severe drought*. This is followed by Table **A.10**, which describes the operationalization of the dependent, independent and control variables for the India sample and lists the sources used for operationalizing the controls in this sample. The seventh part to our supplemental appendix first reports in Table **A.11** the 18 provinces (2004-2010) that comprise the Thailand province-year sample. We then list the primary and secondary data sources used to operationalize the following dependent and indepen-

dent variables for the Thailand province-year sample: *land expropriation*, *civilians death* and *harsh drought*. Table **A.12** then describes the operationalization of the dependent, independent and control variables for the Thailand sample and lists the sources used for operationalizing the controls in this sample.

I. Proofs

Proof of Lemma 1: From equation (1) in the text, the rebel group r's optimization problem is to maximize $f_r - c_r(a + \frac{1}{2}\theta b^2) + (1-p)[s(1-\phi)\pi(L,b,K)]$ – where $\pi(L,b,K) = \gamma(\alpha L^\rho + (1-\alpha)b^\rho + \beta K^\rho)^{\frac{1}{\rho}}$– with respect to a subject to $c_r(a + \frac{1}{2}\theta b^2) \leq f_r$ (this constraint means that it is feasible for r to commit atrocities against b only if their total costs of doing so is lesser than f_r; it is also equivalent to $f_r \leq \frac{c_r}{(a+\frac{1}{2}\theta b^2)}$). Since it is rational for r to commit a if and only if $c_r \leq s(1-\phi)\pi(L,b,K)$, the constraint $f_r \leq \frac{c_r}{(a+\frac{1}{2}\theta b^2)}$ is re-written as $f_r \leq \frac{c_r}{s(1-\phi)\pi(L,b,K)}$. Because $(1-p) = (1 - \frac{m}{m+a})$, $r's$ optimization problem is fully defined as:

$$\begin{aligned} \max_a \; & f_r - c_r(a + \frac{1}{2}\theta b^2) + (1 - \frac{m}{m+a})[s(1-\phi)\gamma(\alpha L^\rho + (1-\alpha)b^\rho + K^\rho)^{\frac{1}{\rho}}] \\ s.to. \; & f_r \leq \frac{c_r}{s(1-\phi)\gamma(\alpha L^\rho + (1-\alpha)b^\rho + K^\rho)^{\frac{1}{\rho}}} \end{aligned} \tag{A.1}$$

$b's$ optimization problem is to maximize $f_b - mc_b + p[s(1-\phi)\pi(L,b,K)]$ with respect to m subject to $f_b \geq mc_b$(this constraint means that it is feasible for b to build a militia only if their costs of doing so is lesser than f_b). The constraint $f_b \geq mc_b$ is also defined as $f_b \geq \pi(L,b,K)$ as this condition rules out the possibility that $f_b < mc_b$. Since $p = \frac{m}{m+a}$, $b's$ optimization problem is therefore fully defined as

$$\max_m f_b - mc_b + \frac{m}{m+a}[s(1-\phi)\pi(L,b,K)] \;\; s.to. \;\; f_b \geq \pi(L,b,K) \tag{A.2}$$

From Equation A.1 and the complementary slackness condition, the optimal a is found with straightforward optimization: $\frac{\partial u_r}{\partial a} = \pi(L,b,K)(1-\phi)\left[\frac{\partial p}{\partial a}s - 1\right] = 0$ which is equivalent to $\frac{\partial u_r}{\partial a} = \gamma(\alpha L^\rho + (1-\alpha)b^\rho + K^\rho)^{\frac{1}{\rho}}(1-\phi)\left[\frac{\partial p}{\partial a}s - 1\right] = 0$. From the preceding expression and

given that $(1-p) = (1-\frac{m}{m+a})$ we obtain $a^* = \sqrt{\frac{m}{\phi}s(\phi[(L+K)-\phi b]^2)} - \frac{m}{\phi}$ for $m^* < \overline{m}$ and $a^* = 0$ for $m^* \geq \overline{m} = \phi s((L+K)-\phi b)^2$. For $a^* > 0$, $p = \frac{1}{(1+\frac{\phi a^*}{m})}$ in equilibrium. From complementary slackness and (A1.2), the optimal m is found via straightforward optimization: $\frac{\partial u_b}{\partial m} = -(1-\phi)\pi(L,b,K) - \frac{\partial p}{\partial a}(1-\phi)s\pi(L,b,K) = 0$ which given $p = \frac{1}{(1+\frac{\phi a^*}{m})}$ leads to $m^* = \frac{s(\phi[(L+K)-\phi b]^2)}{4a(1+\phi)}$ for $m^* < \overline{m}$ and $m^* = \phi s(\phi[(L+K)-\phi b]^2)$ for $m^* \geq \overline{m}$. $s > 0$ in equilibrium if and only if $s(1-\phi)\pi(L,b,K) \geq f_r \; \forall \phi \in [0,1]$. Further, $s(1-\phi)\pi(L,b,K) > f_r$ which $\Rightarrow s(1-\phi)\gamma(\alpha L^\rho + (1-\alpha)b^\rho + \beta K^\rho)^{\frac{1}{\rho}} > f_r$ when $\phi < \overline{\phi}$ where $\overline{\phi} = \frac{\pi(L,b,K)-f_r}{\pi(L,b,K)}$. From $s(1-\phi)\pi(L,b,K) \geq f_r$, it follows that in equilibrium, the optimal $s^* = \frac{f_r}{(1-\phi)\pi(L,b,K)} = \frac{f_r}{(1-\phi)\gamma(\alpha L^\rho+(1-\alpha)b^\rho+\beta K^\rho)^{\frac{1}{\rho}}}$. The marginal productivity of the cropland with respect to the factors or production given ϕ is $(1-\phi)\pi(L,b,K)$. Hence the marginal productivity of the rural labor working on the cropland in equilibrium given ϕ is $(1-\phi)\frac{\partial \pi(L,b,K)}{\partial b} = (1-\phi)\left[\gamma(\alpha L^\rho + (1-\alpha)b^\rho + \beta K^\rho)^{\frac{1}{\rho}-1}\right] (1-\alpha)b^{\rho-1}$.

Proof of Proposition 1: (i) From $s^* = \frac{f_r}{(1-\phi)\gamma(\alpha L^\rho+(1-\alpha)b^\rho+\beta K^\rho)^{\frac{1}{\rho}}}$, we find that $s^* > 0$ for $\lim \phi \to 1$ and thus $\phi = 1$. Additionally, $\frac{\partial s^*}{\partial \phi} = \frac{\pi(L,b,K)f_r}{[(1-\phi)\pi(L,b,K)]^2} > 0$ for $\lim \phi \to 1$ and $\phi = 1$. (ii) Substituting s^*in a^* in Lemma 1 leads to $a^* = \sqrt{\frac{w}{\phi}s^*(\phi[(L+K)-\phi b]^2)} - \frac{m}{\phi}$. For $s^* > 0$ (which occurs when $\phi = 1$) we get $\frac{\partial a^*}{\partial s^*} = \frac{\sqrt{m}/2\sqrt{s^*}}{\sqrt{\phi}}\phi[(L+K)-\phi b)]^2 > 0 = (\sqrt{w}/2\sqrt{s^*})[(L+K)-b)]^2 > 0$ for $\phi = 1$. When $a^* > 0$, then the rebel's payoff from expropriation in equilibrium (given $(1-p)$) is $\Pi_r = \left(1-\frac{m^*}{m^*+a^*}\right)[(1-\phi)\pi(L,b,K)s^*]$. Note that $\Pi_r > 0$ for $a^* > 0$, $s^* > 0$. In contrast, if r chooses to cooperate and share s^* with b, then $s^* < 0$ or at most $s^* = 0$. If $s^* = 0$, then $\widehat{a}^* \leq 0$ for $\phi = 1$. Let $\widehat{\Pi}_r = \left(1-\frac{m^*}{m^*+\widehat{a}^*}\right)[(1-\phi)\pi(L,b,K)s^*]$ be the rebel group's payoff from expropriation when $\widehat{a}^* \leq 0$. If $\widehat{a}^* \leq 0$ in equilibrium, then one can easily check that $\widehat{\Pi}_r \leq 0$. Because $\Pi_r > \widehat{\Pi}_r$, it follows that the rebel group's strictly dominant strategy is to expropriate when $\phi = 1$, while not expropriating and co-operating with b is strictly dominated for $\phi = 1$.

Proof of Claim 1: We need to show that $\pi_L < 0$ for $\phi = 1$ to prove this claim. From $(1-\phi)\pi(L,b,K) = (1-\phi)\gamma(\alpha L^\rho + (1-\alpha)b^\rho + \beta K^\rho)^{\frac{1}{\rho}}$, we get $\frac{\partial \pi}{\partial L} = (1-\phi)$ $\left[\gamma(\alpha L^\rho + (1-\alpha)b^\rho + \beta K^\rho)^{\frac{1}{\rho}-1}\right] \alpha L^{\rho-1}$. Note that $(1-\phi)\left[\gamma(\alpha L^\rho + (1-\alpha)b^\rho + \beta K^\rho)^{\frac{1}{\rho}-1}\right]$ $\alpha L^{\rho-1} < 0$ for $\phi = 1$ as claimed.

Proof of Claim 2: When the rebel group expropriates the cropland during a drought, they also (by default) fully confiscate the input factors of production; that is, they obtain $\pi(L,b,K) = \gamma(\alpha L^{\rho} + (1-\alpha)b^{\rho} + \beta K^{\rho})^{\frac{1}{\rho}}$ where $\pi(L,b,K) > 0$. When the rebel group "controls" $\pi(L,b,K)$, then from the equilibrium level of $s^* = \frac{f_r}{(1-\phi)\gamma(\alpha L^{\rho}+(1-\alpha)b^{\rho}+\beta K^{\rho})^{\frac{1}{\rho}}}$ in Lemma 1, $s^* > 0$ for $\phi = 1$ and $\pi(L,b,K) > 0$. For $s^* > 0$ and $\pi(L,b,K) > 0$, then for each rebel group member $u_r = f_r - c_r(a + \frac{1}{2}\theta b^2) + (1 - \frac{m}{m+a})[s^*(\pi(L,b,K))] > 0$. This implies that $s^* > 0$ can be credibly promised to the rebel group members when $\phi = 1$ only if the cropland is appropriated. Conversely, if the rebels do not appropriate the cropland, they will not (again by default) confiscate the input factors of production $\pi(L,b,K)$ which $\Longrightarrow \pi(L,b,K) = 0$. Consequently, $s^* \to 0$ when $\pi(L,b,K) = 0$ for $\phi = 1$. For $s^* \to 0$, $u_r = f_r - c_r(a + \frac{1}{2}\theta b^2)$ which means that $u_r \leq 0$ in this case since $f_r \leq c_r(a + \frac{1}{2}\theta b^2)$. Thus $s^* > 0$ cannot be credibly promised to the rebel group members when $\phi = 1$ when the cropland is not appropriated.

Proof of $\pi_b < 0$ and $\pi_{bb} < 0$ for $\phi = 1$— First note that from $c_r(a + \frac{1}{2}\theta b^2)$, it follows that$\frac{dc_r}{db} = \theta b > 0$. Define the function $q = (1-\phi)\pi_b$ where $\pi_b = \frac{\partial \pi(L,b,K)}{\partial b}$. From Lemma 1, $q = \pi_b = (1-\phi)\left[\gamma(\alpha L^{\rho} + (1-\alpha)b^{\rho} + \beta K^{\rho})^{\frac{1}{\rho}-1}\right](1-\alpha)b^{\rho-1}$ which, as stated earlier, is the marginal productivity of the rural labor working on the cropland. One can check that $(1-\phi)\left[\gamma(\alpha L^{\rho} + (1-\alpha)b^{\rho} + \beta K^{\rho})^{\frac{1}{\rho}-1}\right](1-\alpha)b^{\rho-1} < 0$ for $\phi = 1$ which $\Longrightarrow \pi_b < 0$ for $\phi = 1$. The aforementioned expression for $q = \pi_b$ can also be written as $\pi_b = \frac{\partial q}{\partial b} = (1-\phi)\frac{q}{b}\Delta_b$ where $\Delta_b = \frac{(1-\alpha)L^{\rho}}{\alpha L^{\rho}+(1-\alpha)b^{\rho}+\beta K^{\rho}}$. We need to check the sign of $\pi_{bb} = \frac{\partial \pi^2(L,b,K)}{\partial b^2}$ to complete the proof. Deriving the sign of π_{bb} reveals that

$$\pi_{bb} = (1-\phi)\left[\frac{q}{b}\Delta_b b^{-2}\right][(1-\rho)\Delta_b + (\rho - 1)] \tag{A.3}$$

In Equation A.3, $\left[\frac{q}{b}\Delta_b b^{-2}\right] > 0$ while $[(1-\rho)\Delta_b + (\rho-1)] < 0$ and $0 < \Delta_b < 1$. Hence for $0 < \Delta_b < 1$ and $\rho < 1$, it follows that $\pi_{bb} < 0 \; \forall b \in \Re_+$ and $\lim \phi \to 1$, $\phi = 1$ as claimed.

Proof of rebels' returns from the factor input of these workers is negative while costs of maintaining these workers is strictly positive when $\phi = 1$: If the rebels "co-operate" with the rural civilian labor and thus keep the civilian labor on the cropland post-expropriation, then they will account for the marginal productivity (that determines the marginal returns) from

this labor and marginal costs of maintaining these civilian workers. Hence from u_r, we can define the rebels' net utility $\overline{u}_r$ from keeping the labor force on the cropland in equilibrium as $\overline{u}_r = f_r - c_r a^* - \frac{dc_r}{db} + (1 - \frac{m^*}{m^*+a^*})\pi_b$ where $\pi_b = (1-\phi)\left[\gamma(\alpha L^\rho + (1-\alpha)b^\rho + \beta K^\rho)^{\frac{1}{\rho}-1}\right]$ $(1-\alpha)b^{\rho-1}$. Substituting $(1-\phi)\pi_b$ and $\frac{dc_r}{db} = \theta b > 0$ for $\theta > 0$ in $\overline{u}_r$ leads to

$$\begin{aligned}\overline{u}_r =& f_r - c_r(a^* + \theta b) + (1 - \frac{m^*}{m^*+a^*}) \\ & [s^*(1-\phi)\left[\gamma(\alpha L^\rho + (1-\alpha)b^\rho + \beta K^\rho)^{\frac{1}{\rho}-1}\right](1-\alpha)b^{\rho-1}] \end{aligned} \tag{A.4}$$

where $(1 - \frac{m^*}{m^*+a^*})[s^*(1-\phi)\left[\gamma(\alpha L^\rho + (1-\alpha)b^\rho + \beta K^\rho)^{\frac{1}{\rho}-1}\right](1-\alpha)b^{\rho-1}] = 0$ for $\phi = 1$ and by construction $f_r - c_r a^* - c_r\theta b < 0$. Hence $\overline{u}_r < 0$ since $(1-\phi)\pi_b < 0$ and $\frac{dc_r}{db} = \theta b > 0$ when $\phi = 1$ which implies that co-opting or capturing and using the rural civilian labor for agricultural production is strictly dominated for r.

Proof of $\frac{\partial s^*}{\partial b} < 0$ for $\phi = 1$: Recall from Lemma 1 that $s^* = \frac{f_r}{(1-\phi)\pi(L,b,K)} = \frac{f_r}{(1-\phi)\gamma(\alpha L^\rho + (1-\alpha)b^\rho + K^\rho)^{\frac{1}{\rho}}}$ and that $(1-\phi)\frac{\partial \pi(L,b,K)}{\partial b} = (1-\phi)\left[\gamma(\alpha L^\rho + (1-\alpha)b^\rho + K^\rho)^{\frac{1}{\rho}-1}\right](1-\alpha)b^{\rho-1}$. Hence $\frac{\partial s^*}{\partial b} = \frac{-f_r\left[(1-\phi)\gamma(\alpha L^\rho + (1-\alpha)b^\rho + K^\rho)^{\frac{1}{\rho}-1}(1-\alpha)b^{\rho-1}\right]}{\left((1-\phi)\gamma(\alpha L^\rho + (1-\alpha)b^\rho + K^\rho)^{\frac{1}{\rho}}\right)^2} < 0$ for $\lim \phi \to 1$, $\phi = 1$.

Proof of $s^* > 0$ for $b \to 0$ when $\phi = 1$: If $b \to 0$, then $s^* = \frac{f_r}{(1-\phi)\gamma(\alpha L^\rho + K^\rho)^{\frac{1}{\rho}}}$. From this expression, we find that $s^* > 0$ when $\phi = 1$. Hence $s^* > 0$ for $b \to 0$ when $\phi = 1$. For $s^* > 0$ and $b \to 0$, $\frac{\partial u_r}{\partial s^*} = (1 - \frac{m}{m+a})[(1-\phi)\gamma(\alpha L^\rho + \beta K^\rho)]^{\frac{1}{\rho}}$. Because $(1 - \frac{m}{m+a})[(1-\phi)\gamma(\alpha L^\rho + \beta K^\rho)]^{\frac{1}{\rho}} > 0$, it follows that $\frac{\partial u_r}{\partial s^*} > 0$ for $s^* > 0$ and $b \to 0$ when $\phi = 1$. Conversely, if $b > 0$ for $\phi = 1$, then $\frac{\partial s^*}{\partial b} < 0$ (see proof of claim 5). In other words, s^* strictly decreases for $b > 0$ when $\phi = 1$. s^* strictly decreasing $\Longrightarrow s^* \to 0$. When $s^* \to 0$, then $\underline{u_r} = f_r - c_r(a + \frac{1}{2}\theta b^2) \leq 0$ since $f_r \leq c_r(a + \frac{1}{2}\theta b^2)$. Hence $\frac{\partial u_r}{\partial s^*} > \underline{u_r}$ which means that the rebels have no incentives to share the stockpiled food with (but will rationally deprive) the rural civilian labor in the appropriated cropland during a drought. This $\Longrightarrow s^* \to 0$ for b when $\phi = 1$.

Proof of b will not co-operate (or join) r but with form $m > 0$: From the previous proof, $s^* \to 0$ for b when r expropriates the cropland during $\phi = 1$. Hence if the rural civilian labor "co-operates" with r when $s^* \to 0$ for b, then from $u_b = f_b - mc_b + p[s^*(1-\phi)\pi(L,b,K)]$ it

follows that $\overline{u}_b = f_b - mc_b$. Suppose that the civilian workers invest in developing m to prevent confiscation of L from r. This increases the possibility of $s^* > 0$ for b when $\phi = 1$. Then $m > 0$ and from $p = \frac{m}{m+a}$, we obtain $\frac{\partial p}{\partial m} > 0$; substituting $\frac{\partial p}{\partial m}$ in u_b leads to $\widehat{u}_b = f_b - mc_b + \frac{\partial p}{\partial m}[s^*(1-\phi)\pi(L,b,K)]$. Since $[s^*(1-\phi)\pi(L,b,K)] > 0$ for $s^* > 0$ and $\frac{\partial p}{\partial m} > 0$, it follows that $\widehat{u}_b > \overline{u}_b$. This $\Rightarrow \widehat{u}_b - \overline{u}_b > 0$ which in turn means that $m > 0$ is a strictly dominant strategy – while co-operating with r is strictly dominated by $m > 0$ – for the rural civilian workers when $\phi = 1$.

Proof of r keeping b on L being risky: If the finite set of the civilian labor b work on the rebel-confiscated cropland, then for $\phi = 1$ – and expropriation by r – it is plausible that m (where $m \subseteq b$) strictly increases, that is $m > 0$ (as shown in proof of claim 7). Let μ be the probability with which the civilian labor b (who work on the expropriated cropland) use their militia to oppose r. To maintain consistency with the model, μ is defined as the contest success function $\mu = p = \frac{m}{m+a}$. Thus $1-\mu$ (the probability with which the rebels' hold onto the confiscated cropland) is $1-\mu = 1 - \frac{m}{m+a}$. If $m > 0$, $\frac{\partial \mu}{\partial m} = \frac{a}{(m+a)^2} > 0$ and $u_b > 0$ for $\frac{\partial \mu}{\partial m} > 0$. Conversely, for $m > 0$ $\frac{\partial(1-\mu)}{\partial m} = -\frac{a}{(m+a)^2} < 0$ and $u_r < 0$ for $\frac{\partial(1-\mu)}{\partial m} < 0$. Thus it is highly risky for r to keep b on L as this weakens the rebels' ability to control L as $m > 0$ for b when $\phi = 1$

Proof of Proposition 2: (i) $a^* = \sqrt{\frac{m}{\phi}s^*}(\phi[(L+K)-\phi b)]^2) - \frac{m^*}{\phi}$ for $m^* < \overline{m}$ and $s = s^*$. $\frac{\partial a^*}{\partial \phi} = \sqrt{m^* s^*}\left(\frac{1}{\phi^2}\right) + \sqrt{\frac{m^*}{s^*}}[(L+K)^2 + b(b-4\phi)] + \frac{m^*}{\phi^2}$. Hence $\frac{\partial a^*}{\partial \phi} > 0$ for $\lim \phi \to 1$ and $\phi = 1$iff $b \geq 2$. Also $\frac{\partial m^*}{\partial a} = \frac{4a(1+\phi)[-2s\phi((L+K)-\phi b)]-2s[\phi((L+K)-\phi b)^2]}{[4a(1+\phi)]^2} < 0$ for $\phi = 1$ and $\frac{\partial m^*}{\partial \phi} = \frac{-s4a}{[4a(1+\phi)]^2} < 0$ for $\lim \phi \to 1$, $\phi = 1$. (ii) $(1-p) = (1 - \frac{m}{m+a}) = (1 - \frac{m^*}{m^*+a^*})$. $\frac{\partial(1-p)}{\partial a^*} = 1 + \frac{m^*}{(m^*+a^*)^2} > 0$ and from part (i) of this proposition $a^* > 0$ for $\phi = 1$. Thus $\frac{\partial(1-p)}{\partial a^*} > 0$ for $a^* > 0$ and $\phi = 1$. Further, in equilibrium $p = \frac{1}{(1+\frac{\phi a^*}{m})} > 0$ (see Lemma 1). Hence $(1-p) = 1 - \frac{1}{(1+\frac{\phi a^*}{m})}$. $\frac{\partial(1-p)}{\partial a^*} = \frac{\frac{\phi}{m^2}}{(1+\frac{\phi a^*}{m})^2}$for $\lim \phi \to 1$ and $\phi = 1$.

Proof of keeping b on L is strictly dominated for r by tacic of evicting and killing b when $\phi = 1$: Recall from the proof of **claim 4** that $\overline{u}_r < 0$ as $(1-\phi)\pi_b < 0$ and $\frac{dc_r}{db} = \theta b > 0$ when $\phi = 1$.When $a^* > 0$ for $\phi = 1$ (see proof of Proposition 2) then by construction $b \to 0$. For $b \to 0$, we obtain

$$\widehat{u}_r = f_r - c_r a^* + (1 - \frac{m^*}{m^*+a^*})[s^*(1-\phi)\pi(L,K)] \tag{A.5}$$

If the rebels simply use land as the factor input for production for $b \to 0$, then $\widehat{u}_r = f_r - c_r a^* +$

$(1-\frac{m^*}{m^*+a^*})[s^*(1-\phi)\left[\gamma(\alpha L^\rho+\beta K^\rho)^{\frac{1}{\rho}-1}\right]\alpha L^{\rho-1}$(furthermore $\frac{\pi_L}{\pi_b}=\frac{\left[\gamma(\alpha L^\rho+(1-\alpha)b^\rho+\beta K^\rho)^{\frac{1}{\rho}-1}\right]\alpha L^{\rho-1}}{\left[\gamma(\alpha L^\rho+(1-\alpha)b^\rho+\beta K^\rho)^{\frac{1}{\rho}-1}\right](1-\alpha)b^{\rho-1}}$ >0 and Likewise, $\frac{\pi_K}{\pi_b}=\frac{\left[\gamma(\alpha L^\rho+(1-\alpha)b^\rho+\beta K^\rho)^{\frac{1}{\rho}-1}\right]\beta K^{\rho-1}}{\left[\gamma(\alpha L^\rho+(1-\alpha)b^\rho+\beta K^\rho)^{\frac{1}{\rho}-1}\right](1-\alpha)b^{\rho-1}}>0$ for $\rho\geq 1$ and $0<\rho<1$). Importantly, one can check that $(1-\frac{m^*}{m^*+a^*})[s^*(1-\phi)\left[\gamma(\alpha L^\rho+\beta K^\rho)^{\frac{1}{\rho}-1}\right]\alpha L^{\rho-1}\to 0$ for $\phi=1$. But $f_r\geq c_r a^*$ since $c_r(a+\frac{1}{2}\theta b^2)\leq f_r \Longrightarrow f_r\geq c_r a^*$. Hence $\widehat{u}_r>0$ when $\phi=1$. Hence, $f_r-c_r a^*-c_r\theta b+(1-\frac{m^*}{m^*+a^*})[s^*(1-\phi)\pi(L,K)]<f_r-c_r a^*+(1-\frac{m^*}{m^*+a^*})[s^*(1-\phi)\pi(L,b,K)]$ for $\lim\phi\to 1$ and $\phi=1$. This $\Longrightarrow \overline{u}_r-\widehat{u}_r<0$ for $\phi=1$ while $\overline{u}_r<0$ for $\phi=1$. Thus $\overline{u}_r-\widehat{u}_r<0$ when $\phi=1$ which implies that $a^*>0$ is a strictly dominant strategy – while co-operating (co-opting) or forcing the civilian labor to work as bonded labor on the cropland is strictly dominated by $a^*>0$ – for the rebel group.

Proof of the rebels' net utility from committing atrocities is higher than their benefits from keeping the workers on L when when $\phi=1$: Follows directly from the previous proof.

CES production function properties (brief)

- More formally, $\rho\leq 1$ is the (constant) elasticity of substitution which is $\sigma=\frac{1}{1-\rho}$. The CES production function is a more general production function that (depending on the values of ρ and σ) incorporates the Cobb-Douglas production function, the Leontief production function, and the linear production function. The CES production function $\pi(L,b,K)$ and variants of this production function have been used by various economists including Arrow et al (1961) and Nehru and Dhareshwar (1993) to study crop production in croplands of developing countries.

- Without loss of generality, we assume constant returns to scale for the CES production function $\pi(L,b,K)$. The model's equilibrium and comparative static results do not alter when we (i) assume increasing or decreasing returns to scale (results from increasing and decreasing returns to scale are available on request), (ii) focus on just cropland L and labor b as inputs in the production function (results from the CES production function for just these two inputs are briefly shown below) and (iii) employ different functional forms for $\pi(L,b,K)$ (results from this exercise are also briefly shown below).

Results with other CES production functions

Example 1: Two input factors of production — Land L and Labor b. The CES production function in this case is $\pi(L,b) = \gamma(\alpha L^{\rho} + (1-\alpha)b^{\rho})^{\frac{1}{\rho}}$. Using this two-input factor CES production function leads to

$$a^* = \sqrt{\frac{m}{\phi}}s(\phi[(L-\phi b]^2) - \frac{m}{\phi} \text{ for } m^* < \overline{m} \tag{A.6}$$

$$s^* = \frac{f_r}{\gamma(\alpha L^{\rho} + (1-\alpha)b^{\rho})^{\frac{1}{\rho}}} \tag{A.7}$$

Finally, the marginal productivity of the rural labor working on the cropland in equilibrium given ϕ in this two-input factor case is $(1-\phi)\frac{\partial \pi(L,b,K)}{\partial b} = (1-\phi)\left[\gamma(\alpha L^{\rho} + (1-\alpha)b^{\rho})^{\frac{1}{\rho}-1}\right]$ $(1-\alpha)b^{\rho-1}$. The detailed derivation of these results are available on request. Further, the comparative static results shown above in Propositions 1 and 2 and the additional results in claims 1-8 also hold for $\pi(L,b) = \gamma(\alpha L^{\rho} + (1-\alpha)b^{\rho})^{\frac{1}{\rho}}$ (these results are available on request as well).

Example 2: Three input factors of production — Land L, Labor b and Capital K. But with the following three-input CES production function $\pi(L,b,K) = [\gamma(\alpha L^{\rho} + \beta K^{\rho} + (1-\alpha-\beta)b^{\rho}]^{\frac{1}{\rho}}$. Using this three-input factor CES production function leads to

$$a^* = \sqrt{\frac{m}{\phi}}sH(.)(\phi[(L+K-\phi b)]^2) - \frac{m}{\phi} \text{ for } m^* < \overline{m} \tag{A.8}$$

$$s^* = \frac{f_r}{H(.)[\gamma(\alpha L^{\rho} + \beta K^{\rho} + (1-\alpha-\beta)b^{\rho}]^{\frac{1}{\rho}}} \tag{A.9}$$

where $H(.) = [\gamma(\alpha(\sigma)L^{\rho} + \beta(\sigma)K^{\rho} + (1-\alpha(\sigma)-\beta(\sigma))b^{\rho}]$.The marginal productivity of the rural labor working on the cropland in equilibrium given ϕ in this three-input factor case is $(1-\phi)\frac{\partial \pi(L,b,K)}{\partial b} = (1-\phi)\left[H(.)^{\frac{1}{\rho}-1}\gamma(\alpha L^{\rho} + \beta K^{\rho} + (1-\alpha-\beta)b^{\rho})^{\rho-1}\right]$. The detailed derivation of these results are available on request. Additionally, the comparative static results shown above in Propositions 1 and 2 and the additional results in claims 1-8 do not alter for

$\pi(L,b,K) = [\gamma(\alpha L^{\rho} + \beta K^{\rho} + (1-\alpha-\beta)b^{\rho}]^{\frac{1}{\rho}}$ (these results are also available on request).

II. Detailed Anecdotal Evidence

The anecdotal evidence corresponding to Bastar and Dantewada (India) and Songkhla (Thailand) in our main paper's theoretical section is described in more substantial detail below. This is followed by a relatively brief discussion of the Somalia and Peru examples.

India Example

Consider the case of Bastar and Dantewada — agricultural districts in the state of Chattisgarh, India in which predominantly rice is cultivated — where anti-government Naxalite rebel groups actively operate (Singh, 2006; Sundar, 2007; Pandita, 2011). When Bastar and Dantewada were afflicted by a severe drought in 2004 (and early 2005), villagers in these two districts stored higher quantities of the rice they produced for future consumption (Sundar, 2007) and also "kept the accumulated rice in numerous anaj ghars located on their rice fields."[1] As predicted by our theory, this induced the Naxalite rebels to seek to forcibly expropriate the villagers' rice fields to capture these rice stockpiles (thus avoiding transportation costs), and ensure a steady supply of food given uncertainty created by the drought (Gregory, 2013; Sundar, 2007, 287). In fact, apart from newspaper and magazine articles that reported how the 2004-05 drought influenced the Naxalites to move toward "capturing the farmers' rice fields and collected rice to obtain food,"[2] a report by the Ministry of Home Affairs (Government of India) also suggested that...

> "The long-lasting drought of 2004 led to a situation where the Naxalites had little choice but to make a concerted decision to usurp the rice lands of rural farmers in Bastar and Dantewada...this was a necessary tactic for the Naxalites to help them get enough food for sustenance, and to feed the rank and file of their group..."[3]

[1] Singh (2006, 71). Also see Sundar (2007).

[2] "Chhattisgarh orders ban on Naxals," *The Asian Age*, 6 September 2005, pp.B.3; also see "War Against Naxals that Backfired," *The Times of India*, September 24, 2005 and "Maoist shadow over Chhattisgarh," *The Times of India*, 16 May 2005.

[3] Ministry of Home Affairs, *Annual Report* 2004-05 (Official Documents Section in the Library of the Central Secretariat-Shastri Bhawan), Government of India, New Delhi (2005: 39).

Historical evidence from Bastar and Dantewada reveals that the rural civilians working in the rice fields in these two districts did actively seek to build "self-help" militias to protect their rice fields from expropriation by the Naxalite rebels during the 2004-05 drought (Singh, 2006; Pandita, 2011). As suggested in Ministry of Tribal Affairs Report by the Indian government, the

> "...farmers and *adivasi* tribals residing in Bastar and Dantewada started organizing themselves and holding rallies during the onset of the severe drought in 2004 and later in 2005...the ostensible objective behind such organization was to facilitate the formation of self-defense groups that would be used to defend expropriation of agricultural land, property, houses and other assets by the Naxalites. These self-defense groups laid the foundation for the *Salwa Judum* militia mobilised by farmers and the *adivasis* in 2005."[4]

A series of books and newspaper articles from 2004-06 also pointed out that the farmers in Bastar and Dantewada organized and held public meetings in which they discussed the need to form militias to protect their rice fields and property from the "rampaging and violent Naxalites."[5]

Note that the Naxalite rebels perceived the meetings held by farmers in Bastar and Dantewada in attempts to organize defensive militias in 2004 as a threat to their twin goal of expropriating their (the farmers') rice fields and consuming the stockpiled rice in these fields (Singh, 2006; Shankar, 2006). They believed that once (and if) the farmers in these two districts formed self-defense militias, then it would make it "very difficult for the Naxals to get access to the peasants' rice fields and crops stored in anaj ghars, militarily challenge them and deprive the Naxals of desperately needed food for consumption"[6] (Pandita, 2011; Singh, 2006, 31-32). The Naxalite rebel leaders in Bastar also expressed their opinion to journalists in 2004 that the farmers would use their militias to militarily oppose them and thereby "weaken the Naxalite rebel

[4]"Background note on the Scheduled Tribes" (Recognition of Forest Rights Bill), 2005, Ministry of Tribal Affairs, New Delhi: Government of India, pp. 24; also see Sundar (2007); Singh (2006, 34-36).

[5]Singh (2006, 57). Also see "Taking on Maoists proving an uphill task," *The Pioneer*, 29 October 2004; "War in tribal heartland," *Indian Express*, 7 May 2006 and Shankar (2006, 37-38).

[6]*Ministry of Home Affairs*, "Status Paper on the Naxal Problem," 18 August 2004., Internal Security Division. Government of India, New Delhi, pp.11-12. Also, see "Naxalgarh: Rule of the outlaw," *The Times of India*, 27 May 2005; "Naxalism hits 30 crore people," *The Central Chronicle* 31 May 2005; Ramana (2008).

movement as a whole" (Ramana, 2008; Singh, 2006, 17).[7] Thus as emphasized in a report by the Government of India's Planning Commission, in the drought year of 2004, Naxalites operating in Bastar and Dantewada took the "critical decision of expelling the peasants and *adivasi* tribals from their farmlands"[8] so that the farmers could *not* credibly hinder their appropriation goals (Singh, 2006; Pandita, 2011). This strategic decision to expel the farmers from their rice fields was further bolstered by the Sangham (Naxalite) rebel group's view that evicting the farmers would ensure that the "Sangham group members can eat the rice stored in *anaj ghars* without sharing with farmers" (Singh, 2006, 19).[9] Indeed, keeping the farmers and their families on the rice fields was considered a *liability* by the Naxalites in Bastar as they would be (i) "forced to share limited food supplies with the farmers"[10] if the latter were retained in the croplands and the (ii) Sangham rebel group members' believed that owing to the drought the farmers would be an "unproductive workforce" that would not add much to crop production (Singh, 2006; Shankar, 2006; Pandita, 2011).

Anecdotal evidence from Bastar and Dantewada (districts in Chattisgarh, India) also bolster our theoretical claims about the link between severe droughts and rebel-perpetrated violence against civilians in croplands. To this end, first note that during the severe drought of 2004 in Bastar and Dantewada, Naxalites engaged in substantial violence against rural civilians residing in these two districts which resulted in the following outcome,

> "150,000 people have been displaced, approximately one-third of whom were officially living in camps as of February 2006; some 500 to 1000 people have been killed and over 3000 houses burnt" (Gregory, 2013, 18)

An actual witness of the Naxalite-perpetrated violence against rural civilians that occurred in Bastar in the context of the 2004 drought pointed out that,

> "Earlier they would sweet-talk us, promising to stop exploitation of *Adivasis*; they

[7] "Taking on Maoists proving an uphill task," *The Pioneer*, 29 October 2004; Ramana (2008); Gregory (2013).

[8] Planning Commission of India. 2008. *Development Challenges in Extremist Affected Areas: Report of an Expert Group.* New Delhi: Government of India. For more details on this see, Ray (2002); Singh (2006); Ramana (2008) and "War in tribal heartland," *The Indian Express*, 27 February 2006.

[9] Also see Ray (2002); Ramakrishnan (2010).

[10] Shankar (2006, 17); also see "Naxalites worried about villagers defense tactics," *Hitavada*, 12 October 2004; "Taking on Maoists proving an uphill task," *The Pioneer*, 29 October 2004; Singh (2006).

said they would form the government...but once the rains failed in July and August of 2004, the Sangham (Naxalite) rebels started harassing and attacking us, taking our land, and even taking away our young girls. Then, they began to kill. They claim to hold *Jan Adalats*, peoples' court, before doling out punishments or execution orders, but I never saw one."[11]

Another farmer who was also a witness to Naxalite-led violence against civilians in Bastar in 2004-05 further confirmed that "Sangham (Naxalites) members armed with guns, choppers and spears attacked us and killed some of us."[12] And a report issued by India's Home Ministry in 2005 stated that "when the monsoon failed in 2004 in Chattisgarh over a thousand people were killed by the Naxals in Bastar alone, over 3000 houses have been burnt and stories of brutal gang rape by the Naxalites circulate as common knowledge."[13]

Further, an in-depth study of violence committed against farmers and tribals in Bastar and Dantewada in 2004 emphasizes that after the "outbreak of the devastating drought of 2004, group members from the Sangham (Naxalite) rebels regularly used violence in their treatment towards the locals. They burned down self sustaining villages to pursue their agenda of capturing rice field and the farmers living on the rice field paid direct costs — they were often sought out and killed indiscriminately by the rebels."[14]

Why did the Naxalites consistently carry out such indiscriminate acts of violence against farmers in Bastar and Dantewada during the 2004 drought? Detailed accounts of the interaction between the Sangham (Naxalite) rebels and rural civilians in the context of the 2004 drought in Bastar and Dantewada emphasize that the Naxalites

"...indiscriminately killed farmers and *adivasis* living in Bastar and Dantewada in 2004 as a tactic to prevent consumption of limited food by rural residents...From

[11]Rao (2010, 351). Further, see "In Naxal Heartland," *The Hindu*, 10 April 2005; "Maoists kill villagers," *Hitavada*, 5 November 2004; Ramana (2008); "Extremists abduct, kill five villagers," *Hitavada*, 29 July 2005.

[12]BRao (2010, n. 11, p. 352). Also see Planning Commission of India, 2008, *Development Challenges in Extremist Affected Areas: Report of an Expert Group* (New Delhi: Government of India); "Naxalism hits 30 crore people," *The Central Chronicle* 31 May 2005; Singh (2006); Raja (2008).

[13]Ministry of Home Affairs, "Revisiting the Naxal Problem," 14 July 2005, Internal Security Division. Government of India, New Delhi, pp. 3. Also, see Singh (2006); Sundar (2007).

[14]Ministry of Home Affairs, "Status Paper on the Naxal Problem," 18 August 2004. Internal Security Division. Government of India, New Delhi, pp. 4-5. Additionally, see Ministry of Tribal Affairs, 2006, *National Tribal Policy: A Policy for the Scheduled Tribes of India* (New Delhi: Official Documents Section in the Library of the Central Secretariat (Shastri Bhawan); Shankar (2006); Raja (2008).

the Naxalite viewpoint, the lesser the local residents and farmers living on arable lands, the greater the amount of crops they could eat."[15]

The aforementioned view has been echoed by researchers[16] and the print media.[17] It has also been corroborated by the Home Ministry (Government of India) which posits that "killing farmers and *adivasis* in Bastar during droughts is a time-tested tactic that the Naxals use to get access to stored crops and food"[18] and moreover to "prevent others, including locals, from getting access to and consuming the food which is in short supply when the rains fail."[19]

Another complementary goal that the Naxalites hoped to achieve by massacring farmers and tribals in Bastar during the 2004 drought was to both send an observable signal of their intent to evict these farmers plus tribals from their arable land and generate fear among these residents (Shankar, 2006; Rao, 2010). As suggested in a recent study, the Naxalites indiscriminately killed civilians in Bastar and Dantewada during the 2004 drought to send "a very public and clear message to the *adivasis* and the local farmers"[20] that they would be "physically harmed if they did not voluntarily leave their rice fields...to allow the Naxals to use the fields"[21]—this in effect meant that the Naxals were strategically using acts of murder and brutalities against villagers to warn local farmers and tribals to *vacate* their farmland and leave their property behind (see, e.g., Shankar, 2006; Pandita, 2011).[22] Furthermore, the Government of India's Home Ministry pointed out that the Naxal-perpetrated atrocities against farmers in Bastar during the 2004 drought was intentionally carried out by Sangham (Naxalite) rebel group members "to generate fear and panic among the villagers...they were confident that this fear tactic produced by brutal killings, rape and house burning would force the villagers to run away from their rice

[15]Shankar (2006, 91); in addition, see "Taking on Maoists proving an uphill task," *The Pioneer*, 29 July 2004; "Maoist shadow over Chhattisgarh," *The Times of India*, 16 May 2005; Singh (2006); Raja (2008).

[16]See e.g., Singh (2006); Raja (2008); Ramana (2008); Rao (2010).

[17]"Maoists kill villagers," *The Hitavada*, 5 November 2004; "War in tribal heartland," *The Indian Express*, 27 February 2006; "Naxalgarh: Rule of the outlaw," *The Times of India*, 27 May 2005; "Naxalism hits 30 crore people," *The Central Chronicle* 31 May 2005.

[18]Ministry of Home Affairs, 18 August 2004, fn.14, pp.4. See also Ray (2002); Raja (2008); Ramana (2008).

[19]Ministry of Home Affairs, Ibid., pp.4. Further, see "Naxalgarh: Rule of the outlaw," *The Times of India*, 27 May 2005; "Maoists kill villagers," *The Hitavada*, 5 November 2004; Ramana (2008).

[20]Shankar (2006, 59). For more analysis of this issue see "Taking on Maoists proving an uphill task," *The Pioneer*, 29 October 2004; Singh (2006); Raja (2008).

[21]"Naxalites worried about villagers defense tactics," *Hitavada*, 12 October 2004, p.7; also see Ministry of Home Affairs, 18 August 2004, fn.14; Ramana (2008); Rao (2010).

[22]"Extremists abduct, kill five villagers," *Hitavada*, 29 July 2005, p.2. Also see "Naxalism hits 30 crore people," *The Central Chronicle* 31 May 2005; Singh (2006).

fields"[23] and hide in neighboring forests (Singh, 2006; Pandita, 2011).

Finally, as suggested in our formal model, Naxalite rebels in Bastar and Dantewada during the 2004 drought also fully recognized that killing and committing other acts of brutality against local farmers and tribals would produce a mass exodus and facilitate forcible eviction of these rural residents (Singh, 2006; Pandita, 2011). As such, this mass exodus would help the Naxalites to "capture the rice fields, obtain stored food for survival, and make it next to impossible for the farmers to build defence organizations that could contest"[24] their (the Naxals') land appropriation goals (Singh, 2006; Shankar, 2006; Rao, 2010; Gregory, 2013). Thus from the Naxalites' perspective, killing innocent civilians was "necessary to prevent the villages from arming themselves, and to force them to flee"[25] so that the Naxals can capture the farmers' food, houses and farmland (Singh, 2006; Shankar, 2006).

Thailand Example

For the second example, consider the province of Songkhla in Thailand — a crop-producing province in which rice is the predominant cultivated crop — where the anti-government rebel organization, the Barisan Revolusi Nasional-Coordinate (BRN-C), has operated for several years. During the intense drought of 2004 in Songkhla that lasted for several months, farmers working in the rice-producing areas of Rattaphum, Na Mom and Bang Klam in Songkhla province stored significant amounts of rice on their rice fields for consumption (Srirai, 2008; Ball and Mathieson, 2007; Rattanachaya, 2004, 47-48). As noted by numerous scholars, this action of storing rice influenced BRN-C rebels (sometimes known as *juwae* warriors) to actively seek to expropriate the farmers' rice fields to capture the latter's rice stocks for personal consumption and to facilitate a steady supply and distribution of crops to group members (see, e.g., Rattanachaya, 2004; Gunaratna, Acharya and Chua, 2005).[26] The BRN-C's goal of appropriating rice fields was also reported by the print media at the time which suggested that the accumulation and storing of rice by farmers in Songkhla during the 2004 drought "influenced

[23]Ministry of Home Affairs, 14 July 2005, fn.13, pp. 3. Also see Ramana (2008); Ramakrishnan (2010).

[24]Ministry of Tribal Affairs, May 2006, fn.14, p.6. Further, see Raja (2008); Rao (2010).

[25]"Naxalites worried about villagers defense tactics," *The Hitavada*, 12 October 2004, p.7; also see Singh (2006); Shankar (2006); Ramana (2008).

[26]Also see Srirai (2008); Helbardt (2011) and "Drought and competition for agricultural land" *The Nation*, September 29, 2004, p B1.

BRN-C to decide to raid and capture rice fields across Rattaphum, Na Mom and Bang Klam. This decision was motivated by their desperate need to acquire, distribute among group members and eat rice stored by farmers in these rice fields as well as other assorted fruit crops (from langsat, rambutan, and mangosteen) in the rural areas."[27]

But it was not merely the media who recognized that the BRN-C was interested to forcefully appropriate the rice fields and farmlands of rice producing peasants in Songkhla owing to the severe drought conditions that prevailed in 2004. Rather the rice producing farmers in Rattaphum, Na Mom and Bang Klam in Songkhla understood *and* anticipated during the 2004 drought that BRN-C rebels would make serious attempts to appropriate their rice fields (Janchitfah, 2004; Srirai, 2008). According to accounts in the print media (at the time) and extant research, these farmers thus "started talking among themselves to put together defense associations"[28] in August-September 2004 to defend their farmlands from appropriation by BRN-C which they fully anticipated (see, e.g., Janchitfah, 2004; Rattanachaya, 2004; Gunaratna, Acharya and Chua, 2005). One account in fact emphasized that villagers in Rattaphum and Na Mom believed that "village-based defense associations would help them to thwart and discourage BRN-C rebels from raiding"[29] their crops and rice fields (Chongkittavorn, 2004; Srirai, 2008).

Rebel group members from BRN-C were alarmed when they heard from reliable sources that the rice producing farmers in villages around Rattaphum and Na Mom in Songkhla would set up military-style organizations to defend their rice paddy fields (Gunaratna, Acharya and Chua, 2005; Helbardt, 2011). This is because they (i.e., BRN-C) viewed such self-defense militias that the farmers in Songkhla planned to organize as a "serious impediment to their goal of capturing and controlling rice fields in Rattaphum, Na Mom and Bang Klam"[30] that are situated in Songkhla. This impediment was of serious concern to the BRN-C rebel group during the severe 2004 drought as failure to control rice fields in Songkhla would "increase the

[27]"Separatist violence takes new turn in southern Thailand," *The Nation*, 24 June 2004, p.2. Also see (Srirai, 2008; Liow and Pathan, 2010).

[28]Chongkittavorn (2004, 17); also see "Peace stays far away in southern Thailand," *Asia Times*, 15 March 2006.

[29]"Villagers in Songkhla rely on militias for defense," *The Nation*, 17 March 2004, pp.4; "Defense Tactics by Farmers in Songkhla," *The Bangkok Post*, 2 April 2004; ICG 2005; Srirai (2008).

[30]"Food fights between BRN-C and Farmers in Songkhla" *The Nation*, 19 November 2004; pp.A-2. Also, see Janchitfah (2004); Rattanachaya (2004).

possibility of starvation of BRN-C members"[31] as they needed the farmers' stored rice in these fields for their basis sustenance (Janchitfah, 2004; Chongkittavorn, 2004).

The BRN-C, however, did not just view the residing farmers' efforts toward organizing a defense association as a threat to their expropriation goal. They also overtly opined during the severe drought of 2004 that it was "not feasible for them to share the stored rice on the paddy fields of Rattaphum, Na Mom and Bang Klam with residing villagers"[32] given the "limited amount of rice stockpiles."[33] And furthermore, they believed that the residing farmers in the rice producing villages of Songkhla province "would not be of much use to them given their diminished capacity to work because of water scarcity"[34] generated by the failed monsoon of 2004 (Janchitfah, 2004; McCargo and Pathmanand, 2005; Ball and Mathieson, 2007). In short, leaders from BRN-C viewed the continued presence of farmers in the rice fields of Songkhla province as a financial liability that they could dispense with (Rattanachaya, 2004; Ball and Mathieson, 2007; Aphornsuvan, 2007).

The BRN-C's view of working farmers in Songkhla as a financial liability during the 2004 drought combined with their perception of these farmers as a threat to their appropriation goals influenced them to take the decision to "expel peasants and families from the rice-fields of Rattaphum, Na Mom and Bang Klam"[35] which they sought to appropriate (Janchitfah, 2004; Srirai, 2008). After all, leaders from BRN-C considered the decision to evict farmers from the rice fields of villages in Songkhla in 2004 as a feasible tactic that would help them to "block the formation of defense associations by farmers"[36] in the villages of Songkhla, and facilitate expropriation of both rice fields plus stored grains in the farmlands of the province McCargo and Pathmanand (2005); Montesano and Jory (2008); Srirai (2008). Evicting the peasants from their villages was also an attractive economic option for the BRN-C rebels as it meant that they

[31] "BRN-C and the insurgency in Thai south," *Straits Times*, 25 September 2004, p.7. Further, see Chongkittavorn (2004); Davis (2005); Srirai (2008).

[32] "Food fights between BRN-C and Farmers in Songkhla," *The Nation*, 19 November 2004; pp.A-2. Additionally, see "BRN-C and the insurgency in Thai south," *Straits Times*, 25 September 2004; Chongkittavorn (2004); Aphornsuvan (2007).

[33] Srirai (2008, 15). Also see Rattanachaya (2004); Aphornsuvan (2007).

[34] Srirai (2008, 15-16); also see Ball and Mathieson (2007).

[35] "Expelling farmers for Convenience," *Bangkok Post*, 11 January 2005, pp.2. For more details on this see, McCargo and Pathmanand (2005); Liow and Pathan (2010).

[36] "Food fights between BRN-C and Farmers in Songkhla," *The Nation* 19 November 2004, pp.A-2. Additionally, see "Expelling farmers for Convenience," *Bangkok Post*, 11 January 2005; Montesano and Jory (2008).

would not have to bear the "costs of feeding and maintaining the rural workforce at a time of severe water crisis"[37] in Songkhla (Chongkittavorn, 2004; Aphornsuvan, 2007; Helbardt, 2011).

Interestingly, similar to the Naxalites in Bastar and Dantewada, the BRN-C rebel organization employed targeted killing of farmers working in Rattaphum, Na Mom and Bang Klam (in Songkhla) as a tactic to evict these farmers from their rice fields (e.g., Rattanachaya, 2004; Ball and Mathieson, 2007). To see this in some detail, it is important to first note that there was a significant increase in violence committed against (specifically killing of) civilians by the BRN-C in the rice-producing districts and villages of Songkhla during the severe drought of 2004 (Rattanachaya, 2004; Gunaratna, Acharya and Chua, 2005). For instance, a report released by Government of Thailand's Ministry of Interior in 2005 points out that

> "...according to estimates, there was an astounding 90% increase in the share of villagers killed in Songkhla in the drought year of 2004...Beheading, hangings and beatings of farmers in Songkhla became common; women, children, farmers and their families have been murdered and 'disappearances' become a frequent occurrence."[38]

Reports by the media and Human Rights Watch also documented that during the 2004 drought in Songkhla "tactics used by the BRN-C had become savage"[39] in that the BRN-C "systematically killed over a thousand farmers in Rattaphum alone, forcefully displaced villagers from their paddy fields, burnt houses"[40] and captured grain stockpiles (Chongkittavorn, 2004; Rattanachaya, 2004). Furthermore, the BRN-C's tactic of killing rural civilians continued throughout 2004 and well into 2005 (Davis, 2005; Gunaratna, Acharya and Chua, 2005).It is important to note here that the BRN-C perpetrated violence and killing of rural civilians during the 2004 drought in Songkhla was not random. Rather, as suggested in recent research, "there

[37]"BRN-C and the insurgency in Thai south," *Straits Times*, 25 September 2004, p.7. "Who Controls the insurgency in Songkhla," *The Nation*, 11 August 2004. Also see Rattanachaya (2004); Srirai (2008).

[38]*Ministry of Interior*, July 2005, "Civilians Attacked and Villages Raided by BRN-C in Songkhla in 2004." Bangkok: Government of Thailand, pp. 27. For more analysis of this issue see "The BRN-C and the Southern Malaise," *Bangkok Post*, September 4 2005, pp.2; Srirai (2008).

[39]Chongkittavorn (2004, 9-10); also see Gunaratna, Acharya and Chua (2005); Srirai (2008).

[40]"Death Toll Could be Far Higher," *The Nation*, October 30 2004, pp.2; Davis (2005); Srirai (2008); Helbardt (2011).

is sufficient evidence to believe that the killing of civilians by the BRN-C in 2004 was driven by some strategic objectives"[41] which is in contrast to media reports that focused on the morally abhorrent character of the BRN-C's violence. What then are these strategic objectives?

As predicted by our theory, the first objective behind the BRN-C led killing of civilians in the villages of Songkhla in 2004 was to send a "clear signal to farmers and residents in the villages that the BRN-C meant business"[42] and that it was "willing to impose serious physical harm on those individuals who opposed the insurgents by remaining on their property"[43] which belonged to the BRN-C. A report by the Thailand's Ministry of Interior in 2005 also suggests that the leaders of BRN-C felt that committing atrocities against farmers working in the rice fields of Songkhla would send an "unambiguous message to the farmers that their presence in the rice fields would not be tolerated...murdering the villagers would produce a deep-rooted fear among farmers that their lives would be in danger if they remained on their farmlands"[44] and that they would be spared only if they fled from their farms plus abandoned their property (Rattanachaya, 2004; Davis, 2005; Montesano and Jory, 2008).

The Ministry of Interior's insight is confirmed by other researchers as well who posit that "violence was frequently directed by the BRN-C against farmers in Songkhla to drive them *away* from their farms"[45] (italics added) and the region in general (Davis, 2005; Montesano and Jory, 2008). Generating fear among the farmers in the villages of Songkhla (by resorting to indiscriminate killings) so as to drive them away from their farms was considered necessary by the BRN-C as it would help them to capture and settle in these farms without concerns about serious opposition from rural peasants (Janchitfah, 2004; Rattanachaya, 2004; Srirai, 2008). Indeed, expelling the farmers from their rice fields by threatening them with overt physical danger (i.e., killings, beheadings, burning houses) was seen by "BRN-C commanders as a tactic to discourage the farmers from forming associations to defend their farmland, crops stored on

[41] *Ministry of Defense*, March 2005, "Domestic Security Problems in Thailand" (White Paper), Bangkok: Supreme Command Headquarters, pp. 16. Further, see "Southern carnage: kingdom shaken," *The Nation*, 29 Apr. 2004, pp.1; Gunaratna, Acharya and Chua (2005).

[42] "Who Controls the insurgency in Songkhla," *The Nation*, 11 August 2004, p.2. Also see Rattanachaya (2004).

[43] "Food fights between BRN-C and Farmers in Songkhla," *The Nation* 19 November 2004, pp.A-2. Additionally, see Janchitfah (2004); Srirai (2008); Liow and Pathan (2010).

[44] *Ministry of Interior*, July 2005, fn.37, pp. 28. Additionally, see Chongkittavorn (2004); Montesano and Jory (2008); Srirai (2008).

[45] Janchitfah (2004, 53); *Ministry of Defense*, March 2005, fn.17, pp. 16-17; Aphornsuvan (2007).

the land"[46] and their property (Rattanachaya, 2004; Davis, 2005).

The BRN-C's second objective for killing farmers in the village-areas of Rattaphum, Na Mom and Bang Klam in Songkhla was driven by the need to curtail the number of individuals who could consume the limited amount of rice and other foodstocks stored by the farmers on their croplands during the 2004 drought (Chongkittavorn, 2004; Rattanachaya, 2004; Davis, 2005). This has been suggested not only by researchers and the print media[47] but also in an interview given by a captured BRN-C leader "Hama" who commented that,

> "...killing of rural civilians in Rattaphum, Na Mom, Bang Klam was an integral part of the BRN-C's strategy to get them to leave their farms and to prevent them eating rice saved in *B̂ān k̄ĥāws* as the BRN-C needed this rice...once we have won, everybody will see that these [i.e., violent actions] were cruel, but civilians were necessary victims. It's something that is done in the BRN-C's interest."[48]

Interestingly, the BRN-C's tactic of using violence against civilians (i.e., farmers) in Songkhla in 2004 was quite effective as one observer estimated that as many as 30-40 percent of residents in the Songkhla region reportedly left their homes and fled from the region as a result of the BRN-C's targeted violence.

Somalia and Peru Examples

We also briefly discuss anecdotal evidence from two more examples, Somalia and Peru, to corroborate our key theoretical claims that explore the link between severe drought in rural croplands of developing countries and killing of civilians by rebels operating in these croplands. First, note that in Somalia, "farmers in the villages of Lower Jubba started frantically storing crops in houses and granaries on their land to maintain food reserves to feed their families during the prolonged drought"[49] of 2011 (Ferris, 2011; Bryden, 2014; Lindley, 2014). As

[46]Chongkittavorn (2004, 12). Also, see *Ministry of Defense*, March 2005, fn.42; Janchitfah (2004); Srirai (2008).

[47]"BRN-C and the insurgency in Thai south," *Straits Times*, 25 September 2004; "The BRN-C and the Southern Malaise," *Bangkok Post*, September 4 2005; Srirai (2008); Liow and Pathan (2010).

[48]*Ministry of Defense*, March 2005, fn.42, pp. 16. Also see Srirai (2008); Ball and Mathieson (2007).

[49]"Al-Shabaab Seeking Survival In Drought," *Wardheer News*, 14 October 2011, pp.3; also see "Drought and Conflict in Jubba Continues Unabated," *The East African*, 6 November 2011; Lindley (2014).

mentioned in the main paper's text, this act of storing of crops by the peasants in Lower Jubba in 2011 encouraged the Al-Shabaab rebels to seek to "raid and capture" the farmers' agricultural lands to "forcibly usurp, eat, and distribute food among their group"[50] to sustain themselves in the drought period (Zimmerman, 2011; Hansen, 2013; Lindley, 2014). Such stored food supplies was necessary for survival of Al-Shabaab group members and their "capacity to remain as a cohesive"[51] unit (Ferris, 2011; Galindo, 2015). A similar dynamic also occurred in Peru during the severe drought of 1982 in the rural part of country's southern provinces of Tacuna and Arequipa that contain farmlands in which rice, soyabean and (some) pulses are the predominant cultivated crops (Masterson, 1991; Poole and Rénique, 1992; Simpson, 1993). Specifically, during the "onset of the 1981 drought, farmers in Arequipa stored a variety of crops to serve as a food-bank"[52] in order to sustain themselves throughout the drought (Masterson, 1991; Poole and Rénique, 1992). This act of storing crops and other food items was noted by the anti-government Tupac Amaru rebels who then "calculated that capturing the farms of would help them to obtain the necessary stored food from these farms"[53] for their own survival during the drought period (Masterson, 1991; Beverly, 2008; Galindo, 2010).

It is important to note here that during the 2011 drought, the farmers in Lower Jubba recognized — as emphasized by scholars— that "Al-Shabaab would raid their lands and capture their stored crops, food and other property"[54] to sustain and finance themselves (Ferris, 2011; Galindo, 2015). This prompted the farmers to "initiate meetings in which they openly called for armed, trained defensive militias to protect their land, crops"[55] and their livelihood (Galindo, 2015). These "meetings" to set up self-defense groups did not go unnoticed by Al-Shabaab. They recognized in the drought of 2011 that once the farmers in Lower Jubba fully organize

[50]"Farms Raided by Al Shabaab to obtain Sorghum," *Somaliland Times*, 22 January 2012; Zimmerman (2011); Hansen (2013).

[51]"Food and Politics in Al-Shabaab in Afamdow and Kismayo," *Wardheer News*, 10 December 2011; also, see "Drought and Conflict in Jubba Continues Unabated," *The East African*, 6 November 2011; Zimmerman (2011).

[52]"Water scarcity and farmers' survival strategies in Arequipa," *Peruvian Times*, 15 March 1983, p.7; also see Masterson (1991); Beverly (2008).

[53]"Túpac Amaru elige para capturar las granjas para alimentar a los miembros del grupo," *La Republica*, 25 January 1983, p.2 (translated to English with title "Tupac Amaru chooses to capture farms to feed group members"), pp.2. Further see Beverly (2008).

[54]"Al-Shabaab Seeking Survival In Drought," *Wardheer News*, 14 October 2011, fin. 49, pp.3; additionally, see "Farms Raided by Al Shabaab to obtain Sorghum," *Somaliland Times*, 22 January 2012; Hansen (2013).

[55]"Farms Raided by Al Shabaab to obtain Sorghum," *Somaliland Times*, 22 January 2012; pp.2. Furthermore, see Galindo (2015).

their defense groups, their (Al-Shaabab's) "capacity to capture the farmers' agricultural land and crops would be costly and may be even impossible to get"[56] thus setting of "alarm bells" among the leaders of Al-Shabaab (Zimmerman, 2011; Hansen, 2013).

Key group members in Al-Shabaab in 2011 also felt that the farmers in Lower Jabua would "neither be useful assets nor serve as productive workers as they were seriously emaciated"[57] by the "terrible" drought conditions at the time (Gartenstein-Ross and Vassefi, 2011; Galindo, 2015). Al-Shaabab's concern that the farmers in Lower Jubba could "credibly block their land-grabbing attempt if they formed defense organizations"[58] and their perception about the farmers' physical limitations as useful workers went a long way toward convincing Al-Shabaab in 2011 that they need to "expel the local farmers from their agricultural land when severe water shortages resulted from the drought." This particular phenomenon of rebels seeking to evict local peasants from their farmland under conditions of onerous water scarcity also occurred in Peru during the severe drought of 1982 in the country's southern provinces (Poole and Rénique, 1992; Simpson, 1993; Ellenbogen, 1999).[59] Similar to Lower Jubba (Somalia) in 2011, rural peasants in the farms of Tacuna and Arequipa "expected that Túpac Amaru would attempt to forcefully grab their land, crops and property"[60] to feed group members during the 1982 drought (Masterson, 1991; Ellenbogen, 1999; Beverly, 2008). Thus during the 1982-83 drought, peasants in both Tacuna and Arequipa (Peru) created their own civil defense forces to "prevent the continuous robbery of cattle, of crops, house-breaking, assaults...committed...by individuals who wander well armed at night" (Ellenbogen, 1999; Gitlitz and Rojas, 1983, 163). The Túpac Amaru rebels who were interested to appropriate the farmers' croplands in Arequipa during the 1982 drought viewed the farmers' potential defense militia as a "serious to challenge to their objective of capturing the agricultural property"[61] in which the farmers 'had stored suf-

[56] "Local Farmers and Al Shabab: An Uneasy Relationship," *The East African*, 4 December 2011, pp.3; Lindley (2014); Galindo (2015).

[57] "Local Farmers and Al Shabab...," Ibid., fn.56, pp.3; Galindo (2015).

[58] "Farmers Discouraged from Organizing Defenses," The Daily Nation, pp.2. Also see McKenzie (2011); Hansen (2013).

[59] "Local Farmers and Al Shabab...," fn.56, pp.3; Hansen (2013); Lindley (2014).

[60] "Water scarcity and farmers' survival strategies in Arequipa," *Peruvian Times*, fn.52, pp.7; also see Masterson (1991); Beverly (2008).

[61] "Túpac Amaru elige para capturar las granjas para alimentar...," *La Republica*, 25 January 1983, fn. 53, pp.2; Masterson (1991); Walker (1999).

ficient quantities of crops and fruits that Túpac Amaru members could use for their survival"[62] in the drought period (Poole and Rénique, 1992; Simpson, 1993; Beverly, 2008). Concerns about the growth and military strength of the farmers' planned civil defense associations — and "openly expressed beliefs about the farmers' inability to be financially useful"[63] because of water shortages — were critical factors that influenced Túpac Amaru to drive the peasants away from the farmland in 1982 and later in 1983 as well (Poole and Rénique, 1992; Walker, 1999; Beverly, 2008).

Returning to the case of the Al-Shabaab rebels who wanted to evict the farmers in Lower Jabua away from their farmlands in 2011, we find that there was a dramatic increase in the number of such civilian farmers killed by Al-Shabaab during the 2011 drought (McKenzie, 2011; Human-Rights-Watch, 2013; Lindley, 2014). For example, one study points out that during the severe 2011 drought, Al-Shabaab "went on a murderous rampage killing several hundred local civilians and farmers in Jubba"[64] with the "advertised intent" of driving the farmers away from their land and (then) taking over the farmers' agricultural property (Hansen, 2013; Galindo, 2015). International NGOs like Human rights Watch also pointed out in 2011 that in addition to civilian-targeted attacks by Al-Shabaab in Mogadishu, several "cells" of Al-Shabaab also repeated killed "hundreds of civilians in the rural hinterlands of Jubba"[65] during the 2011 drought. And a report released by a CNN journalist (David McKenzie) who interviewed survivors of rural civilian family members who were killed by Al Shabaab rebels during the 2011 drought pointed out that

> "And person after person told CNN that their husbands have been killed by Al Shabaab. Shamso Hassan, who escaped just days ago, said many of the men in her village were killed. Some of the survivors, such as her elderly father, Abdul Yousuf, managed to escape. "There was heavy fighting going on in our area. We were hiding and some men came into our house. They took my husband out and they

[62] "Túpac Amaru elige para capturar las granjas para alimentar...," *La Republica*, 25 January 1983, fn. 53, pp.2; Simpson (1993).

[63] "Recent tactics of Túpac Amaru," *Peru Reports*, 12 February 1983; pp.1; also see Poole and Rénique (1992); Simpson (1993).

[64] "Drought and Conflict in Jubba Continues Unabated," The East African, fn.49; McKenzie (2011); Zimmerman (2011).

[65] "Al-Shabaab Seeking Survival In Drought," *Wardheer News*, 14 October 2011, fin. 49, pp.3; Hansen (2013).

slaughtered him like a goat," Hassan said, passing her finger across her throat."[66]

In fact, killing of rural civilians and farmers in Lower Jhabua during the 2011 drought by Al-Shabaab escalated to such an extent that the Africa director at Human Rights Watch at the time emphatically stated that "Al-Shabaab's heinous attack" on civilians "shows utter disregard for civilian life...Al-Shabaab should immediately stop targeting civilians."[67]

Why did the Al-Shabaab resort to such mass killings of civilian farmers in Lower Jubba during the 2011 drought? As predicted by our theory, numerous researchers and newspaper articles have emphasized that one important reason that explains why Al-Shabaab opted to kill rural civilian peasants was "to create terror among local civilians in the drought affected crop cultivating areas of Lower Jubba...the idea was to generate as much terror as possible to send strong signals to the civilians that Al-Shabaab could kill and harm them at anytime."[68] Furthermore, the ostensible objective behind sending these signals (via indiscriminate killing of civilians) was to (as also suggested in our theoretical story) "make sure that the farmers in Jhabua would be fearful of Al-Shabaab's tactics...Indeed, Al-Shabaab's fully understood that if the civilian farmers in Lower Jhabua was fearful that Al-Shabaab can kill, maim and threaten to physically destroy them,"[69] then it would "compel the farmers to run away from their lands"[70] and abandon their property (Human-Rights-Watch, 2013; McKenzie, 2011; Lindley, 2014). This in turn would facilitate land-grabbing and control of farmland in Lower Jubba by Al Shaabab (Zimmerman, 2011; Galindo, 2015).

Similar to Somalia in 2011, there was also a "spike" in civilian-targeted killings by Túpac Amaru in the agricultural lands of Tacuna and Arequipa (Peru) in the context of the 1982 drought in the region. For example, it was reported that over "three hundred local peasants and their families were killed by men from Túpac Amaru in Tacuna when the rains failed

[66]See David McKenzie. "Somalis fear tyranny of al-Shabaab as they flee drought-stricken areas," CNN News, September 6, 2011. http://www.cnn.com/2011/WORLD/africa/09/05/somalia.al.shabaab.drought/.

[67]Daniel Bekele cited in "Somalia: Al-Shabaab Attack Indefensible Mogadishu Bombing Shows Price Being Paid by Civilians" Human Rights Watch, October 5 2011; https://www.hrw.org/news/2011/10/05/somalia-al-shabaab-attack-indefensible.

[68]"Al-Shabaab Seeking Survival In Drought," *Wardheer News*, 14 October 2011, fin. 49, pp.3; Checci and Robinson (2013); Lindley (2014).

[69]"Farms Raided by Al Shabaab to obtain Sorghum," *Somaliland Times*, 22 January 2012, pp.1; Hansen (2013); Checci and Robinson (2013); Galindo (2015).

[70]"Farms Raided by Al Shabaab to obtain Sorghum," *Somaliland Times*, 22 January 2012, pp.1; McKenzie (2011); Zimmerman (2011); Galindo (2015).

in 1982"[71] and in general Túpac Amaru carried out a concerted campaign of violence and atrocities against these rural civilians for much of 1982 and the first half of 1983 (Poole and Rénique, 1992; Simpson, 1993; Beverly, 2008). More systematic research by scholars further show that in 1982 there was a "sharp increase and upward trend in the number of peasants killed in particularly (but not only) Arequipa by Túpac Amaru during the weeks and days in which the region was plagued by serious water shortages"[72] because of the drought (Masterson, 1991; Poole and Rénique, 1992). An "infamous" report in the also voiced concern that the dramatic increase of rural civilians killed in the Arequipa region by Túpac Amaru may lead to a "complete breakdown in law and order"[73] and thus to total anarchy (Poole and Rénique, 1992; Walker, 1999). Note that the Túpac Amaru rebels underlying tactics for indiscriminately killing rural civilians in Peru in 1982 are largely similar to those of Al-Shabaab. For instance, scholars have hypothesized (based on extensive field research) that the leaders from Túpac Amaru were "cognizant of the reason that targeting and killing farmers, stealing their crops and cattle would visibly indicate to farmers in Areuipa that the farmers need to leave their land"[74] during the drought period and that they (the farmers) would not be safe if they chose to remain on their agricultural land (Poole and Rénique, 1992; Walker, 1999; Beverly, 2008). The Túpac Amaru rebels also viewed the "random killing of local peasants as a cost-effective strategy that would produce deep-rooted fear"[75] among villagers residing in Arequipa during the 1981 drought. As such, this deep-rooted fear would — from the perspective of the Túpac Amaru rebels — help them to make it clear to the local farmers that they "meant business" in terms of taking over and fully controlling the farmers' farmlands as well as stored crops for their (the rebels') sustenance (Poole and Rénique, 1992; Simpson, 1993; Walker, 1999). And, more importantly, in the words of the print media, the Túpac Amaru group believed and "fully understood" that the fear generated by their indiscriminate killing of local farmers would force these civilian peasants to flee from their farmland thus allowing members from Túpac Amaru to more easily

[71]Masterson (1991, 117); also see Poole and Rénique (1992); Simpson (1993); Beverly (2008).

[72]Masterston, *Ibid.*, pp. 119; Ellenbogen (1999); Poole and Rénique (1992).

[73]"Recent tactics of Túpac Amaru," *Peru Reports*, 12 February 1983; pp.1; Masterson (1991); Beverly (2008).

[74]"Recent tactics of Túpac Amaru," *Peru Reports*,*Ibid.*, pp.1; Simpson (1993); Ellenbogen (1999).

[75]" Túpac Amaru elige para capturar las granjas para alimentar...," *La Republica*, fn.53. pp.2; Simpson (1993); Ellenbogen (1999); Walker (1999).

"capture, control and consume the food stored in the farmlands in Arequipa"[76] in the drought period of 1982 (Poole and Rénique, 1992; Walker, 1999).

III. India & Thailand Analyses

As mentioned in the main paper, statistically evaluating our claims with respect to droughts and the expropriation of civilian food stockpiles by rebels is extremely difficult, given that there is no publicly available cross-national data (to our knowledge) on the stockpiling of food from rural civilians and cropland expropriation by rebels. To briefly evaluate our claim about droughts and land expropriation by rebels, we independently coded a selection of regional data on rainfall and agricultural land expropriation by rebels to provide illustrative quantitative evidence from India and Thailand. These data are geocoded at the district-level in India and the province-level from Thailand. Recall that in India anecdotal evidence shows that rebel groups, particularly the "Maoist" Naxalite rebels, operate in rural cropland districts (e.g. Bastar, Gumla) across the following seven "red" states, illustrated (and divided by district) in Figure A.1a: Andhra Pradesh, Bihar, Chattisgargh, Jharkand, Madhya Pradesh, Orissa and West Bengal.[77] In these states, the expropriation of agricultural property by Naxalite rebels was frequent, and over 90% of civilians massacred by the Naxalites have occurred within these seven states (Sundar, 2007; Gregory, 2013).

We thus assess the link between severe drought and cropland expropriation by Naxalite rebels in crop-producing districts within the seven listed Indian states between 2002 and 2009 (the years for which land expropriation data was available). Our district-year sample consists of 58 districts[78] across the seven aforementioned states where, according to India's Ministry of Agriculture and Farmer's Welfare reports, three main crops (rice, bajra, kharif) — a critical component of farm output and rural consumption — are produced (NREGA, 2010).

The dependent variable is a dichotomous measure land expropriation$_t$ coded "1" when Naxalite rebels specifically expropriate the agricultural property of rural civilians in each of the 58

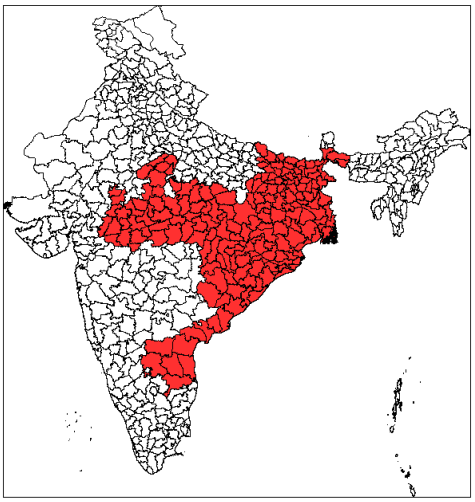
[76]" Túpac Amaru elige para capturar las granjas para alimentar...," *La Republica*, *Ibid.,* pp.2; Simpson (1993).

[77]See e.g., Eynde (2011); Gawande, Kapur and Satyanath (Forthoming); Gregory (2013).

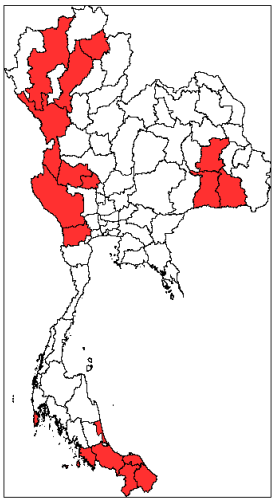
[78]*Examples* of these districts include Banka, Bankura, Bastar, Dantewada, Dhar, Dumka, East Godavari, Gajapati, Latihar, Munger, Kurnool, Saran, Saran, Suraj, Sukma, Uttar Dinajpur etc. The names of the remaining districts in the India-country sample is not listed here to save space but is available on request.

Figure A.1: The Regions Analyzed in India and Thailand

(a) India Districts



(b) Thailand Provinces



districts (2002-2009) and coded "0" otherwise. Data for coding this variable were obtained from the Government of India's Ministry of Rural Development NREGA annual reports (2002-09), primary sources such as National English newspapers (e.g. The Times of India),[79] local editions of national English dailies,[80] and local language vernacular newspapers from the seven states.[81] The independent variable is a binary *severe drought* measure, operationalized in two steps. First, we gathered rainfall data using the high resolution $1^{\circ} \times 1^{\circ}$ latitude/longitude daily rainfall dataset for the Indian region, recorded by the India Meteorological Department's (IMD) National Data Center, which measures district-level rainfall. We aggregate this daily rainfall data for each district into annual measures in centimeters. Second, following the IMD's definition of severe drought, we created the binary drought$_t$ measure: a given district was coded "1" if the annual rainfall amount falls 2 standard deviations below the district's mean rainfall level for the 2002-09 period; coded "0" otherwise. We also employ robustness analyses to show our findings hold if annual rainfall in the district falls 1.5, 2.5 or 3 standard deviations below the

[79]These newspapers include *The Times of India, The Hindu, Indian Express, Telegraph.*

[80]These local English Dailies: *The Times of India—Patna edition*, *The Hindu, Indian Express, Navbharat Times, Deccan Chronicle*, and the *Daily Chattisgarh*

[81]These vernacular newspapers from each of the 7 "red" states include (1) Andhra Pradesh: Eenadu, Praja Sakit, Andhra Bhoomi; (2) Bihar: Bihar Times, Dainik Jagran; (3)Chattisgarh: Patrika Hindi News, Naidunia; (4).Jharkand: Dainik Bhaskar, Khabar Mantra; (5) Madhya Pradesh: Navbharat Times, Naidunia; (6) Orissa: Dharitri, Samaja; (7) West Bengal: Banglatelegraph, Anand Bazar Patrika

district's mean level of rainfall.

The effect of drought$_t$ on *land expropriation* in the India district-year sample is positive and significant at the 1% level in the baseline (random effects) probit specification, where only one control (forest$_t$) is included (see India results, Table A.1). Drought$_t$ remains positive and highly significant as we move to the fully specified (random effects) probit model in Table A.1. This model include the following controls, which scholars suggest are positively associated with Naxalite land expropriation:[82] mineral$_t$, forest$_t$, and expropriation$_{t-1}$.[83] Our fully-specified probit model also reveals (using parametric bootstraps, where control variables are held at their median, for ordinal variables, and modal, for binary variables, values) that a 0-to-1 increase in drought$_t$ increases the probability of land expropriation by 11% within these seven states. This substantive effect is significant at the 95% confidence level, indicating that severe drought increases the degree of agricultural property expropriation by the Naxalites.

Next, we analyze the Thailand example. Studies show that over 90% of rural civilians killed by rebel groups (e.g., the Pattani United Liberation Organization) resided in 18 provinces, as illustrated in Figure A.1b and discussed in the relevant existing studies (Human-Rights-Watch, 2007; Davis, 2010; Helbardt, 2011).[84] These 18 (largely) agricultural provinces produce 80% of Thailand's five key crops: rice, sugarcane, rubber, corn, and maize.[85] We thus geocode data on rainfall and cropland expropriation by rebels and other controls for each of these 18 Thai provinces from 2004 to 2010 (the years for which data were available).

The dependent variable for the Thailand sample is again the binary land expropriation$_t$ measure coded as "1" for provinces where rebels expropriate agricultural property between 2004 and 2010; "0" otherwise. Land expropriation$_t$ is operationalized using the following sources: Helbardt (2011), English daily newspapers (e.g. Bangkok Post), and the Thai government's Na-

[82]See Sundar (2007); Gregory (2013).

[83]These variables are operationalized from the following primary sources: (i) Government of India. Ministry of Environment and Forest, "District-Wise Forest Cover", GOI: New Delhi; (ii) Government of India. Ministry of Home Affairs, "District Census Handbook", GOI, IMHA: New Delhi; (iii) Government of India, Registrar General and Census Commissioner, 2001. Census data, GOI: New Delhi (iv) Government of India, Ministry of Mines, 2010, "Annual Report 2009-10", Annexure 3, GOI: New Delhi; (v) Government of India, Ministry of Mines, 2009, "Annual Report 2008-2009", Annexure 3.1, GOI: New Delhi.

[84]These 18 provinces are: Buriram, Chai Nat, Chiang Mai, Kanchanaburi, Lampang, Narathiwat, Pattani, Phayao, Phuket, Ratchaburi, Roi Et, Satun, Si Sa Ket, Songkhla, Surin, Tak, Uthai Thani, and Yala.

[85]See National-Statistics-Office (1985).

tional Statistical Office's *Socio-Economic Survey Datatapes* 2010.[86] The binary independent variable *drought* was again operationalized in two steps. First, we gathered monthly rainfall data for the years 2004 to 2010 for these 18 provinces using the Government of Thailand's Meteorological Department "Monthly Rainfall Reports," which measures province-level rainfall data collected by 61 meteorological stations. We then aggregate this monthly rainfall data for each province into annual measures in centimeters. The binary variable drought$_t$ is again coded as "1" when the annual rainfall for a given province falls 2 standard deviations below the province's mean for the 2004-10 period; "0" otherwise. Again, we show that these results hold when the province's annual rainfall falls 1.5, 2.5 or 3 standard deviations below the within-province mean rainfall level.

The impact of drought$_t$ on land expropriation$_t$ in the Thailand province-year sample is positive and highly significant in all (random effects) probit specifications (see Thailand results, Table A.1), as we move from the baseline specification that only includes the forest$_t$ variable to a fully-specified probit model that includes expropriation$_{t-1}$ and four controls — forest$_t$, Muslim fraction$_t$, tobacco$_t$, and oil palm cultivation$_t$.[87] These findings confirm the argument that droughts affect the expropriation of cropland by rebels in Thailand.[88] Using parametric boostraps while holding all other variables to their medians or modes, our full random effects probit model suggests that a 0-to-1 increase in drought$_t$ yields a 27% increase in the probability of land expropriation$_t$ in Thailand; this effect is statistically significant at the 95% confidence level. Thus the brief analysis of the Thailand and India cases, as well as anecdotal evidence, suggests that our argument that rebels expropriate agricultural land from civilians during severe droughts is quite plausible. As we show below, additional comparative statics from our model

[86] Also see the following additional sources: (i) Government of Thailand. (Various years) Province Security Annual Reports. Office of the National Security Council (in Prime Minister's office). Bangkok: Government of Thailand and (ii) National Statistics Office. 2013. Thailand's Agricultural Census. Bangkok: Government of Thailand

[87] These controls are drawn from: (i) Govt of Thailand. Ministry of Natural Resources and Environment, "Rapid Forest Cover Assessment" (2004-10); (ii) Govt of Thailand. Royal Forest Department, "Forestry Statistics of Thailand" (2004-10); (iii) National Statistical Office. 2012. Advance Results: Population and Housing Census. National Statistical Office, Govt of Thailand; (iv) National Statistical Office. Data: Population and Housing Census 2000. National Statistical Office, Govt of Thailand; (v) Agricultural Statistics of Thailand, Office of Agricultural Economics, Govt of Thailand (2000-2010); (vi) Agricultural Statistics of Thailand, Office of Agricultural Economics Govt of Thailand (2004-2010); (vii) Ministry of Agriculture and Cooperatives. 2011. Agricultural Statistics of Thailand Crop Year (2000-10). Centre for Agricultural Statistics, Bangkok

[88] See e.g., Davis (2010); Helbardt (2011).

(summarized in Proposition 2 within the main paper) also suggest that during droughts, rebels will commit atrocities against civilians to facilitate expropriation and increase the probability of successfully grabbing cropland and food supplies.

Before turning to this analysis, it is important to note that land expropriation$_t$ dependent variable for both our Thailand and India samples—as depicted within Figure A.2 and Table A.3—is heavily weighted towards "no expropriation" for the India sample, but it is more evenly distributed for the Thailand sample (owing in part to the moderately larger units of temporal aggregation used in the latter). As such, for both individual country-samples, we report a second robustness table, that re-assesses our primary India and Thailand land expropriation$_t$ models while using penalized maximum likelihood-estimated logistic regressions within Table A.2. We find in this Table that our results for drought$_t$ on *land expropriation* are generally robust to this alternate estimation strategy. Thus the brief expropriation analyses of the Thailand and India cases, as well as the anecdotal evidence discussed in the main paper, suggest that our argument that rebels expropriate agricultural land from civilians during severe droughts is quite plausible. Yet it is important to note here that, as posited within our main paper's theory section, the rebels also recognize *ex ante* that they will face a fundamental trade-off *ex post* upon expropriating the cropland. To reiterate, this trade-off is as follows—on the one hand, the rebels can capture or co-opt the rural civilian labor in the expropriated cropland and use them for agricultural production. Doing so will make it necessary for the rebels to "maintain" the captured labor and share some of the stockpiled food with these rural workers as they need at least subsistence consumption of food for survival. On the other hand, the rebels can potentially *expel* the rural civilian workers from the cropland and then use the entire stockpiled food for their own consumption instead of sharing it with the workers. Our model suggests that in the specific context of a severe drought, the rebels will address this trade-off by optimally choosing to *not* employ the rural labor for agricultural production in the cropland that they seek to expropriate. Rather our model suggests that the rebels will rationally opt to expel — in other words evict — the rural labor from the cropland and in fact, they will commit atrocities against the civilian workers to evict them from their croplands.

To empirically evaluate our claims in this regard, we again conduct a brief statistical anal-

ysis of district-year data from the same 58 Indian districts (2002-09) and 18 Thai provinces (2004-10) examined above to explore the link between severe droughts and rebel-perpetrated atrocities in these two countries. The dependent variable for the India district-year sample is the civilian deaths$_t$ (count) variable that captures the number of civilians killed by Naxalite rebels each year from 2002 to 2009, for each of the 58 districts in the seven red states. This variable was operationalized from the the Government of India's Ministry of Home Affairs reports, additional secondary sources[89] and primary sources including national English newspapers,[90] local editions of English daily newspapers,[91] and local language vernacular dailies from the seven states.[92] The independent variable is again the binary drought$_t$ measure described in the previous section. As Table A.1 illustrates, drought$_t$ again produces a positive and highly significant effect on civilian deaths$_t$ in both (fixed effects) negative binomial models: the (i) baseline specification that includes civilian atrocities$_{t-1}$; and (ii) the fully specified model which, following recent research on Naxalite violence,[93] includes mineral$_t$, forest cover$_t$, registered caste/tribe as a fraction of the total population (social frac.$_t$),[94] and civilian deaths$_{t-1}$. Using parametric bootstraps while holding all other variables to their medians or modes, our fixed effects negative binomial suggests that a 0-to-1 increase in severe droughts leads to a 35% increase in the average district-level rate of civilians killed by Naxalites. This impact is significant at the 95% confidence level, again suggesting a strong positive association between severe droughts and rebel-perpetrated atrocities in India.

The dependent variable for the analysis of rebel-perpetrated atrocities in the Thailand province-year sample is again the count variable civilian deaths$_t$, operationalized as the number of civilians killed per year by anti-government groups for the years 2004-2010 in each of the 18

[89]These additional secondary sources include: (i) "Statistics of Naxal Violence" (Various years) Naxal Management Division, Ministry of Home Affairs, Govt of India: New Delhi and (ii) Rajat Kujur. 2009. "Naxal Movement in 2008: An Assessment", IPCS Issue Brief, New Delhi: India

[90]See e.g. *The Times of India, The Hindu, Indian Express, Telegraph.*

[91]These include *The Times of India—Patna edition*, *The Hindu, Indian Express, Navbharat Times, Deccan Chronicle*, and the *Daily Chattisgarh*

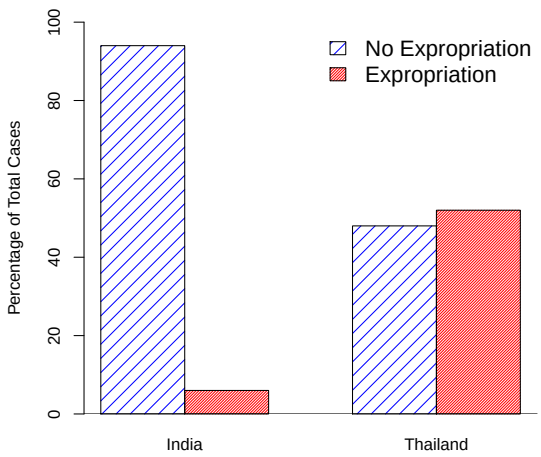
[92]These vernacular newspapers from each of the 7 "red" states include (1) Andhra Pradesh: Eenadu, Praja Sakit, Andhra Bhoomi; (2) Bihar: Bihar Times, Dainik Jagran; (3)Chattisgarh: Patrika Hindi News, Naidunia; (4).Jharkand: Dainik Bhaskar, Khabar Mantra; (5) Madhya Pradesh: Navbharat Times, Naidunia; (6) Orissa: Dharitri, Samaja; (7) West Bengal: Banglatelegraph, Anand Bazar Patrika

[93]E.g., Eynde (2011); Gawande, Kapur and Satyanath (Forthoming).

[94]The sources from which these control variables have been operationalized have been listed in an earlier footnote.

provinces in our sample.[95] To operationalize severe drought we relied on the same binary *drought* measure for Thailand discussed earlier. The impact of drought$_t$ on civilian deaths$_t$ is positive and significant at the 1% level in the following two (fixed effects) negative binomial specifications (see Table A.1): (i) a baseline model that only includes civilian deaths$_{t-1}$ and tobacco$_t$ (to account for a potential relationship between violence and more profitable/tradable crops); and (ii) a fully-specified model that includes civilian deaths$_{t-1}$, forest$_t$, Muslim fraction$_t$, tobacco$_t$, and oil palm cultivation$_t$.[96] As above, bootstrap simulations done while holding all other variables to their modes or medians show that drought$_t$ produces an 18% increase in the rate of civilian deaths$_t$ for our Thailand sample, which significant at the 95% level. These findings again confirm our expectations regarding the positive association between droughts and rebel-perpetrated atrocities in Thailand.

Figure A.2: Distributions of Expropriation$_t$ (India and Thailand)



[95]This variable is coded from the following sources: (i) Deep South Watch (2012). Conflict in Southern Thailand. Center of Conflict Studies and Cultural Diversity. Prince of Songkla University; (ii) International Crisis Group. Crisis Watch Database–Thailand. Various years; (iii) Human Rights Watch. 2007. "No One is Safe: Insurgent Attacks on Civilians in Thailand's Southern Border Provinces." New York: Human Rights Watch; (iv) Helbardt, S. 2011 and (v) Government of Thailand. "Province and Local Violence Yearly Report." Thailand Government Committee on Social Development and Human Security (Office of the Prime Minister). Bangkok: Thailand.

[96]For studies highlighting these variables, see Human-Rights-Watch (2007); Davis (2010); Helbardt (2011). The sources from which these variables are operationalized were listed in an earlier footnote.

Table A.1: Probit and Negative Binomial (NB) Results (India and Thailand)

	Probit Estimates: Land Expropriation$_t$	**s.e.**	**Probit Estimates: Land Expropriation$_t$**	**s.e.**	**NB Estimates: Civilian Deaths$_t$**	**s.e.**	**NB Estimates: Civilian Deaths$_t$**	**s.e.**
India								
Drought$_t$	5.930*	(1.343)	5.140*	(1.409)	0.253*	(0.111)	0.293*	(0.106)
Expropriation$_{t-1}$	.	.	0.365	(0.818)	.	.	.	.
Civilian deaths$_{t-1}$	.	.	.	.	0.001*	(0.0001)	0.001*	(0.0001)
Minerals$_t$	.	.	0.366	(1.410)	.	0.691*	(0.162)	
Forest$_t$	-8.959	(5.612)	-7.360	(5.712)	.	.	0.004	(0.011)
Social frac.$_t$	.	.	.	.	.	.	2.323*	(0.779)
Constant	-7.913*	(1.494)	-7.326*	(1.764)	1.271*	(0.095)	-0.358	(0.493)
ρ	0.967*	(0.013)	0.957*	(0.017)	.	.	.	.
Observations	319		317		318		318	
Log-psuedoikelihood	-25.375		-25.356		-1440.657		-1429.208	
Thailand								
Drought$_t$	1.528*	(0.688)	1.019*	(0.508)	0.141*	(0.058)	0.163*	(0.063)
Expropriation$_{t-1}$	.	.	1.723*	(0.361)	.	.		
Civilian deaths$_{t-1}$	.	.	.	.	0.002*	(0.004)	0.001*	(0.0003)
Forest$_t$	2.237	(1.669)	13.380	(15.617)	.	.	6.218*	(2.913)
Musl. frac.$_t$	.	.	0.018	(0.010)	.	.	-0.001	(0.004)
Tobacco$_t$	.	.	11.548	(14.811)	-.574*	(0.144)	5.522	(2.918)
Oil palm cult.$_t$	.	.	0.006	(0.005)	.	.	0.0004	(0.0004)
Constant	-1.145	(0.827)	-14.452	(15.421)	4.940*	(0.320)	-0.798	(3.027)
ρ	0.657	(0.145)	$4.86e^{-6}$	(0.004)	.	.	.	.
Observations	106		98		106		100	
Log-psuedoikelihood	-57.562		-35.557		-365.695		-331.810	

Note: * indicates $p < .05$; groups are clustered by district for India, and by province for Thailand.

Table A.2: Penalized Maximum Likelihood Logistic Regression Results (India and Thailand)

	Small Specifications: Land Expropriation$_t$	**s.e.**	**Large Specifications: Land Expropriation$_t$**	**s.e.**
India				
Drought$_t$	1.507*	(0.547)	1.557*	(0.718)
Expropriation$_{t-1}$	.	.	3.972*	(0.695)
Minerals$_t$	.	.	0.093	(0.716)
Forest$_t$	0.003	(0.034)	0.020	(0.035)
Constant	-3.385*	(0.352)	-4.133*	(0.530)
Observations	319		317	
Penalized Log-likelihood	-48.991		-31.272	
Thailand				
Drought$_t$	1.137*	(0.517)	1.450$^+$	(0.818)
Expropriation$_{t-1}$	.	.	2.636*	(0.601)
Forest$_t$	0.096	(1.095)	19.654	(23.513)
Musl. frac.$_t$	.	.	0.027	(0.017)
Tobacco$_t$	.	.	16.977	(22.198)
Oil palm cult.$_t$	.	.	0.011	(0.009)
Constant	-0.256	(0.560)	-21.369	(23.181)
Observations	106		98	
Penalized Log-likelihood	-67.588		-28.245	

Note: * indicates $p < .05$; $+$ indicates $p < .10$.

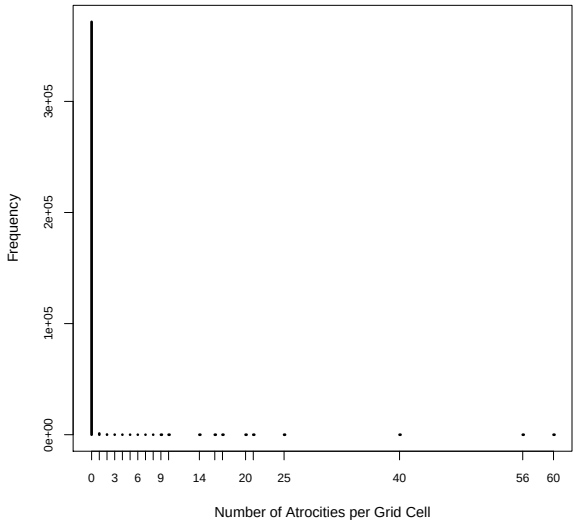
Table A.3: Summary Statistics for Expropriation$_t$ (India and Thailand)

	Median	**Mean**	**Std. Dev.**	**Min**	**Max**	Obs.
Expropriation$_t$ (India)	0	0.06	0.23	0	1	386
Expropriation$_t$ (Thailand)	1	0.52	0.50	0	1	117

IV. Descriptive Statistics & Robustness Models

Figure A.3: Rebel-Perpetrated Atrocity Incidents by Grid-Cell, 1995-2008

(a) Annual Instances of Atrocities



(b) Annual Non-Zero Instances of Atrocities

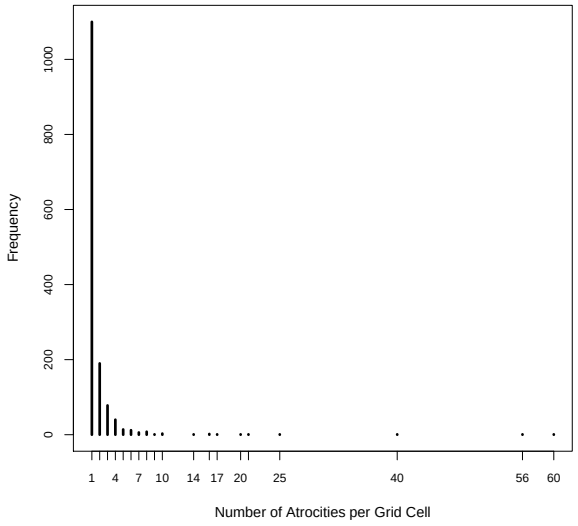


Figure A.4: Rebel-Perpetrated Atrocities Over Time, 1995-2008

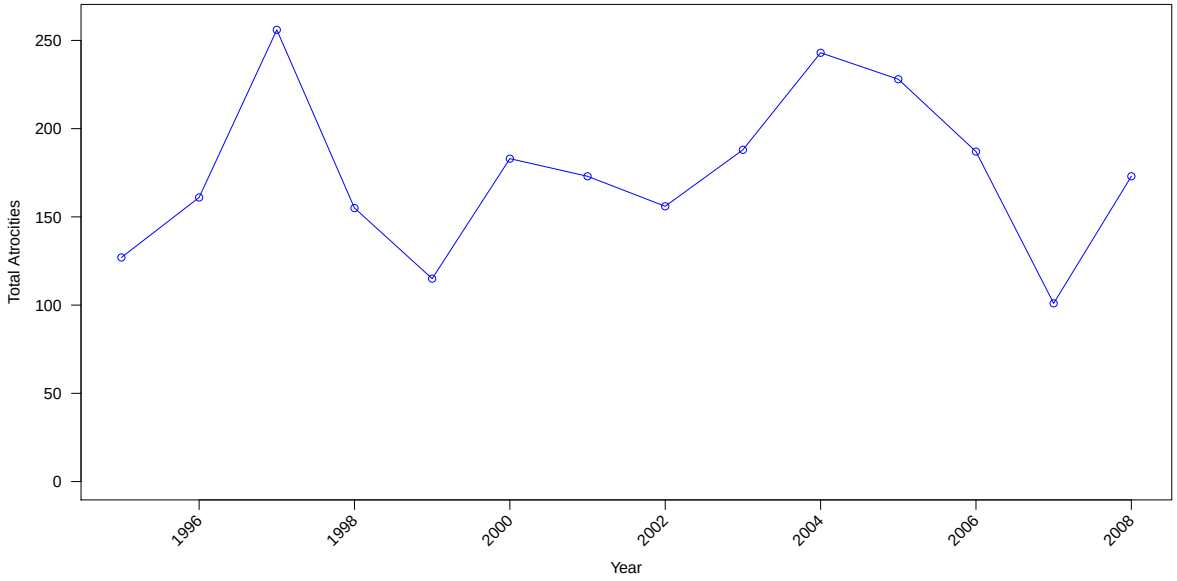


Figure A.5: Rebel-Perpetrated Atrocities Across Countries, 1995-2008

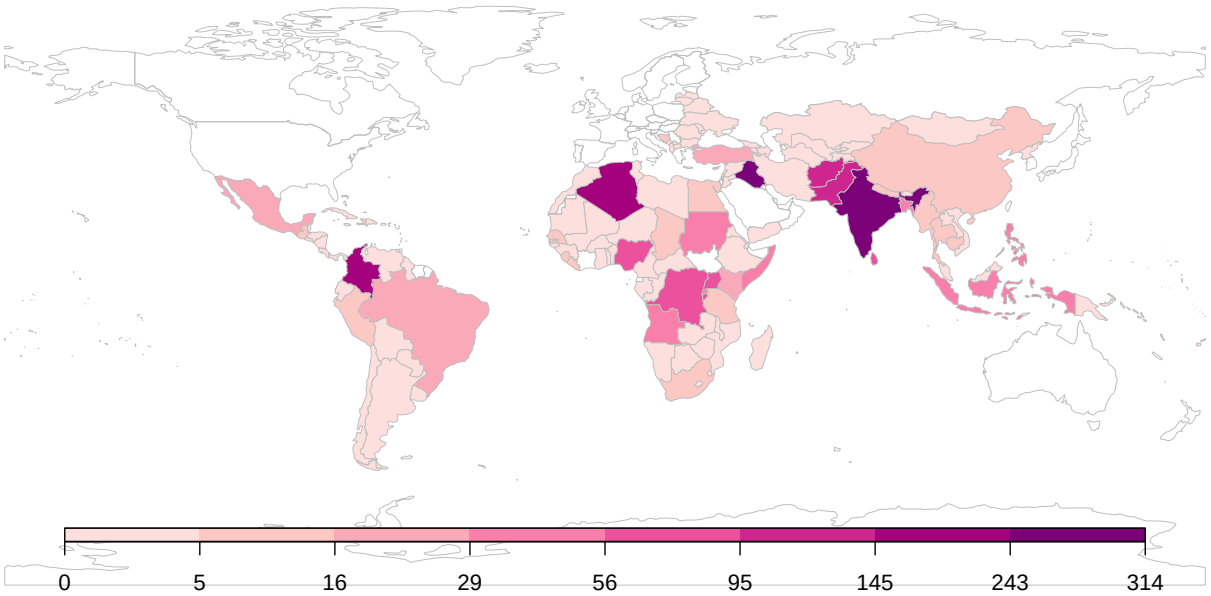


Table A.4: Summary Statistics for All Variables, 1995-2008

	Median	**Mean**	**Std. Dev.**	**Min**	**Max**
Atrocities$_t$	0	0.01	0.21	0	60
Drought$_t$	0	0.09	0.28	0	1
Drought$_t$ Index	0	0.28	0.73	0	2.5
Civil conflict$_{t-1}$	0	0.14	0.35	0	1
Ln travel time$_t$	5.82	5.92	0.98	0	10.31
Ln cell area$_t$	7.93	7.71	0.80	-5.91	8.04
Ln population$_{t-1}$	10.34	10.23	2.17	0	16.63
Ln GCP$_{t-1}$	0.25	0.62	0.79	0	5.85
Polity$_{t-1}$	4	1.82	6.50	-10	10
Ln border distance$_t$	5.15	5.00	1.35	0	7.99
Urban$_t$	0	0.22	1.15	0	51.55
Cropland$_t$	17.34	29.67	31.19	0	99.99
Ethnic Diversity$_{t-1}$	1	1.71	1.42	0	8
Ln GDP pc$_{t-1}$	8.18	8.13	0.94	4.61	9.95
Temperature$_t$	21.97	18.44	9.32	-16.04	35.93
Ln precipitation$_t$	6.59	6.49	0.86	4.22	9.27
Ethnic Fractionalization	0.54	0.51	0.23	0	0.93
Polity$^2_{t-1}$	49	45.58	25.59	0	100
Atrocities$_t$ (GED)	0	0.01	0.33	0	57
Splag Atrocities$_{t-1}$	0	0.003	0.03	0	1
Splag Atrocities$_{t-1}$ (GED)	0	0.002	0.02	0	1
Government Initiated Atrocities$_{t-1}$	0	0.002	0.06	0	12

Table A.5: Primary ZINB Robustness Models (Count Stage)

	Year FE in Inflation-Stage	Spatial Lag in Inflation-Stage	All Additional Controls	Alternative Drought Var.	ZIP Model	GED-Atrocity Sample	Africa Sample	Non-Urban Cells Only
Count Stage								
Drought$_t$	0.336*	0.336*	0.269$^+$	.	0.357*	0.223*	0.420*	0.238*
	(0.130)	(0.130)	(0.144)		(0.154)	(0.096)	(0.163)	(0.116)
Drought$_t$ Index	.	.	.	0.119*	.	.	.	.
				(0.050)				
Civil conflict$_{t-1}$	0.238*	0.238*	0.220*	0.239*	0.247*	0.229*	0.023	0.176
	(0.076)	(0.076)	(0.085)	(0.077)	(0.084)	(0.083)	(0.080)	(0.070)
Ln travel time$_t$	0.035	0.035	0.016	0.032	0.043	-0.086	0.030	-0.029
	(0.099)	(0.099)	(0.092)	(0.099)	(0.107)	(0.089)	(0.086)	(0.090)
Ln cell area$_t$	-0.105	-0.105	-0.574	-0.104	-0.124	-0.055	-0.091	0.055
	(0.111)	(0.111)	(0.364)	(0.111)	(0.123)	(0.165)	(0.133)	(0.092)
Ln population$_{t-1}$	0.077	0.077	0.067	0.076	0.083	0.180*	0.022	0.018
	(0.064)	(0.064)	(0.054)	(0.064)	(0.069)	(0.062)	(0.087)	(0.053)
Ln GCP$_{t-1}$	-0.019	-0.019	-0.004	-0.017	-0.034	-0.192*	-0.075	0.064
	(0.083)	(0.083)	(0.072)	(0.083)	(0.091)	(0.082)	(0.137)	(0.072)
Polity$_{t-1}$	-0.001	-0.001	0.004	-0.0001	-0.001	0.013	-0.014	0.006
	(0.007)	(0.007)	(0.008)	(0.007)	(0.009)	(0.057)	(0.011)	(0.006)
Ln border distance$_t$	0.025	0.025	0.034	0.027	0.027	-0.058	0.038	0.021
	(0.025)	(0.025)	(0.024)	(0.025)	(0.032)	(0.091)	(0.039)	(0.024)
Urban$_t$	0.019	0.019	0.008	0.020	0.022	-0.0001	0.005	0.035
	(0.020)	(0.020)	(0.018)	(0.021)	(0.022)	(0.015)	(0.030)	
Cropland$_t$	-0.001	-0.001	-0.001	-0.001	-0.001	0.0004	0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Ethnic Diversity$_{t-1}$	-0.044	-0.044	-0.035	-0.045	-0.048	-0.129*	-0.094*	-0.029
	(0.035)	(0.035)	(0.037)	(0.035)	(0.037)	(0.036)	(0.047)	(0.033)
Ln GDP pc$_{t-1}$	-0.019	-0.019	-0.056	-0.023	-0.005	0.002	-0.068	-0.076
	(0.072)	(0.072)	(0.066)	(0.072)	(0.078)	(0.060)	(0.094)	(0.063)
Splag Atrocities$_{t-1}$	0.645*	0.645*	0.424*	0.665*	0.655*	1.232*	0.862*	0.598*
	(0.149)	(0.149)	(0.161)	(0.150)	(0.151)	(0.153)	(0.152)	(0.158)
t	-34.794*	-25.530*	-22.605*	-40.485*	-46.081*	-36.740*	-25.644*	-28.544
	(0.084)	(0.082)	(0.078)	(0.134)	(0.139)	(0.091)	(0.128)	(0.099)
t^2	5.550*	2.553*	3.314*	20.424*	23.412*	14.853*	3.771*	4.944*
	(0.014)	(0.011)	(0.014)	(0.078)	(0.037)	(0.252)	(0.019)	(0.018)
t^3	-0.241*	-0.062*	-0.134*	-3.311*	-3.737*	-1.816*	-0.151*	-0.235*
	(0.001)	(0.0003)	(0.001)	(0.015)	(0.178)	(0.005)	(0.001)	(0.001)
Temperature$_t$	.	.	-0.006	.	.	.	.	.
			(0.007)					
Ln Precipitation$_t$	.	.	0.038	.	.	.	.	.
			(0.054)					
Polity$^2_{t-1}$	.	.	-0.001	.	.	.	.	.
			(0.002)					
Ethnic Frac.	.	.	-0.134	.	.	.	.	.
			(0.219)					
Gov. Atrocities$_{t-1}$	.	.	0.104*	.	.	.	.	.
			(0.035)					
Constant	0.016	0.016	4.203	0.060	-0.061	-0.255	0.913	0.206
	(1.412)	(1.412)	(2.924)	(1.417)	(1.478)	(1.658)	(1.792)	(1.254)
Observations	333,243	333,243	289,072	333,243	333,243	218,975	90,481	388,830
Log-psuedoikelihood	-1,665.74	-1,665.74	-1,442.85	-1,667.42	-1,689.79	-2,378.39	-781.85	-1,568.17

Note: * indicates $p < 0.05$; $+$ indicates $p < .10$; values in parentheses are clustered standard errors. Year FEs included in Model 1, though not reported here. The GED-Atrocity dependent variable (Model 6) is operationalized as the cell-year sum of fatal (i.e., at least one civilian death) one sided political violence—targeting civilians and excluding government perpetrators—for the countries currently included in the GED data set (i.e., Africa, the Middle East, and Asia — excluding Syria), and for only those cases geo-coded with cell-level precision.

Table A.6: Primary ZINB Robustness Models (Inflation Stage)

	Year FE in Inflation-Stage	**Spatial Lag in Inflation-Stage**	**All Additional Controls**	**Alternative Drought Var.**	**ZIP Model**	**GED-Atrocity Sample**	**Africa Sample**	**Non-Urban Cells Only**
Inflation Stage								
Ln population$_{t-1}$	-0.329*	-0.400*	-0.651*	-0.245*	1.190*	-0.245*	-0.526*	0.111
	(0.125)	(0.063)	(0.219)	(0.057)	(0.131)	(0.053)	(0.112)	(0.138)
Ln travel time$_t$	0.540	-0.765*	0.530	-0.417*	0.850*	0.044	-0.347	-0.913*
	(0.313)	(0.181)	(0.399)	(0.115)	(0.228)	(0.116)	(0.256)	(0.379)
Civil conflict$_{t-1}$	-4.857*	-4.917*	-3.861*	-4.377*	5.682*	0.158	-0.579*	-3.127*
	(0.396)	(0.120)	(0.866)	(0.098)	(0.258)	(0.107)	(0.203)	(0.552)
Urban$_t$	-12.098*	0.029	-4.022	0.017	-0.122	-0.279*	0.292*	0.381*
	(3.462)	(0.022)	(2.838)	(0.056)	(0.022)	(0.069)	(0.024)	(0.106)
Ln GDP pc$_{t-1}$	-2.057*	-0.292*	-2.555*	-0.206*	0.209	0.534*	-1.310*	-0.122
	(0.215)	(0.090)	(0.392)	(0.434)	(0.137)	(0.064)	(0.196)	(0.179)
Polity$_{t-1}$	0.129*	0.156*	0.578*	-0.053*	-0.099*	0.010	-0.425*	0.217*
	(0.033)	(0.016)	(0.116)	(0.011)	(0.020)	(0.011)	(0.052)	(0.038)
Drought$_t$	-2.700*	-0.632*	-1.103	.	1.623*	0.436*	-11.306*	4.038*
	(0.768)	(0.288)	(0.653)		(0.178)	(0.126)	(0.213)	(0.552)
Drought$_t$ Index	.	.	.	0.190*	.	.	.	.
				(0.076)				
Splag Atrocities$_{t-1}$	.	-10.351*	12.764*	.	.	.	.	.
		(0.797)	(1.743)					
Constant	-17.711*	-11.002*	-5.295	-14.539*	45.569*	22.480*	-5.736	-20.077*
	(2.978)	(1.831)	(4.165)	(1.595)	(3.046)	(1.201)	(3.045)	(4.043)
Observations	333,243	333,243	289,072	333,243	333,243	218,975	90,481	388,830
Log-psuedoikelihood	-1,665.74	-1,665.74	-1,442.85	-1,667.42	-1,689.79	-2,378.39	-781.85	-1,568.17

Note: * indicates $p < 0.05$; + indicates $p < .10$; values in parentheses are clustered standard errors. Year FEs included in Model 1, though not reported here. The GED-Atrocity dependent variable (Model 6) is operationalized as the cell-year sum of fatal (i.e., at least one civilian death) one sided political violence—targeting civilians and excluding government perpetrators—for the countries currently included in the GED data set (i.e., Africa, the Middle East, and Asia — excluding Syria), and for only those cases geo-coded with cell-level precision.

Table A.7: **Count Model Estimates of Rebel-Perpetrated Atrocities, 1995-2008 (All Developing Country Grid-Cells)**

	Model 1: Baseline NB	**Model 2: Baseline ZINB**	**Model 3: Medium ZINB**	**Model 4: Full ZINB**
Count Stage				
Drought$_t$	0.334*	0.419*	0.532*	0.338*
	(0.128)	(0.144)	(0.211)	(0.128)
Civil conflict$_{t-1}$	2.133*	0.806*	0.902*	0.236*
	(0.095)	(0.245)	(0.407)	(0.076)
Ln travel time$_t$	0.007	-0.191	0.214	0.036
	(0.153)	(0.260)	(0.352)	(0.099)
Ln cell area$_t$	0.047	-0.008	-0.165	-0.106
	(0.135)	(0.136)	(0.173)	(0.111)
Ln population$_{t-1}$	0.620*	0.323*	0.588*	0.078
	(0.062)	(0.110)	(0.233)	(0.062)
Ln GCP$_{t-1}$	.	.	-0.183	-0.020
			(0.134)	(0.820)
Polity$_{t-1}$	.	.	-0.081*	-0.0003
			(0.029)	(0.007)
Ln border distance$_t$	.	.	-0.378*	0.025
			(0.073)	(0.025)
Urban$_t$	.	.	0.034	0.019
			(0.034)	(0.020)
Cropland$_t$	.	.	-0.010*	-0.001
			(0.003)	(0.002)
Ethnic Diversity$_{t-1}$	.	.	-0.042	-0.045
			(0.075)	(0.034)
Ln GDP pc$_{t-1}$	.	.	0.553*	-0.018
			(0.170)	(0.071)
Splag Atrocities$_{t-1}$	.	.	.	0.648*
				(0.149)
t	.	.	.	-26.825*
				(0.094)
t^2	.	.	.	4.023*
				(0.015)
t^3	.	.	.	-0.164*
				(0.001)
Constant	-0.439	-0.439*	-12.446*	0.002
	(0.758)	(0.758)	(5.557)	(1.394)
Inflation Stage				
Ln population$_{t-1}$	.	-0.371*	-0.426*	-0.325*
		(0.130)	(0.201)	(0.122)
Ln travel time$_t$	.	-0.311	0.089	-0.353
		(0.222)	(0.316)	(0.257)
Civil conflict$_{t-1}$	.	-1.871*	-2.738*	-0.800*
		(0.507)	(0.275)	(0.227)
Urban$_t$	.	0.118*	-0.119	-0.947*
		(0.041)	(0.068)	(0.234)
Ln GDP pc$_{t-1}$	.	.	1.155*	0.758*
			(0.451)	(0.178)
Polity$_{t-1}$	.	.	-0.164*	1.361*
			(0.060)	(0.135)
Drought$_t$	.	.	0.271	0.194
			(0.294)	(0.284)
Constant	-13.543*	-8.191*	-2.266	-19.817*
	(1.278)	(1.859)	(7.380)	(3.519)
Observations	432,350	432,350	389,764	
Log-psuedoikelihood	-9,727.35	-9,630.26	-1,674.74	

Note: * indicates $p < 0.05$; values in parentheses are robust standard errors clustered by cell-id.

Table A.8: List of Developing Countries Included in Sample

Afghanistan	Georgia	Nicaragua
Albania	Ghana	Niger
Algeria	Grenada	Nigeria
Angola	Guatemala	Pakistan
Argentina	Guinea	Palau
Armenia	Guinea-Bissau	Panama
Azerbaijan	Guyana	Papua New Guinea
Bangladesh	Haiti	Paraguay
Belarus	Honduras	Peru
Belize	India	Philippines
Benin	Indonesia	Romania
Bhutan	Iran	Rwanda
Bolivia	Iraq	Saint Kitts and Nevis
Bosnia-Herzegovina	Jamaica	Saint Lucia
Botswana	Jordan	Saint Vincent and the Grenadines
Brazil	Kazakhstan	Samoa/Western Samoa
Bulgaria	Kenya	Senegal
Burkina Faso	Kiribati	Seychelles
Burundi	Korea, People's Republic of	Sierra Leone
Cambodia	Kosovo	Solomon Islands
Cameroon	Kyrgyz Republic	Somalia
Cape Verde	Laos	South Africa
Central African Republic	Latvia	Sri Lanka
Chad	Lebanon	Sudan
Chile	Lesotho	Swaziland
China	Liberia	Syria
Colombia	Libya	Sao Tome and Principe
Comoros	Lithuania	Tajikistan
Congo	Macedonia	Tanzania
Congo, Democratic Republic of	Madagascar	Thailand
Costa Rica	Malawi	Togo
Cote D'Ivoire	Malaysia	Tonga
Cuba	Maldives	Tunisia
Djibouti	Mali	Turkey
Dominica	Marshall Islands	Turkmenistan
Dominican Republic	Mauritania	Tuvalu
East Timor	Mauritius	Uganda
Ecuador	Mexico	Ukraine
Egypt	Moldova	Uruguay
El Salvador	Mongolia	Uzbekistan
Eritrea	Montenegro	Vanuatu
Ethiopia	Morocco	Venezuela
Federated States of Micronesia	Mozambique	Vietnam
Fiji	Myanmar	Yemen
Gabon	Namibia	Zambia
Gambia	Nepal	Zimbabwe

V. Drought and Violence Narratives

Anecdotal evidence is highly suggestive of rebels' use of increased violence to evict civilians and occupy their lands during droughts. For instance, Naxalite rebel groups in the Andhra Pradesh and Chattisgarh states in India (Pandita, 2011), the Karenni National Progressive (KNP) Party in the Loikaw district (Kayah State) in eastern Myanmar (South, 2005; Smith, 1999), and Hutu rebels in Southern Burundi (Lemarchand, 1996; Longman, 1998), have all been reported to (frequently) grab the arable land of peasants to attain food-stuffs and farmers' cattle for consumption, or as a monetary tool for recruiting potential soldiers.

The use of expropriated land for the purpose of self-sustenance has also been exercised by armed groups in the Philippines (Reuveny, 2007), Somalia (the Somali National Movement and Al-Shabaab, Hendrix and Brinkman, 2013), and Nicaragua (the Contras, see e.g. Kay, 2007). These groups have often sought to forcibly expropriate agricultural land from civilians for consumption and production, or—as in the case of Sierra Leone—for recruiting potential combatants who "were more likely to participate if offered money and food" (Hendrix and Brinkman, 2013, 4). The underlying logic to this dynamic of forcible expropriation of land for food consumption by armed actors is emphasized by Hendrix and Brinkman who state that, "[r]ebel movements typically do not grow their own food and depend on voluntary or coerced contributions from the population" (2013, 4). In this sense, the overarching need for food-stuffs from local civilians directly underpins rebels' demands for local resources, and in turn, often provides the justification for the use of atrocities against these same civilian populations.

Indeed, rebels' dependencies on local populations for sustenance frequently spiral into acts of violence against civilians for a number of reasons. Rebel organizations, especially mobile ones, often have trouble controlling local populations, given that "many rebels are merely passing through the countryside, on their way to seek power in towns. Having little in common with the peasantry, and nothing to offer it, they resort to violence as the only way to control it" (Mkandawire, 2002, 181). In these respects, social unfamiliarity between rebels and civilians is argued to be a common feature of contemporary conflicts, and is believed in turn to compel rebels to use violence not only to control civilians, but also to loot resources, including food-stuffs. Indeed, as Mkandawire argues, "[t]he targeted area need not be one with diamonds, but

any from which rebels can extract surplus" (2002, 212). Here, rebels especially use violence to obtain food (i.e., rather than securing cooperation among civilians to obtain this food) in areas designated specifically as "target areas." One example of these latter dynamics comes from Mozambique, where "[i]n the south, RENAMO raided villages for food but rarely tried to establish control over the population. These provinces were mainly destruction areas, where RENAMO just carried out military operations, attacking villages and killing people" (Hultman, 2009, 832-833).

While these food related dynamics are evident in all periods of conflict, drought increases rebels' incentives to use violence to extract surplus. Importantly, droughts cause resource shrinkage, which forces the local population to significantly reduce consumption and change consumption habits. For example, during the drought in Burkina Faso "farmers strove to minimize cash investments in agriculture, but in some cases they were unable to do so because many had consumed all their seed before planting" (Roncoli, Ingram and Kirshen, 2001, 128). Similarly, during droughts in Sudan, "[e]ventually, desperate people will consume toxic plants, and may even rob insect colonies for grain. The consumption of dum palm trees by the Beja represents a form of disinvestment, as the trees provide raw materials for mat and rope making" (Cutler, 1986, 187-188).

As a result, the shrinkage of resources caused by drought has been shown to produce an increase in violence against civilians. For instance, in Darfur, long term desertification and drought has been invoked to explain the massive use of violence by pastoralist Arab militias against agriculturalist groups designed to capture the latter's fertile land (Flint and de Wall, 2008, 40). Similarly, Sabot Land Defense Force rebels in Kenya, who were dependent on the local population for coerced food support, perpetrated atrocities from 2006-2008, a period of decreased precipitation (Theisen, 2012, 82), in order to obtain land and cattle (Simiyu, 2008).

With declines in available resources for consumption and heightened instances of violence, civilians typically either give up their food resources, turn the government for help, or form their own defense forces, which further pushes rebels to use violence in order to prevent the formation of armed opposition. For example, in the Horn of Africa:

> ...In response to increasing violence against the Mukogodo Masai by armed groups,

> the government took a decision to arm home guards for the protection of the communities. Far from this being a solution to the problem, the government decision has led, firstly, to the increase of small arms in the hands of untrained men. Secondly, the home guards are believed to be in the forefront of the raids, though research is needed to substantiate this claim. Thirdly, the experience in Uganda shows that it is not an effective security solution. Fourthly, there is now the problem of the legal control of home-guards and the law which they operate under. There is also no law under which the home guards are issued arms. The only person allowed to issue licence according to the law of Kenya to carry arms is the Chief Licensing Officer...
>
> ...Arms have introduced a new dimension to conflict. Armed Samburu terrorised residents of Laikipia who then felt compelled to protect themselves by acquiring arms. Preliminary research done in Samburu indicates that the Samburu armed themselves after being raided many times by the Turkanas (Mkutu, 2001).

Similar dynamics are evident in Peru, where peasants in many regions form their own civil defense forces, the *rondas companistas*:

> ...for the sole purpose of preventing the continuous robbery of cattle, of crops, house-breaking, assaults and the abuses that are committed against our defenseless wives, by individuals who wander well armed at night... to give us security so we can dedicate ourselves to raising cattle and crops (Gitlitz and Rojas, 1983, 163).

The different motivations for violence against civilians, which intensify during drought, are captured in the model presented in the main paper and supported by the anecdotal evidence presented here. Specifically, this evidence highlights two different motivational pathways—resource shrinkage and the need to prevent the formation of armed opposition—which together compel rebels to use and increasingly commit atrocities against rural civilian populations so as to increase the likelihood with which they can expropriate, and retain control of, croplands during a severe drought.

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