Rebel Tactics*

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Abstract

I study a model of mobilization and tactical choice by rebels. The rebel leaders have two tactics available to them: *symmetric* tactics are most effective when public mobilization is high, whereas *asymmetric* tactics can be effective with more limited mobilization. The model yields six results. First, successful asymmetric campaigns demonstrate rebel capacity and increase mobilization, allowing a shift to symmetric tactics. Second, successful counterinsurgencies demonstrate lack of rebel capacity and diminish mobilization, causing a shift from symmetric to asymmetric tactics or withdraw from conflict. As such, successful counterinsurgencies may actually lead to an increase in asymmetric violence (such as terrorism). Third, increased non-violent opportunity (economic or political) decreases symmetric conflict but has a non-monotone effect on asymmetric conflict, since when opportunity is very bad rebel leaders substitute from asymmetric to symmetric tactics and when opportunity is very good rebel leaders believe future mobilization will be low and withdraw from conflict. This non-monotonicity suggests the importance of considering the endogenous choice among tactics in empirical research on the causes of terrorism, insurgency, and civil war. Fourth, the ideological extremism or social isolation of rebel leaders is positively correlated with asymmetric conflict, but not with symmetric conflict. Fifth, conflict begets conflict because when fighting is more intense, the non-violent outside option is eroded, making high level mobilization more likely in the future. Finally, engaging in conflict has option value in terms of the organization surviving to fight another day. Hence, rebel leaders continue asymmetric conflicts longer than is in their short-term interests.

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Rebels use a wide variety of tactics to fight governments. Surprisingly, both the empirical and theoretical conflict literatures have tended to treat these tactics in isolation—developing separate explanations and models of terrorism, guerilla warfare, insurgency, and so on. (Though see Kalyvas (2004); Sambanis (2008); Laitin and Shapiro (2008) for exceptions.) This is unfortunate because rebels choose tactics strategically, in response to a variety of political, economic, geographic, and military constraints. If changes in the economic, political, or strategic environment alter the attractiveness of one tactic or another, then studying the tactics in isolation may lead us to miss important substitutabilities between them, have incorrect or incomplete intuitions about their causes, and make invalid inferences from data on their correlates.

As such, I present a model of endogenous mobilization and dynamic tactical choice by a rebel organization. The rebels have two tactics available to them, which I refer to as *symmetric* and *asymmetric*. The key difference between the two tactics is that symmetric tactics are most effective when mobilization is strong, whereas asymmetric tactics can be used effectively even by a small group of extremists.

The model yields six results. First, successful asymmetric campaigns demonstrate to the population that rebel capacity is relatively high. As a result, such campaigns lead to an increase in mobilization that intensify conflict and may ultimately allow rebel leaders to shift from asymmetric to symmetric tactics. Hence, the model is consistent with a variety of historical examples in which successful terrorist campaigns helped spark a larger insurgency or civil war.[1]

Second, successful counterinsurgencies demonstrate a lack of capacity in the rebel organization. This leads to an endogenous decrease in public mobilization. In the case of a moderately successful counterinsurgency, the rebel leaders transition from symmetric to asymmetric tactics. Hence the model suggests that successful counterinsurgency operations against groups engaged in civil war can lead to an increase in urban terrorism or other guerilla tactics. Even more successful counterinsurgency may lead the rebels to withdraw from conflict entirely.

The finding that successful counterinsurgency can lead to an increase in terrorism offers a theoretical interpretation of events such as the recent suicide bombings in the Moscow subway. Such attacks can be seen as a sign of the success of the Russian counterinsurgency

[1] For instance, the Algerian War of Independence (Kalyvas, 1999), the Russian Revolution (DeNardo, 1985), or the Second Palestinian Intifada. For other models of "vanguard violence" leading to larger insurrections, see, among others, Olson Jr. (1965); Tullock (1971, 1974); Popkin (1979); DeNardo (1985); Finkel, Muller and Opp (1989); Kuran (1989); Lohmann (1994); Lichbach (1995); Ginkel and Smith (1999); Chwe (1999); Baliga and Sjöström (2009); Bueno de Mesquita (2010).

in Chechnya. As a result of Russian efforts, the rebels lost enough popular support that the most effective tactic available to them is terrorism. (See Lyall (2009, 2010) on the Russian counterinsurgency.) A similar argument might account for the shift in North Vietnamese tactics—away from symmetric warfare by the army and toward guerilla and terrorist attacks by the Viet Cong—following the Tet Offensive.

Third, the model predicts that the quality of the outside option (e.g., economic opportunity or non-violent opportunities for expression of grievance) has different effects on the likelihood of symmetric and asymmetric conflict. A decrease in opportunity increases the risk of symmetric conflict. This is due to standard arguments about opportunity costs. As opportunity diminishes, the population is more willing to mobilize. Since symmetric tactics are only an attractive tactic for rebellions with strong popular support, as opportunity decreases and mobilization increases, symmetric tactics become a more attractive option.

More surprisingly, the effect of opportunity on asymmetric conflict is non-monotone. Asymmetric tactics are used by rebel groups that believe they are capable of fighting the government, but lack high levels of mobilization. When opportunity is poor, if the population perceives the rebels to be capable enough to fight the government, enough people will mobilize such that the rebels will engage in symmetric conflict. When opportunity is very good, then not only will the population not mobilize in the short-run, the rebel leaders believe future mobilization is likely to be low, increasing the appeal of withdrawing from conflict. Thus, all else equal, asymmetric conflict is most likely in societies where non-violent opportunity is at moderate levels, such that mobilization is low, but extremists are still willing to fight.

This non-monotonicity highlights the importance of jointly studying the causes of terrorism, insurgency, and civil war, not only in theoretical models, but empirically. A standard intuition, which informs much empirical work on terrorism and civil wars, is that conflict should increase as opportunity diminishes.[2] My model suggests that the intuition that there will be a monotone relationship between opportunity costs and terrorism is an artifact of considering terrorism in isolation from other forms of conflict. When we consider the possibility of an endogenous choice among rebel tactics we find that terrorism is expected to be maximized at some interim level of outside opportunity, rather than having a monotone

[2]This intuition is the same as that articulated by Becker (1968) in his seminal work on the economics of crime. For empirical research examining this intuition for civil wars see, among many others, Collier and Hoeffler (2004); Miguel, Satyanath and Sergenti (2004); Bazzi and Blattman (2011). For empirical research examining this intuition for terrorism see, among many others, Krueger and Maleckova (2003); Blomberg, Hess and Weerapana (2004); Drakos and Gofas (2006); Pape (2005); Krueger and Laitin (2008); Benmelech, Berrebi and Klor (forthcoming). For empirical work suggesting the relationship between opportunity and mobilization may be more complicated, see, Berman et al. (forthcoming); Dube and Vargas (2009).

relationship with opportunity. This suggests that standard empirical attempts to identify an effect of opportunity on terrorism may be misspecified.

Fourth, the model predicts that the ideological extremism or social isolation of rebel leaders will be positively correlated with asymmetric conflict, but not with symmetric conflict. When the rebel leaders are very extreme or isolated, it is more likely that a scenario will arise in which the population is not willing to mobilize, but the rebel leaders will still engage in conflict. In the absence of strong mobilization by the population, the best tactical choice available to the rebel leaders is asymmetric conflict. Thus, extremism or isolation on the part of the rebel leaders increases the risk of asymmetric conflict. Such a relationship does not exist with respect to symmetric conflict because symmetric tactics are only attractive when mobilization is high. And if the outside option is bad enough that population members are willing to mobilize, then rebel leaders (who are more extreme than the population) are certainly willing to fight.

Fifth, the model predicts that conflict begets conflict. Fighting damages the economy. Hence, the more intense fighting is in one period, the worse the outside option is expected to be in future periods. As such, periods of intense conflict are likely to be followed by periods of even more intense conflict, since, on average, intense conflict in one period lowers the opportunity costs of conflict in future periods.

Finally, engaging in conflict has option value for the rebel leaders, in the sense that it allows the rebel organization to survive to fight another day. When the rebel organization is close to defeat, the rebel leaders hold out hope that circumstances might change in a way that is more favorable to attracting mobilization. Hence, rather than withdraw from conflict and give up, during the last gasps of conflict, rebel leaders continue to engage in asymmetric conflict longer than is in their short-term interests.

1 The Model

There are two kinds of players: the rebel leaders (treated as a unitary actor) and a continuum of population members of mass N, indexed by i. Each population member is described by a parameter, η_i. It is common knowledge that the η's are distributed uniformly on $[\underline{\eta}, \overline{\eta}]$.

There are two kinds of periods: conflict periods and peace periods. The time line for a conflict period is as follows:

(i) The rebel organization has a capacity κ_{t-1}, which is not observed by any player.

(ii) Each member of the population, i, decides whether to mobilize, $a_t^i \in \{0, 1\}$, where

$a_t^i = 1$ is interpreted as population member i mobilizing for period t.

(iii) The rebel leaders observe the mass of population members who mobilized, N_t, and choose a tactic $a_t^R \in \{A, S, W\}$, with A representing asymmetric tactics, S representing symmetric tactics, and W representing withdrawal from conflict

(iv) If $a_t^R \in \{A, S\}$, there is conflict. During the fighting, a new capacity, κ_t, is determined. If the choice is $a_t^I = W$, there is no conflict.

During a peace period, there is no mobilization decision nor is there any conflict. The game starts in a conflict period. It transitions to a peace period if the rebel leaders ever choose to withdraw from conflict. Withdrawing from conflict is an absorbing state—the game cannot transition from a peace period to a conflict period. The game lasts $T > 1$ periods, with T finite.[3]

The common priors are as follows. κ_t is the realization of a random variable distributed according to an absolutely continuous cumulative distribution function, $F_{\kappa_{t-1}}$ with mean κ_{t-1} and support $(0, \infty)$. The associated density is $f_{\kappa_{t-1}}$. These distributions are ordered by first-order stochastic dominance. That is, F_κ first-order stochastically dominates $F_{\kappa'}$, if $\kappa > \kappa'$. The distributions and κ_0 are common knowledge.

In each period the population members' outside option has a common component, u_t, which is the realization of a random variable distributed according to an absolutely continuous cumulative distribution function, $G_{u_{t-1},N_{t-1}}$, with support $[\underline{u}, \overline{u}]$. The associated density is $g_{u_{t-1},N_{t-1}}$. These distributions are ordered by first-order stochastic in u_{t-1} and in $-N_{t-1}$. The first of these implies that the better is the outside option today, the better is the expected outside option tomorrow. The idea behind the second is that the more people who mobilized for conflict yesterday, the more intense was the fighting, and so the more damage was done to the expected outside option.[4] The distributions and u_0 are common knowledge. The realization of u_t is observed by all players.

[3]It is straightforward to show that the equilibrium I identify is a Markov Perfect Equilibrium of the infinitely repeated game. Uniqueness, however, is not guaranteed. (To see why, see the proofs of Lemmas B.1, B.2, and B.3.)

[4]Some recent studies raise empirical questions about the scope of economic damage associated with war. Exploiting local variation in the intensity of arial bombing in Japan (Davis and Weinstein, 2002) and Vietnam (Miguel and Roland, 2011), these studies find that heavily bombed areas return to prewar growth levels fairly quickly. Of course, such findings do not contradict the claim that war damages capital and reduces short-run opportunity costs. In any event, none of the results are sensitive to the assumption that G is a function of N_{t-1} with the exception of those in the section *Conflict Begets Conflict*.

1.1 Technology of Conflict

In a period t, the returns to symmetric conflict are:

$$B_t^S = \kappa_t \theta_S N_t$$

and the returns to asymmetric conflict are

$$B_t^A = \kappa_t \left(\theta_A N_t + \tau\right).$$

The parameters θ_S and θ_A capture facts about the society which determine how responsive the effectiveness of symmetric and asymmetric tactics are to mobilization, respectively. For instance, rough terrain might increase θ_S, while a highly urbanized population might make θ_A larger (Fearon and Laitin, 2003). The parameter τ captures how effective asymmetric tactics are when carried out by the rebel leaders alone, without the participation of the population.

I make two assumptions:

Assumption 1.1 *(i)* $\tau > 0$.

(ii) $\theta_S > \theta_A + \frac{\tau}{N}$.

Both assumptions are related to the same substantive idea, which is that the effectiveness of symmetric tactics is more responsive to the level of mobilization than is the effectiveness of asymmetric tactics. The first assumption insures that, if no one from the population mobilizes, asymmetric tactics are more effective than symmetric tactics. The second assumption says that, if the whole population mobilizes, symmetric tactics are more effective than asymmetric tactics. An implication of this assumption is that $\theta_S > \theta_A$; that is, increased mobilization has a bigger impact on the efficacy of symmetric tactics than on the efficacy of asymmetric tactics.

1.2 Payoffs

All players are risk neutral and have von Neuman-Morgenstern expetced utility functions given has follows.

The rebel leaders' instantaneous payoff from symmetric conflict in period t is:

$$U_t^R(a_t^R = S, N_t, \kappa_t, u_t) = B_t^S.$$

The rebel leaders' instantaneous payoff from asymmetric conflict in period t is:

$$U_t^R(a_t^R = A, N_t, \kappa_t, u_t) = B_t^A.$$

The rebel leaders' instantaneous payoff in a period in which there is no conflict is:

$$U_t^R(a_t^R = W, N_t, \kappa_t, u_t) = \beta.$$

Population members who mobilize have the same instantaneous payoffs as do the rebel leaders, except they bear a cost $c > 0$ for mobilizing. So a mobilized population member's instantaneous payoff from mobilizing when the tactics employed are symmetric is:

$$U_t^i(a_t^R = S, a_t^i = 1, N_t, \kappa_t, u_t) = B_t^S - c$$

and when the tactics employed are asymmetric is:

$$U_t^i(a_t^R = A, a_t^i = 1, N_t, \kappa_t, u_t) = B_t^A - c.$$

A population member i's instantaneous payoff from mobilizing when the rebel leaders withdraw is:

$$U_t^i(a_t^R = W, a_t^i = 1, N_t, \kappa_t, u_t) = u_t + \eta_i - c.$$

A population member i's instantaneous payoff from not mobilizing is

$$U_t^i(a_t^R, a_t^i = 0, N_t, \kappa_t, u_t) = u_t + \eta_i.$$

I assume $\beta \leq \underline{u} + \underline{\eta}$. The idea is that the rebel leaders find the idea of ending conflict less desirable than members of the population. This could be because their leadership role in the rebellion has foreclosed some outside options or because of greater ideological commitment to conflict.

All players discount the future using a common discount factor $\delta \in (0, 1)$.

1.3 Strategies and Equilibrium Concept

The solution concept is pure strategy Markov Perfect Equilibrium (MPE). A Markovian strategy for a member of the population, s_i, is a mapping from $(\overline{\kappa}_t, u_t + \eta_i, T - t)$ into $\{0, 1\}$. A Markovian strategy for the rebel leaders, s_R, is a mapping from $(N_t, \overline{\kappa}_t, u_t + \beta, T - t)$ into $\{A, S, W\}$.

I impose two additional equilibrium selection criteria. First, I restrict attention to monotone strategies for the population members. A monotone strategy is one in which, at each t, a_t^i is non-decreasing in $\overline{\kappa}_t$ and non-increasing in u_t. Second, there is a coordination game between population members. I focus on the equilibrium in which the population coordinates on the highest level of mobilization that is consistent with equilibrium. I refer to a pure strategy MPE satisfying these selection criteria as simply an *equilibrium*.

2 Verisimilitude of Key Assumptions

Before turning to the analysis, it is worth commenting on a few assumptions. Two assumptions are critical for the analysis.

The first assumption is that the efficacy of symmetric tactics is more responsive to mobilization than is the efficacy of asymmetric tactics. (See Berman, Shapiro and Felter (forthcoming) for a discussion of the role of public support in insurgency.) This, I believe, is a standard view in the literature. For instance, Sambanis (2008) writing about terrorism (asymmetric) and insurgency (symmetric), says:

> Terrorism is inherently a clandestine activity and does not require mass level support. . . insurgents during a civil war require much more active support from civilians.

Of course, frequently both types of tactic are used simultaneously within the context of a civil war (Kalyvas, 2004). In my model, rebel leaders choose only one tactic. However, this should not be taken too literally. Rather, one should think about factors that increase the incentives for the rebel leaders to choose a particular tactic (within the model) as being incentives that would lead the optimal mix of tactics to tilt more toward that tactic within a richer model where rebel leaders engaged in multiple tactics simultaneously.

The second assumption is that there is some characteristic of rebel organizations, κ, that reflects the organization's capacity relative to the government and is separate from mobilization. The idea, here, is that there are a variety of determinants of rebel efficacy beyond the number of people willing to fight. For instance, κ might represent facts about the rebel organization's institutional design (Weinstein, 2007; Berman, 2009), sources of funding (Weinstein, 2007), internal factional conflict (Kydd and Walter, 2002; Bueno de Mesquita, 2005*a*), and so on.

Finally, it is worth noting that, while I assume that the efficacy of asymmetric tactics is responsive to mobilization, this assumption is not necessary for the analysis. Indeed, all results presented continue to hold in a model where the payoff to asymmetric conflict is constant in mobilization. Nonetheless, I believe the assumption is a reasonable one in terms of verisimilitude, for two reasons. First, at least for small enough groups, increased mobilization may actually expand the ability to engage in operations. Second, theoretical and empirical findings suggest that terrorist organizations, for example, screen potential recruits for ability or quality (Bueno de Mesquita, 2005*b*; Benmelech and Berrebi, 2007; Benmelech, Berrebi and Klor, forthcoming). The capacity to attract a larger group of potential recruits may give terrorist organizations increased access to highly effective operatives.

3 Analysis

In this section, I characterize equilibrium play.

3.1 Beliefs

At the beginning of a conflict period, players directly observe the outside option, but they must form beliefs about capacity. To see how these beliefs are formed, consider a period, $t > 1$, where there was conflict in $t-1$. The rebel organization's expected new capacity, should there be conflict in round t, is $\overline{\kappa}_t = \kappa_{t-1}$, since κ_t is distributed according to $F_{\kappa_{t-1}}$. Further, all players can deduce κ_{t-1} from the previous period's outcome. For instance, suppose that in period $t-1$ the rebel leaders pursued symmetric conflict. The outcome of that conflict was $B^S_{t-1} = \kappa_{t-1}\theta_S N_{t-1}$. Thus, $\overline{\kappa}_t = \kappa_{t-1} = \frac{B^S_{t-1}}{\theta_S N_{t-1}}$.

Notice, this doesn't imply that the rebel leaders or the population know how effective the rebel organization will be in period t. But they are able to deduce its expected capacity.

3.2 Tactical Choice

In a conflict period, at the point the rebel leaders are choosing a tactic, there are five relevant pieces of information: the rebel leaders' expected capacity ($\overline{\kappa}_t$), the value of the outside option (u_t), the number of people who have mobilized (N_t), the number of periods remaining in the game ($T-t$), and the strategy being played by the population. Given these five pieces of information, the rebel leaders choose a tactic by comparing expected payoffs. What are the expected payoffs of each tactic?

Suppose the rebel leaders believe that, in the future, all players (including themselves) will play according to the strategies in a strategy profile, $s = (\vec{s}_i, s_R)$. Assume s_R, the rebel leaders' strategy, is Markovian. Assume $\vec{s}_i$, a collection of strategies, one for each population member, is Markovian and monotone. Let $v_R^{T-t}(\overline{\kappa}, u; s)$ be the expected value of the game to the rebel leaders beginning in a period in which expected capacity is $\overline{\kappa}$, the common component of the outside option is u, and there are $T - t$ periods left to play.

Consider a conflict period, t, with mobilization N_t, outside option u_t, and expected capacity $\overline{\kappa}_t$. The rebel leaders' payoff from withdrawing from conflict in period t is:

$$V_t^W(\overline{\kappa}_t, u_t, T; s) = \frac{\beta(1 - \delta^{T-(t-1)})}{1 - \delta}. \tag{1}$$

The rebel leaders' expected payoff from pursuing symmetric conflict is:

$$\begin{aligned} V_t^S(\overline{\kappa}_t, u_t, N_t, T; s) &= \int_0^\infty \int_{\underline{u}}^{\overline{u}} \left[\tilde{\kappa}\theta_S N_t + \delta v_R^{T-t}(\tilde{\kappa}, \tilde{u}; s)\right] g_{u_t, N_t}(\tilde{u}) f_{\overline{\kappa}_t}(\tilde{\kappa})\, d\tilde{u}\, d\tilde{\kappa} \\ &= \overline{\kappa}_t \theta_S N_t + \delta \int_0^\infty \int_{\underline{u}}^{\overline{u}} v_R^{T-t}(\tilde{\kappa}, \tilde{u}; s) g_{u_t, N_t}(\tilde{u}) f_{\overline{\kappa}_t}(\tilde{\kappa})\, d\tilde{u}\, d\tilde{\kappa}. \end{aligned} \tag{2}$$

Similarly, the rebel leaders' expected payoff from asymmetric conflict is:

$$V_t^A(\overline{\kappa}_t, N_t; s) = \overline{\kappa}_t\left(\theta_A N_t + \tau\right) + \delta \int_0^\infty \int_{\underline{u}}^{\overline{u}} v_R^{T-t}(\tilde{\kappa}, \tilde{u}; s) g_{u_t, N_t}(\tilde{u}) f_{\overline{\kappa}_t}(\tilde{\kappa})\, d\tilde{u}\, d\tilde{\kappa}. \tag{3}$$

For notational convenience, write the rebel leaders' expected continuation value from conflict as:

$$\Delta_R^{T-t}(\overline{\kappa}_t, u_t, N_t; s) = \int_0^\infty \int_{\underline{u}}^{\overline{u}} v_R^{T-t}(\tilde{\kappa}, \tilde{u}; s) g_{u_t, N_t}(\tilde{u}) f_{\overline{\kappa}_t}(\tilde{\kappa})\, d\tilde{u}\, d\tilde{\kappa}.$$

Comparing these expected payoffs, the rebel leaders' tactical choice can be characterized by three constraints, as described in the following result and illustrated in Figure 1. (All proofs are in Appendix A.)

Lemma 3.1 *In period t, there exist three constraints:* $\mathrm{SA} = \frac{\tau}{\theta_S - \theta_A}$, $\mathrm{SP}(\overline{\kappa}_t, u_t, T-t; s)$, *and* $\mathrm{AP}(\overline{\kappa}_t, u_t, T-t; s)$ *such that in equilibrium the rebel leaders choose*

- *Symmetric Conflict if* $N_t \geq \max\{\mathrm{SP}(\overline{\kappa}_t, u_t, T-t), \mathrm{SA}\}$
- *Asymmetric Conflict if* $N_t \in [\mathrm{AP}(\overline{\kappa}_t, u_t, T-t), \mathrm{SA}]$
- *Withdraw from conflict, otherwise.*

Moreover, both $\mathrm{SP}(\overline{\kappa}_t, u_t, T-t; s)$ *and* $\mathrm{AP}(\overline{\kappa}_t, u_t, T-t; s)$ *are decreasing in* $\overline{\kappa}_t$.

The first constraint (SA for *Symmetric over Asymmetric*) characterizes whether, conditional on choosing some form of conflict (i.e., not withdrawing), the rebel leaders prefer

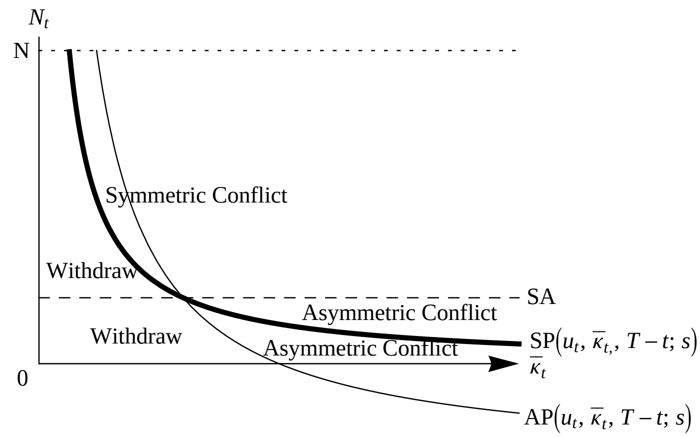

Figure 1: The rebel leaders tactical choice in period t as a function of mobilization and the outside option.

symmetric tactics or asymmetric tactics. As the level of mobilization increases, the returns to symmetric conflict are increasing faster than the returns to asymmetric conflict. Hence, the rebel leaders prefer symmetric tactics over asymmetric tactics if and only if the level of mobilization is sufficiently high.

The next constraint ($\text{SP}(\overline{\kappa}_t, u_t, T-t; s)$, for *Symmetric Participation*) describes whether the rebel leaders prefer symmetric conflict to withdrawing. Again this depends on mobilization being sufficiently high, but now relative to the rebel organization's expected capacity and all of the variables that affect the continuation value of the game.

The final constraint ($\text{AP}(\overline{\kappa}_t, u_t, T-t; s)$, for *Asymmetric Participation*) describes whether the rebel leaders prefer asymmetric conflict to withdrawing. Just as with the choice between symmetric conflict and withdrawing, this depends on mobilization being sufficiently high relative to the rebel organization's expected capacity and all of the variables that affect the continuation value of the game.

The fact that SP and AP are increasing in $\overline{\kappa}_t$ represents the fact that, if the rebel leaders perceive their organization to be particularly high capacity, they are willing to fight even with relatively little mobilization. Similarly, if the rebel leaders perceive their organization to be relatively low capacity, they are only willing to fight if mobilization is very high. Of course, in equilibrium, mobilization is endogenous to perceived capacity, as we will see in the next section.

3.3 Mobilization

Population members decide whether to mobilize given the outside option and their beliefs about two things: the rebel organization's capacity and the tactic the rebel leaders will choose given a level of mobilization by the population. The largest group of population members that is willing to mobilize can be determined by focusing on what I will refer to as a *marginal participant*—a population member who is just indifferent between mobilizing and not.

Marginal Participants

Suppose a group of N' population members mobilize for conflict. Two things must be true for such a mobilization decision to be consistent with equilibrium: (i) everyone within that group of N' must prefer mobilizing to not mobilizing, given total mobilization of N' and (ii) everyone not within that group of N' must prefer not mobilizing to mobilizing, given total mobilization of N'. If $N' \in (0, N)$, there is only one way for both of these conditions to hold. First, the person in the mobilized group with the best outside option must be exactly indifferent between mobilizing and not mobilizing—call this person the *marginal participant*. Second, every population member with an outside option that is worse than the marginal participant's must be mobilized. Third, every population member with an outside option that is better than the marginal participant's must remain unmobilized.

So consider a group made up of the N' lowest outside option population members. If N' population members mobilize, then the marginal participant is the person in that group who has the best outside option. Label that marginal participant's type as $\eta^*(N')$. Given that the η_i's are distributed uniformly on $[\underline{\eta}, \overline{\eta}]$ and have mass N, we can directly calculate $\eta^*(N')$:

$$\eta^*(N') = \begin{cases} \underline{\eta} & \text{if } N' \leq 0 \\ \underline{\eta} + \frac{N'}{N}(\overline{\eta} - \underline{\eta}) & \text{if } N' \in (0, N) \\ \overline{\eta} & \text{if } N' \geq N. \end{cases}$$

Similarly, let $i^*(N')$ satisfy $\eta^*(N') = \eta_{i^*(N')}$. That is, in a group of size N' made up of the lowest η_i individuals, $i^*(N')$ is the marginal participant.

Mobilization Decisions

Let $v_i^{T-t}(\overline{\kappa}_t, u_t; s)$ be the the expected future value of the game to a population member of type η_i, assuming all players use the strategy in s, starting in a period t, where the rebel organization's expected capacity is $\overline{\kappa}_t$ and the common component of the outside option is u_t.

Let $\hat{s} = (\vec{s}_i, s_R^*)$ be a strategy profile with $\vec{s}_i$ a collection of monotone, Markovian strategies for the population members and s_R^* the strategy for the rebel leaders specified in Lemma 3.1. For notational convenience, write a population member i's expected continuation value at $(\overline{\kappa}_t, u_t, N_t)$, as:

$$\Delta_i^{T-t}(\overline{\kappa}_t, u_t, N_t; \hat{s}) = \int_0^\infty \int_{\underline{u}}^{\overline{u}} v_i^{T-t}(\tilde{\kappa}, \tilde{u}; \hat{s}) g_{u_t, N_t}(\tilde{u}) f_{\overline{\kappa}_t}(\tilde{\kappa})\, d\tilde{u}\, d\tilde{\kappa}.$$

Notice, since all population members are measure zero, an individual's mobilization decision does not change the tactic pursued by the rebel leaders or the continuation value of the game.

The decision not to engage in conflict is always more attractive for a member of the population than it is for the rebel leaders. This implies that, if population members are willing to mobilize, the rebel leaders will be willing to engage in conflict—be it symmetric or asymmetric. That is, population members do not have to worry about bearing the costs of mobilizing, only to have the rebel leaders decide to withdraw from conflict. This fact is formalized below.

Lemma 3.2 *Fix u_t and $\overline{\kappa}_t$. Suppose the population believes the rebel leaders use the strategy s_R^*. If, in a period t, $N' > 0$ population members are willing to mobilize for symmetric (resp. asymmetric) conflict, then $N' > \mathrm{SP}(\overline{\kappa}_t, u_t, T-t; \hat{s})$ (resp. $N' > \mathrm{AP}(\overline{\kappa}_t, u_t, T-t; \hat{s})$).*

Lemma 3.2 implies that, in thinking about mobilization, the critical participation constraint is the marginal participant's. Given this, define $N_t^A(\overline{\kappa}_t, u_t)$ to be the largest number of population members who, given the level of mobilization, all prefer asymmetric conflict to not mobilizing. We find N_t^A by setting the marginal participant's constraint to just bind. That is, $N_t^A(\overline{\kappa}_t, u_t; \hat{s})$ is the largest $N_t \in [0, N]$ such the following inequality holds:

$$\overline{\kappa}_t\left(\theta_A N_t + \tau\right) - c + \delta\Delta_i^{T-t}(\overline{\kappa}_t, u_t, N_t^A; \hat{s}) \geq u_t + \eta^*(N_t) + \delta\Delta_i^{T-t}(\overline{\kappa}_t, u_t, N_t^A; \hat{s}).$$

Similarly, define $N_t^S(\overline{\kappa}_t, u_t)$ to be the largest number of population members who, given the level of mobilization, all prefer symmetric conflict to not mobilizing. That is $N_t^S(\overline{\kappa}_t, u_t; \hat{s})$

is the largest $N_t \in [0, N]$ satisfying:

$$\overline{\kappa}_t \theta_S N_t - c + \delta \Delta_i^{T-t}(\overline{\kappa}_t, u_t, N_t^S; \hat{s}) \geq u_t + \eta^*(N_t) + \delta \Delta_i^{T-t}(\overline{\kappa}_t, u_t, N_t^S; \hat{s}).$$

The following result will be useful later in the analysis.

Lemma 3.3 *If N_t^S or N_t^A is interior, they are decreasing in u_t.*

The analysis can now be broken into two cases. In the first, the outside option is good enough that even the population member with the worst outside option considers not mobilizing. In the second, the outside option is sufficiently bad that there will always be positive mobilization.

Relatively Good Outside Option: $u_t + \underline{\eta} > -c$

First consider the possibility of a symmetric conflict. Here, if anyone is willing to mobilize for symmetric conflict, then everyone is, as formalized in the next result.

Lemma 3.4 *If $u_t + \underline{\eta} > -c$, then*

$$N_t^S(\overline{\kappa}_t, u_t; \hat{s}) = \begin{cases} N & \text{if } \overline{\kappa}_t \geq \frac{u_t + \overline{\eta} + c}{\theta_S N} \\ 0 & \text{else.} \end{cases}$$

Lemma 3.4 shows that if expected rebel capacity is high enough relative to the outside option ($\overline{\kappa}_t \geq \frac{u_t + \overline{\eta} + c}{\theta_S N}$), the full population is willing to mobilize for symmetric conflict. Lemma 3.2 shows that if any population members are willing to mobilize, then the rebel leaders will want to fight. At full mobilization, the rebel leaders will choose to engage in symmetric conflict. Hence, for high enough expected capacity (relative to the outside option), there is full mobilization and symmetric conflict. This possibility is illustrated in Figure 2(a).

If the rebel organization is perceived to be moderately strong, there will be partial mobilization and asymmetric conflict. (Partial mobilization and symmetric conflict does not happen in this case but, as we will see, is possible when the outside option is worse.) This possibility is illustrated in Figure 2(b) and formalized in the next result.

Lemma 3.5 *Suppose $u_t + \underline{\eta} > -c$. If the rebel leaders use the strategy s_R^*, then in equilibrium:*

(i) Mobilization is $N_t^A(u_t, \overline{\kappa}_t; \hat{s}) \in (0, N)$ and

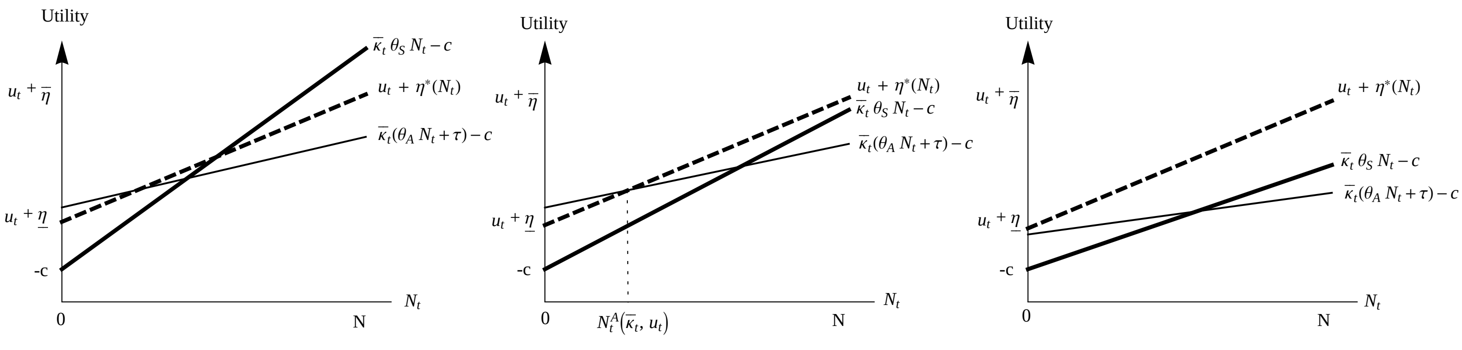

Figure 2: Mobilization decisions and implied tactical choice when $u_t + \underline{\eta} > -c$.

(ii) The rebel leaders choose asymmetric conflict

if and only if $\overline{\kappa}_t \in \left(\frac{u_t+\underline{\eta}+c}{\tau}, \frac{u_t+\overline{\eta}+c}{\theta_S N}\right)$.

Finally, if rebel capacity is perceived to be low (i.e., $\overline{\kappa}_t \leq \frac{u_t+\underline{\eta}+c}{\tau}$), there will be no mobilization, as illustrated in Figure 2(c). With zero mobilization, rebel leaders may choose asymmetric conflict or may withdraw. They choose asymmetric conflict if and only if they perceive themselves to have sufficient capacity, as shown in the following result.

Lemma 3.6 *Suppose $u_t + \underline{\eta} > -c$. For any $\hat{s}$, there exists a unique $\underline{\kappa}_{T-t}(u_t, \beta; \hat{s})$ such that:*

(i) Mobilization is zero and the rebel leaders choose asymmetric conflict if $\overline{\kappa}_t \in \left[\underline{\kappa}_{T-t}(u_t, \beta; \hat{s}), \frac{u_t+\underline{\eta}+c}{\tau}\right]$.

(ii) Mobilization is zero and the rebel leaders withdraw from conflict if $\overline{\kappa}_t < \underline{\kappa}_{T-t}(u_t, \beta; \hat{s})$.

Moreover, $\underline{\kappa}_{T-t}$ is non-decreasing in u_t and β, and is strictly less than $\frac{u_t+\underline{\eta}+c}{\tau}$.

Putting these cases together, the equilibrium correspondence, as a function of the realizations of u_t and $\overline{\kappa}_t$, when $u_t + \underline{\eta} > -c$, is illustrated in Figure 3.

No Viable Outside Option for Population: $u_t + \underline{\eta} < -c$

Next, consider the case where the outside option is lower than the costs of mobilizing, even for the population member with the worst outside option. I begin by showing that, in this case, there will be positive mobilization for certain.

Lemma 3.7 *Suppose the population believes the rebel leaders play the strategy s_R^*. If $u_t + \underline{\eta} < -c$, then $N_t > 0$.*

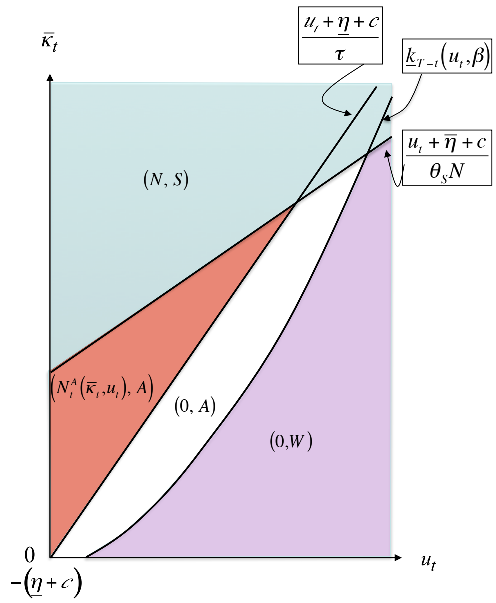

Figure 3: Mobilization and tactical choice in period t as a function of the realized outside option (u_t) and expected rebel capacity ($\overline{\kappa}_t$) when $u_t + \underline{\eta} > -c$.

Given this, we can focus on positive mobilization outcomes.

As before, if the rebel leaders are perceived to be sufficiently capable, the full population will mobilize and there will be symmetric conflict. Once again, this is the case if and only if $\overline{\kappa}_t \geq \frac{u_t+\overline{\eta}+c}{\theta_S N}$. This case is illustrated in Figure 4(a).

Lemma 3.8 *If $u_t+\underline{\eta} < -c$ and the rebels use the strategy, s_R^*, then there is full mobilization and symmetric conflict if and only if $\overline{\kappa}_t \geq \frac{u_t+\overline{\eta}+c}{\theta_S N}$.*

If this condition does not hold, then fully mobilized, symmetric conflict is not possible. In this event there will be partial mobilization and, as shown in Lemma 3.2, either symmetric or asymmetric conflict.

We have already seen that, in such a situation, the maximal number of population members who would mobilize if they anticipate symmetric conflict is $N_t^S(\overline{\kappa}_t, u_t; \hat{s})$ and if they anticipate asymmetric conflict is $N_t^A(\overline{\kappa}_t, u_t; \hat{s})$. The next result shows that equilibrium mobilization will be whichever of N_t^A and N_t^S is higher. Further, given equilibrium mobilization, the rebel leaders prefer symmetric conflict when $N_t^S > N_t^A$ and prefer asymmetric conflict when $N_t^S < N_t^A$. Finally, N_t^S is greater than N_t^A if and only if the rebel organization has high enough expected capacity.

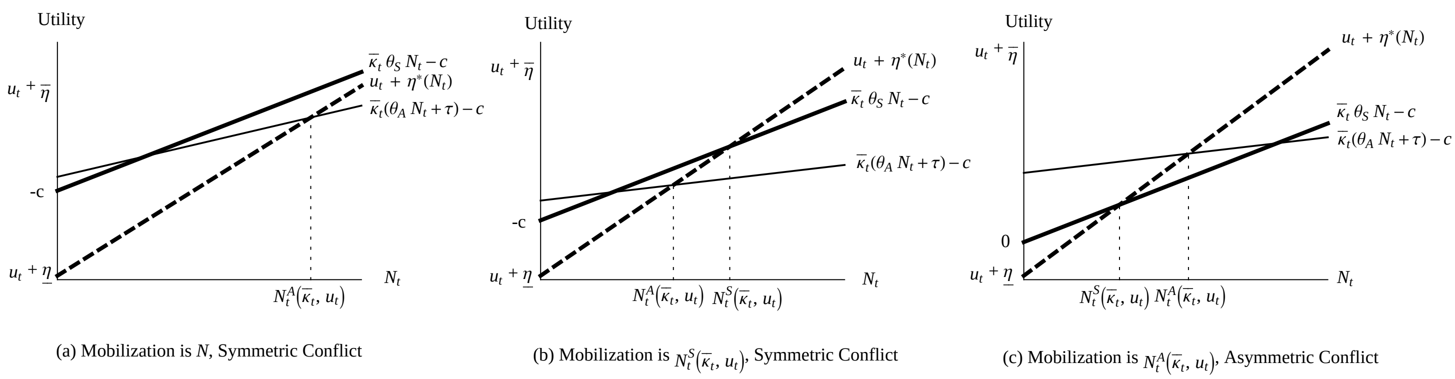

Figure 4: Mobilization decisions and implied tactical choice when $u_t + \underline{\eta} < -c$.

Lemma 3.9 *Suppose $u_t + \underline{\eta} < -c$ and $\overline{\kappa}_t < \frac{u_t + \overline{\eta} + c}{\theta_S N}$. Then, in equilibrium, mobilization is $N_t^S(\overline{\kappa}_t, u_t; \hat{s})$ and the rebel leaders choose symmetric conflict if and only if:*

$$N_t^S(\overline{\kappa}_t, u_t; \hat{s}) \geq N_t^A(\overline{\kappa}_t, u_t; \hat{s}),$$

which is equivalent to

$$\overline{\kappa}_t \geq \frac{(\theta_S - \theta_A)(u_t + \underline{\eta})}{\tau \theta_S N} + \frac{\overline{\eta} - \underline{\eta}}{\theta_S N}.$$

Lemma 3.9 shows that for higher levels of rebel capacity, more population members are willing to mobilize for symmetric conflict than for asymmetric conflict, and, at that higher level of mobilization, the rebel leaders will prefer symmetric conflict. This case is illustrated in Figure 4(b). For lower levels of capacity, more population members are willing to mobilize for asymmetric conflict than for symmetric, and, at that higher level of mobilization, the rebel leaders will prefer asymmetric conflict to symmetric conflict. This cases is illustrated in Figure 4(c).

Putting these cases together, the outcomes of the second period, as a function of the realized outside option (u_t) and expected rebel capacity ($\overline{\kappa}_t$), when $u_t + \beta < 0$, are illustrated in Figure 5.

Equilibrium

Taken together, Lemmata 3.1, 3.4, 3.5, 3.6, 3.8, and 3.9 characterize equilibrium behavior. The equilibrium in formalized in Proposition B.1 in Appendix B. Equilibrium mobilization and tactical choice in any period t is characterized by two factors: expected rebel capacity ($\overline{\kappa}_t$) and the outside option (u_t). Figure 6, which combines Figures 3 and 5, shows this

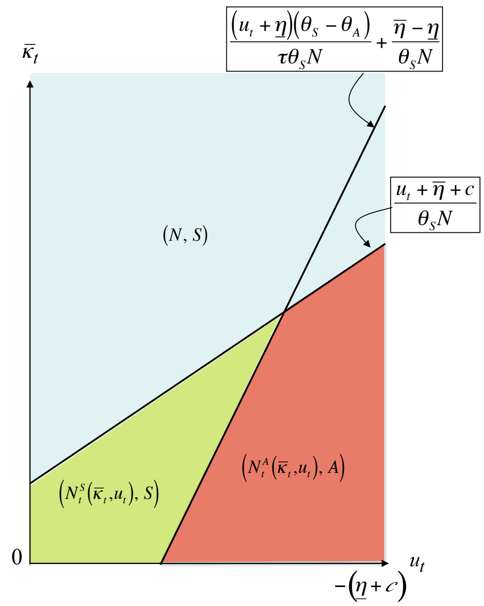

Figure 5: Mobilization and tactical choice in period t as a function of the realizedoutside option (u_t) and expected rebel capacity ($\overline{\kappa}_t$) when $u_t + \underline{\eta} < -c$.

graphically.

4 Implications

Several substantive points follow from the analysis above.

4.1 Tactics and the Outside Option

To think about the effect of the outside option on equilibrium tactics, it is easiest to think about a fixed expected capacity, $\overline{\kappa}_t$. For any such $\overline{\kappa}_t$, a conflict (be it symmetric or asymmetric) occurs if and only if the outside option is sufficiently low. This can be seen in Figure 6. There we see that there is conflict if and only if $u_t \leq \min\left\{\overline{\kappa}_t\theta_S N - (\overline{\eta} + c), \underline{\kappa}_t^{-1}(\overline{\kappa}_t, \beta)\right\}$, where $\underline{\kappa}_{T-t}^{-1}(\overline{\kappa}_t, \beta)$ is the inverse mapping satisfying $\underline{\kappa}_{T-t^{-1}}(\overline{\kappa}_t, \beta) = u_t$. Thus, the model is consistent with a standard opportunity costs intuition—the better the outside option, the less likely is conflict.

More interesting is the effect of the outside option on the choice between symmetric and asymmetric tactics. Fix a $\overline{\kappa}_t$ low enough that all three tactical choices are feasible. For any

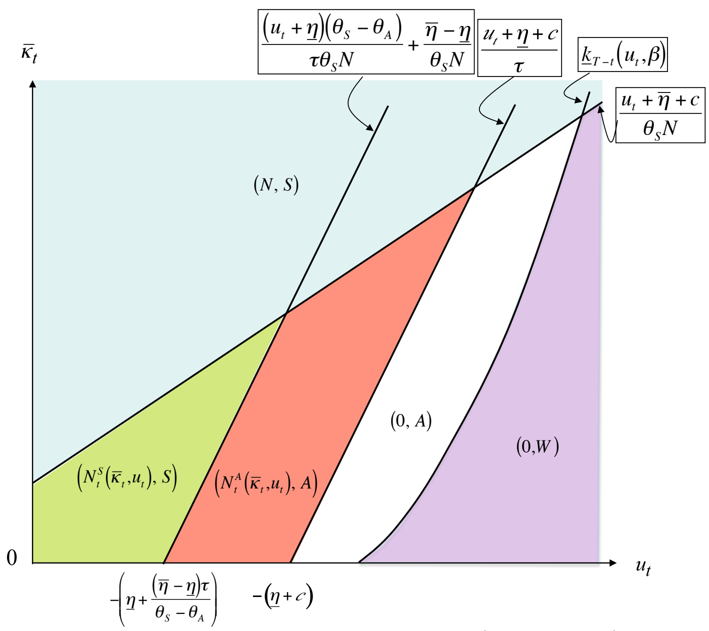

Figure 6: Mobilization and tactical choice in period t as a function of the realized outside option (u_t) and expected rebel capacity ($\bar{\kappa}_t$).

such $\bar{\kappa}_t$, symmetric conflict only occurs if the outside option is low enough. That is, the outside option has the intuitive effect on the likelihood of symmetric conflict.

The effect of the outside option on the occurrence of asymmetric conflict, however, is non-monotone. For very bad outside options, the rebel leaders engage in symmetric conflict. For very good outside options, the rebel leaders believe it is unlikely that they will ever attract much mobilization, leading them to withdraw from conflict entirely. It is only for moderate outside options that the rebel leaders choose asymmetric conflict.

The intuition for the result on symmetric conflict is straightforward. As opportunity diminishes, the population becomes more willing to mobilize and the rebel leaders become more willing to fight, making symmetric conflict more likely. The intuition for the result on asymmetric conflict is more subtle. In societies where the outside option is weak, if the rebel organization has high enough capacity to support any violent activity, it will attract enough mobilization to support symmetric conflict. However, in societies where the outside option is somewhat better, it is possible for the rebel leaders to be willing to engage in conflict, but not attract the mobilization necessary to support symmetric conflict. Were the rebel leaders able to attract more mobilization, they would switch to symmetric tactics, but the strong outside option prevents this from occurring. If the outside option is good enough, even the rebel leaders are not willing to engage in conflict because they expect future outside options to be very good, making the long-term prospects of future mobilization bad. Hence, asymmetric conflict only occurs for moderate outside options.

These findings highlight the importance of considering the endogenous choice of tactics when considering the causes of terrorism, insurgency, and civil war, not only in theoretical models, but empirically. For instance, a model of terrorism alone might predict a monotone relationship between terrorism and the outside option, much as there is a monotone relationship between the outside option and conflict in general here. And it is commonplace to regress measures of terrorism or civil war against measures of the outside option—such as unemployment, inequality, political freedom, or economic growth—looking for a monotone relationship. (See Krueger and Maleckova (2003); Abadie (2006); Blomberg, Hess and Weerapana (2004); Pape (2005), among many others, for such studies of terrorism and Collier and Hoeffler (2001); Elbadawi and Sambanis (2002); Miguel, Satyanath and Sergenti (2004), among many others, for such studies of civil war.) However, by considering the endogenous choice among tactics, this model suggests that the predicted relationship between opportunity and terrorism is instead non-monotone. Such effects, deriving from the substitutability between rebel tactics, will always be missed in studies that treat these phenomena in isolation.

4.2 Dynamics of Rebel Tactics

Consider a society with $\overline{u}_t > -\left(\underline{\eta} + \frac{(\overline{\eta}-\underline{\eta})\tau}{(\theta_S-\theta_A)}\right)$, so that an outcome other than symmetric conflict occurs for some realizations of $\overline{\kappa}_t$. As we have seen, rebel organizations perceived as sufficiently capable attract mobilization and engage in symmetric conflict. Rebel organizations perceived as somewhat less capable engage in asymmetric conflict. And, at least for some values of the outside option, rebel organizations perceived as weak withdraw from conflict.

Importantly, whenever the rebel leaders engage in asymmetric conflict, they would have been willing to engage in symmetric conflict, had they attracted enough support. This is clear from Figure 1, where, when asymmetric conflict is the tactical choice, the rebel leaders would choose symmetric conflict if $N_t >$ SA. Hence, changes in the population's perception of the rebel organization's capacity can change both the level of mobilization and the tactic used. Predictions about the dynamics of tactical choice, and their cause, follow from this.

From Counterinsurgency to Terrorism

Particularly successful counterinsurgencies in period t (i.e., $\kappa_t = \overline{\kappa}_{t+1}$ much lower than $\overline{\kappa}_t$) degrade the population's perception of rebel capacity. Hence a large scale insurgency (symmetric conflict) that suffers some important defeats will lose support in period $t+1$. If the defeats are not too severe it will only lose some support and the rebel leaders will switch tactics to terrorism (asymmetric conflict). If the defeats are severe enough, the rebel leaders may even withdraw from conflict entirely. Thus, the model yields the, perhaps counterintuitive, implication that increased terrorism may be a sign of successful, rather than failed, counterinsurgency. Rebels turn to terrorism because they are perceived as too weak to attract the support necessary to make other tactics viable alternatives.

This idea perhaps sheds some light on cases such as the Second Chechen War. Successful Russian counter-insurgency efforts convinced many Chechen's to withdraw support from the rebels. In response, Chechen rebels shifted tactics, resulting in dramatic terrorist attacks in Moscow. Those attacks, deadly though they were, may have been a sign of the weakness of the Chechen rebellion.

Vanguard Terrorism

On the flip side, a terrorist organization that has success in terrorist attacks may convince the population (and itself) that it is relatively strong. Doing so increases mobilization and intensifies conflict. If the terrorist campaign is sufficiently successful, mobilization increases enough that the rebel leaders transition from terrorism to larger scale rebellion. Importantly, it is not an increase in the rebels' perception of their own capacity alone that causes this transition. The expected payoff from symmetric conflict is increasing in perceived capacity ($\overline{\kappa}_t$) and in mobilization (N_t). Because mobilization is increasing in perceived capacity, the level of perceived capacity needed for the rebel leaders to transition is lower than it would be in the absence of endogenous mobilization. Mobilization creates a multiplier effect for the impact of perceived capacity on tactical choice. Hence, the model is consistent with cases like the Israeli-Palestinian conflict or the Algerian War of Independence, where high levels of terrorism sparked a larger scale uprising and a switch to a more civil war-like rebellion.

4.3 Conflict Begets Conflict

Conflict destroys capital—worsening expected future outside options. As a result, in the model, conflict begets conflict in two senses. All else equal, an exogenous increase to the intensity of period t conflict (i.e., mobilization) increases both the probability of conflict and the expected level of mobilization in period $t+1$. I show these results in turn below.

As is clear from Figure 6, for a fixed $\overline{\kappa}_t$, there is conflict if and only if the outside option is sufficiently bad. In particular, if $u_t \leq \min\left\{\overline{\kappa}_t\theta_S N - (\overline{\eta}+c), \underline{k}_t^{-1}(\overline{\kappa}_t,\beta)\right\}$. Let κ_* satisfy $\underline{\kappa}_{T-t}^{-1}(\kappa_*,\beta) = \kappa_*\theta_S N - (\overline{\eta}+c)$. That is κ_* is the $\overline{\kappa}_t$ such that the two possible constraints on there being conflict are equal.

Define the function $\mathcal{E} = \min\left\{\overline{\kappa}_t\theta_S N - (\overline{\eta}+c), \underline{k}_t^{-1}(\overline{\kappa}_t,\beta)\right\}$. That is:

$$\mathcal{E}(\overline{\kappa}_t) = \begin{cases} \underline{\kappa}_{T-t}^{-1}(\overline{\kappa}_t,\beta) & \text{if } \overline{\kappa}_t < \kappa_* \\ \overline{\kappa}_t\theta_S N - \overline{\eta} + c & \text{if } \overline{\kappa}_t \geq \kappa_*. \end{cases}$$

There is conflict if and only if $u_t \leq \mathcal{E}(\overline{\kappa}_t)$. It is straightforward from Lemma 3.6 that $\mathcal{E}$ is increasing in $\overline{\kappa}_t$—the higher the rebel group's perceived capacity, the better the outside option can be and still sustain conflict. We can write the probability of conflict occurring in period $t+1$, from the perspective of a period t in which there was conflict, as:

$$\int_0^\infty G_{u_t,N_t}(\mathcal{E}(\tilde{\kappa}))f_{\overline{\kappa}_t}(\tilde{\kappa})\,d\tilde{\kappa}.$$

Now, imagine an exogenous (non-equilibrium) shock to the intensity of period t conflict (i.e., N_t). This induces a first-order stochastic worsening of the distribution G_{u_t,N_t} which, by the definition of first-order stochastic dominance, increases $G_{u_t,N_t}(\mathcal{E}(\tilde{\kappa}))$ and therefore increases the probability of conflict in period $t+1$.

Similarly, define $N(\overline{\kappa}_t, u_t)$ as equilibrium mobilization. From Lemma 3.3, N_t^S and N_t^A are decreasing in u_t. Moreover, from Lemma 3.9, at the transition between symmetric and asymmetric conflict, they are equal. Hence, for any $\overline{\kappa}_t$, $N(\overline{\kappa}_t, u_t)$ is decreasing in u_t. Given this, we can write expected mobilization in period $t+1$, from the perspective of a period t in which there was conflict, as:

$$\int_{\underline{u}}^{\overline{u}}\int_0^\infty N(\tilde{\kappa},\tilde{u})f_{\overline{\kappa}_t}(\tilde{\kappa})g_{u_t,N_t}(\tilde{u})\,d\tilde{\kappa}\,d\tilde{u}.$$

Again, , imagine an exogenous (non-equilibrium) shock to the intensity of period t conflict (i.e., N_t). This induces a first-order stochastic worsening of the distribution of next period outside options, g_{u_t,N_t}. Since $N(\tilde{\kappa},\tilde{u})$ is decreasing in $\tilde{u}$, by the definition of first-order stochastic dominance, this implies that, all else equal, expected period $t+1$ mobilization is increasing in period t mobilization.

4.4 Rebel Leader Extremism and Isolation

The distance between the parameters β and $\underline{u} + \underline{\eta}$ can be thought of as a measure of the rebel leaders' extremism or isolation. When β is very small, relative to $\underline{u} + \underline{\eta}$, the rebel leaders are much less willing to abandon conflict than are members of the population—either because of greater ideological commitment or because their leadership role in the rebellion has isolated them from opportunities available to other members of society. The consequence of an increase in such extremism or isolation (i.e., a decrease in β) is that the rebel leaders become more likely to engage in asymmetric conflict. This is because, when the rebel leaders are very extreme or very isolated, it is more likely that a scenario will arise in which the population is not willing to mobilize, but the rebel leaders will still engage in conflict. In such situations, the best tactical choice available to the rebel leaders is asymmetric conflict, since they lack public support.

This has two implications. First, it suggests that a high level of ideological motivation among core rebel leaders is expected to be positively associated with the occurrence of asymmetric conflict, but not symmetric conflict. Second, it suggests that a good strategy for ending asymmetric conflicts with relatively weak rebel groups is to improve the outside option for the rebel leaders, perhaps by offering immunity. Doing so makes rebel leaders less likely to continue an asymmetric conflict in the absence of public support.

4.5 The Last Gasps of Conflict

The model also predicts that rebel leaders may continue to engage in asymmetric conflict even after the short-term payoff from violence has fallen below the short-term payoff from withdrawing from conflict. To see this, note that the rebel leaders will engage in asymmetric conflict, even with zero mobilization, as long as:

$$\overline{\kappa}_t \tau + \delta \Delta_R^{T-t}(\overline{\kappa}_t, u_t, 0; s) \geq \beta + \delta \frac{\beta(1-\delta^{T-t})}{1-\delta}.$$

Since Δ_R^{T-t} is bounded below by $\frac{\beta(1-\delta^{T-t})}{1-\delta}$, there are circumstances where $\overline{\kappa}_t \tau < \beta$, but the rebel leaders fight on. They do so to keep the rebel organization active, so that they might fight another day. Essentially, such rebel leaders are trying to avoid shutting down their organization in the hope that there will be a shock—to their capacity or to outside opportunity—that allows them to continue the conflict to greater effect. Put differently, continuing to engage in conflict has some "option value" that makes the rebel leaders hold on longer than myopic rationality would suggest they would be willing to.

5 Conclusion

I present a model of dynamic mobilization for rebellion and tactical choice by rebels. Tactical choice depends on mobilization—symmetric tactics are more attractive when mobilization is high, while asymmetric tactics are more attractive when mobilization is low. Mobilization is sensitive to both the outside option and perceptions of the rebel organization's relative capacity. While the model produces a variety of results, two key intuitions that bear repeating.

First, successful rebel campaigns indicate higher rebel capacity. Hence, consistent with the notion that terrorist vanguards play a critical role in many conflicts, the model predicts that successful asymmetric campaigns spark mobilization, increasing the intensity of conflict. If an asymmetric campaign is successful enough, then mobilization becomes sufficiently high that rebel leaders shift from asymmetric tactics to a larger scale rebellion using symmetric tactics. Similarly, highly successful counterinsurgencies indicate diminished rebel capacity. As a result, effective counterinsurgencies dynamically reduce mobilization, leading rebel leaders to transition from symmetric to asymmetric tactics, or even to withdraw from conflict altogether. This suggests, perhaps counterintuitively, that successful counterinsurgency operations against groups engaged in civil war can lead to an increase in terrorism and other asymmetric tactics.

Second, a change in the outside option (be it economic or political) has different effects on the likelihood of symmetric and asymmetric conflict. A decrease in opportunity increases mobilization. Since symmetric tactics are preferred when mobilization is strong, as opportunity decreases and mobilization increases, symmetric tactics become a more attractive option.

More surprisingly, the effect of opportunity on asymmetric conflict is non-monotone. Asymmetric tactics are preferred by rebel leaders that want to fight, but lack high levels of mobilization. If opportunity is very poor, mobilization will be so strong that the rebels pursue symmetric conflict. If opportunity is very good, then short-run mobilization is low and expected long-run mobilization is also low, leading the rebel leaders to withdraw from conflict. Thus, asymmetric conflict only occurs if the outside option is moderate—low enough that the rebel leaders are willing to fight but high enough that mobilization stays relatively low.

This non-monotonicity illustrates the importance of jointly studying the causes of multiple forms of political violence—e.g., terrorism, insurgency, guerilla warfare, riots, and so on. Much of the literature examines hypotheses derived from models of conflict, writ large, while focusing on a single rebel tactic. As a result, the empirical literatures on terrorism, civil wars, guerilla warfare, and so on, all work with very similar intuitions (and right-hand sides of regressions), but different right-hand side variables. The model presented here shows the danger of this approach—deriving empirical intuitions from a generic model of conflict leads us to incorrectly expect (and look for) monotone relationships. When we consider the possibility of an endogenous choice among rebel tactics, we find that the likelihood of asymmetric tactics being used is maximized at some interim level of outside opportunity. The standard intuition holds only for symmetric tactics. And, indeed, it is straightforward that if we considered many tactics, each with different levels of labor-intensivity, the monotonicity intuition would hold only for the most labor intensive.

While potentially useful for future empirical work on asymmetric tactics, the particular non-monotonicity identified here is perhaps best viewed as a proof of concept for the value of disaggregating rebel tactics more generally. There are many potentially relevant dimensions of rebel strategy—e.g., levels of violence, civilian vs. military targets, urban vs. rural organization, identity vs. economic vs. ideological mobilization, and so on. Endogenizing rebel choices on these dimensions might lead to a variety of interesting interactions between putative causes of conflict and tactical choice. Here substitutability plus differentiation with respect to labor intensivity of symmetric and asymmetric tactics led to a non-monotonicity with respect to outside options. Elsewhere various technologies of conflict combined with substitutability or complementarity among tactics might lead to other counterintuitive relationships between tactical choice and, say, political freedom, state capacity, geography, economic inequality, ethnic divisions, and so on. Hence, the results presented here highlight a more general point for the conflict literature—the importance of studying not just when, but how, rebels fight.

Appendix A Proofs of Numbered Results

Proof of Lemma 3.1. For SA the result follows directly from comparing expected utilities.

Next consider SP. Comparing Equations 1 and 2, the rebel leaders prefer symmetric conflict to withdrawing from conflict if and only if:

$$\overline{\kappa}_t \theta_S N_t + \delta \Delta_S^{T-t}(\overline{\kappa}_t, u_t, N_t; s) \geq \frac{\beta(1-\delta^{T-(t-1)})}{1-\delta}.$$

By Lemma B.2, the left-hand side is increasing in N_t. The right-hand side is constant in N_t. Moreover, the left-hand side is unbounded as N_t gets sufficiently large, so at some point it crosses the right-hand side (though potentially not for an $N_t \leq N$). The fact that SP is decreasing in $\overline{\kappa}_t$ follows from the fact that, by Lemma B.3, the left-hand side is increasing in $\overline{\kappa}_t$ and the right-hand side is constant.

The proof for TP is identical.

■

Proof of Lemma 3.2. If N' people are willing to mobilize for symmetric conflict, then we have

$$\overline{\kappa}_t \theta_S N' - c + \delta \Delta_i^{T-t}(\overline{\kappa}_t, u_t, N'; \hat{s}) \geq u_t + \eta^*(N') + \delta \Delta_i^{T-t}(\overline{\kappa}_t, u_t, N'; \hat{s}),$$

which implies

$$\begin{aligned} \overline{\kappa}_t \theta_S N' &\geq u_t + \eta^*(N') + c \\ &> \beta. \end{aligned}$$

Given this, we have

$$\begin{aligned} \overline{\kappa}_t \theta_S N' + \delta \Delta_R^{T-t}(\overline{\kappa}_t, u_t, N'; \hat{s}) &\geq \overline{\kappa}_t \theta_S N' + \delta \frac{\beta(1-\delta^{T-t})}{1-\delta} \\ &> \beta + \delta \frac{\beta(1-\delta^{T-t})}{1-\delta} \\ &= \frac{\beta(1-\delta^{T-(t-1)})}{1-\delta}, \end{aligned}$$

where the first inequality follows from the optimality of s_R^* and the second inequality follows form $\overline{\kappa}_t \theta_S N' > \beta$. An analogous argument holds for asymmetric conflict. ■

Proof of Lemma 3.3.

If N_t^A is interior, substituting for η^*, it can be rewritten:

$$N_t^A(\overline{\kappa}_t, u_t; \hat{s}) = \frac{N\left(u_t + \underline{\eta} - \overline{\kappa}_t \tau + c\right)}{\overline{\kappa}_t \theta_A N - \left(\overline{\eta} - \underline{\eta}\right)}.$$

For N_t^A to be interior, it must be that, for $N' > N_t^A$, $\overline{\kappa}_t(\theta_A N' + \tau) < u_t + \eta^*(N') = \underline{\eta} + \frac{N'}{N}(\overline{\eta} - \underline{\eta})$. This implies that $\overline{\kappa}_t \theta_A < \frac{\overline{\eta}-\underline{\eta}}{N}$, which implies that the denominator in the displayed equation is negative. Hence N_t^A is decreasing in u_t. An identical argument shows the result for N_t^S. ■

Proof of Lemma 3.4. There are two possibilities. First, $u_t + \overline{\eta} \leq \overline{\kappa}_t \theta_S N - c$. In this case, all N population members find it incentive compatible to mobilize, so $N_t^S(\overline{\kappa}_t, u_t) = N$. This case requires $\overline{\kappa}_t \geq \frac{u_t+\overline{\eta}+c}{\theta_S N}$.

Second, $u_t + \overline{\eta} > \overline{\kappa}_t \theta_S N - c$. Here, I claim, $N_t^S = 0$. To see this is true, suppose note. That is, suppose that $u_t + \underline{\eta} > 0$ and $u_t + \overline{\eta} > \theta_S \overline{\kappa}_t N - c$, but there exists an $N_t \in (0, N)$ such that $\overline{\kappa}_t \theta_S N_t - c \geq u_t + \eta^*(N_t)$. Note, for an interior N_t, we have that $\eta^*(N_t) = \underline{\eta} + \frac{N_t}{N}(\overline{\eta} - \underline{\eta})$. So η^* is growing linearly in N_t. But this implies that, for $\overline{\kappa}_t \theta_S N_t - c \geq u_t + \eta^*(N_t)$, it must be that the left-hand side (which is also linear in N_t) has a steeper slope than the right-hand side. That is $\overline{\kappa}_t \theta_S > \frac{\overline{\eta}-\underline{\eta}}{N}$, which, in turn, implies that $\overline{\kappa}_t \theta_S N - c > u_t + \overline{\eta}$, a contradiction.
■

Proof of Lemma 3.5. I make use of the following result.

Lemma A.1 *If $u_t + \underline{\eta} > -c$, $\overline{\kappa}_t < \frac{u_t+\overline{\eta}+c}{\theta_S N}$ and $N_t^A(\overline{\kappa}_t, u_t) > 0$, then $N_t^A(u_t, \overline{\kappa}_t; \hat{s}) <$ SA.*

Proof. By hypothesis, we have that $\overline{\kappa}_t \theta_S N - c < u_t + \overline{\eta}$. At N_t^A we have $\overline{\kappa}_A(\theta_A N_t^A + \tau) - c = u_t + \eta^*(\eta_t)$. Suppose $N_t^A >$ SA. This implies that the rebel leaders prefer symmetric to asymmetric conflict. From Lemma 3.4, if a positive number of population members are willing to mobilize for symmetric conflict, then all are. This implies $\overline{\kappa}_t \theta_S N - c \geq u_t + \overline{\eta}$, a contradiction. ■

From Lemma 3.4, if $\overline{\kappa}_t \geq \frac{u_t+\overline{\eta}+c}{\theta_S N}$, then there is full mobilization and symmetric conflict.

Next, suppose $\overline{\kappa}_t \leq \frac{u_t+\underline{\eta}+c}{\tau}$. Then, we have that a population member's instantaneous payoff from mobilizing for asymmetric conflict, $\overline{\kappa}_t(\theta_A N_t + \tau) - c$, is lower than $u_t + \eta^*(N_t)$ for $N_t = 0$ and $N_t = N$. Since the continuation payoffs are the same and both the instantaneous payoff from asymmetric conflict and $u_t + \eta^*(N_t)$ are linear in N_t, this implies that the payoff from asymmetric conflict is lower than $u_t + \eta^*(N_t)$ for all N_t, so there will be no mobilization.

Finally, suppose $\overline{\kappa}_t \in \left(\frac{u_t+\underline{\eta}+c}{\tau}, \frac{u_t+\overline{\eta}+c}{\theta_S N}\right)$. This implies that $\overline{\kappa}_A \tau - c > u_t + \underline{\eta}$ and $\overline{\kappa}_t(\theta_A N + \tau) - c < \overline{\kappa}_t \theta_S N - c < u_t + \overline{\eta}$. Hence, the payoff from asymmetric conflict crosses $u_t + \eta^*(N_t) +$

$\delta\Delta_i^{T-t}(\overline{\kappa}_t, u_t; \hat{s})$ exactly once, at N_t^A. By Lemma A.1, at that level of mobilization, the rebel leaders prefer asymmetric conflict to symmetric conflict and by Lemma 3.2 the rebel leaders prefer asymmetric conflict at that level of mobilization to withdrawing from conflict. ■

Proof of Lemma 3.6. At $N_t = 0$, the rebel leaders choose asymmetric conflict if $0 \geq \mathrm{AP}(\overline{\kappa}_t, u_t, 0; \hat{s})$. Since AP is monotone decreasing in $\overline{\kappa}_t$, if $\underline{\kappa}_{T-t}$ exists, it is characterized by $0 = \mathrm{AP}(\overline{\kappa}_t, u_t, 0; \hat{s})$. This implies that if $\underline{\kappa}_{T-t}(u_t; \hat{s})$ exists it is given by:

$$\underline{\kappa}_{T-t}\tau + \delta\Delta_A^{T-t}(\underline{\kappa}_{T-t}, u_t, 0; \hat{s}) = \frac{\beta(1-\delta^{T-(t-1)})}{1-\delta}.$$

The first term on the left-hand side is increasing in $\underline{\kappa}_{T-t}$ and, by Lemma B.3, the second term is non-decreasing. The right-hand side is constant. The left-hand side becomes arbitrarily large (respectively, small), as $\underline{\kappa}_{T-t}$ becomes arbitrarily large (respectively, small). This establishes existence.

From Lemma B.1, the left-hand side is non-increasing in u_t, so $\underline{\kappa}_{T-t}$ is non-decreasing in u_t.

Both sides are increasing in β. The derivative of the right-hand side with respect to β is $\frac{1-\delta^{T-(t-1)}}{1-\delta}$. The derivative of the left-hand side with respect to β is equal to the derivative of $\delta\Delta^{T-t}$ with respect to β. This derivative is strictly bounded above by the derivative with respect to β of the continuation value with respect to β if the rebel leaders would withdraw for certain in the next period. This upper bound is $\delta\frac{1-\delta^T}{1-\delta}$, which is strictly less than the derivative of the right-hand side, $\frac{1-\delta^{T-(t-1)}}{1-\delta}$. Hence, the the left-hand side is increasing more slowly than the right-hand side in β, so $\overline{\kappa}_t$ is increasing in β.

Finally, to see that $\underline{\kappa}_{T-t} < \frac{u_t+\underline{\eta}+c}{\tau}$ note that we have the following:

$$\begin{aligned}
\underline{\kappa}_{T-t}\tau &= \frac{\beta(1-\delta^{T-(t-1)})}{1-\delta} - \delta\Delta_R^{T-t} \\
&\leq \frac{\beta(1-\delta^{T-(t-1)})}{1-\delta} - \delta\frac{\beta(1-\delta^{T-t})}{1-\delta} \\
&= \frac{\beta(1-\delta^{T-(t-1)} - \delta + \delta^{T-(t-1)})}{1-\delta} \\
&= \beta,
\end{aligned}$$

where the inequality follows from the fact that the optimality of s_R^* implies that Δ_R^{T-t} is bounded below by $\frac{\beta(1-\delta^{T-(t-1)})}{1-\delta}$. This implies $\underline{\kappa}_{T-t} \leq \frac{\beta}{\tau} < \frac{u_t+\underline{\eta}+c}{\tau}$.

■

Proof of Lemma 3.7.

Consider the case where a population member believes the rebel leaders will not withdraw and that mobilization will be N_t. Then the population member's payoff from mobilizing is bounded below by $-c + \delta\Delta_i^{T-t}(\overline{\kappa}_t, u_t, N_t; s)$, which is strictly greater than $u_t + \underline{\eta} + \delta\Delta_i^{T-t}(\overline{\kappa}_t, u_t, N_t; s)$, the payoff from not mobilizing.

Thus, the only way to get zero mobilization is if the population members believe the rebel leaders will withdraw from conflict. To see that the rebel leaders will not do so, even for zero mobilization, notice that the instantaneous payoff from asymmetric conflict with zero mobilization is $\overline{\kappa}_t\tau > 0$. Now we have the following:

$$\begin{aligned}
\overline{\kappa}_t\tau + \delta\Delta_A^{T-t}(\overline{\kappa}_t, u_t, 0; s) &> \delta\Delta_A^{T-t}(\overline{\kappa}_t, u_t, 0; s) \\
&> u_t + \underline{\eta} + c + \delta\Delta_A^{T-t}(\overline{\kappa}_t, u_t, 0; s) \\
&> \beta + \delta\Delta_A^{T-t}(\overline{\kappa}_t, u_t, 0; s) \\
&\geq \beta + \delta\frac{\beta(1-\delta^{T-t})}{1-\delta} \\
&= \frac{\beta(1-\delta^{T-(t-1)})}{1-\delta},
\end{aligned}$$

which implies that the payoff to the rebel leaders from asymmetric conflict, even with zero mobilization, is higher than the payoff from withdrawing from conflict. ■

Proof of Lemma 3.8. To see the "if" direction, note that, by hypothesis, $u_t + \overline{\eta} \leq \theta_S\overline{\kappa}_t N - c$. Hence, all N population members find it incentive compatible to mobilize for symmetric conflict. By Assumption 1.1 symmetric conflict is preferred to asymmetric conflict by the rebel leaders when there is full mobilization. And, by Lemma 3.2, it also implies that symmetric conflict is preferred to withdrawing.

To see the "only if" direct, suppose $\overline{\kappa}_t < \frac{u_t+\overline{\eta}+c}{\theta_S N}$. This implies that, at full mobilization, the highest outside option type prefers to take the outside option, so full mobilization is not part of an equilibrium. ■

Proof of Lemma 3.9. The proof proceeds in four steps.

(i) Suppose $N_t^A > N_t^S$. I claim that the returns to asymmetric conflict under N_t^A are higher than the returns to symmetric conflict under N_t^A.

To see this, suppose not. Then we have $\overline{\kappa}_t\theta_S N_t^A > \overline{\kappa}_t\left(\theta_A N_t^A + \tau\right) = u_t + \eta^*(N_t^A)$. From the fact that all three are linear in N_t and the fact that $u_t + \underline{\eta} < -c$, this implies that $\overline{\kappa}_t\theta_S N_t > u_t + \eta^*(N_t)$ for all $N_t < N_t^A$. This implies that $\overline{\kappa}_t\theta_S N_t$ crosses $u_t + \eta^*(N_t)$ at some $N_t > N_t^A$, a contradiction.

(ii) Suppose $N_t^A < N_t^S$. I claim that the returns to symmetric conflict under N_t^S are higher than the returns to asymmetric conflict under N_t^S.

To see this, suppose not. Then we have that $\overline{\kappa}_t \left(\theta_A N_t^S + \tau\right) > \overline{\kappa}_t \theta_S N_t^S = u_t + \eta^*(N_t^S)$. From the fact that all three are linear in N_t and the fact that $u_t + \underline{\eta} < -c < \overline{\kappa}_t \tau - c$, this implies that $\overline{\kappa}_t (\theta_A N_t + \tau) > u_t + \eta^*(N_t)$ for all $N_t < N_t^S$. This implies that $\overline{\kappa}_t (\theta_A N_t + \tau)$ crosses $u_t + \eta^*(N_t)$ at some $N_t > N_t^S$, a contradiction.

(iii) Clearly, conditional on the level of mobilization, the rebel leader prefers the tactic that maximizes the returns to conflict.

(iv) I claim that for a given u_t, there is a unique $\kappa'(u_t)$ where $N_t^S(\overline{\kappa}_t, u_t; \hat{s})$ is greater than (respectively, is less than) $N_t^A(\overline{\kappa}_t, u_t; \hat{s})$ if and only if $\overline{\kappa}_t$ is greater than (respetively, less than) $\kappa'(u_t)$. Comparing N_t^A to N_t^S we find that $N_t^S > N_t^A$ if and only if $\overline{\kappa}_t > \kappa'(u_t)$ given by:

$$\kappa' = \frac{(\theta_S - \theta_A)(u_t + \underline{\eta})}{\tau \theta_S N} + \frac{\overline{\eta} - \underline{\eta}}{\theta_S N}.$$

The first three points imply that the highest mobilization equilibrium involves N_t^A and asymmetric conflict if $N_t^A > N_t^S$ and involves N_t^S and symmetric conflict if $N_t^A < N_t^S$. Finally, the fourth point shows that $N_t^S \geq N_t^S$ if and only if $\overline{\kappa}_t \geq \frac{(\theta_S - \theta_A)(u_t + \underline{\eta})}{\tau \theta_S N} + \frac{\overline{\eta} - \underline{\eta}}{\theta_S N}$, with the first inequality strict if the second inequality is strict. ■

Appendix B Additional Results

Lemma B.1 *Assume that $s = (\vec{s}_i, s_R)$, with s_R Markovian and $\vec{s}_i$ a collection of Markovian, monotone strategies. Then, for any T and any $t \leq T$, $\Delta_R^{T-t}(\overline{\kappa}_t, u_t, N_t; s)$ is non-increasing in u_t.*

Proof.

The proof is by induction. Assume $\Delta_R^{T-t}(\overline{\kappa}_t, u_t, N_t; s)$ is non-increasing for all t in a game of length T. Now consider a game of length $T+1$. In any period $t \neq 1$, $\Delta_R^{(T+1)-t}(\overline{\kappa}_t, u_t, N_t; s)$ is non-increasing in u_t by the inductive hypothesis. Now we must prove that $\Delta_R^T(\overline{\kappa}_1, u_1, N_1; s)$ is non-increasing in u_1. Recalling that in period 2 we will have

$\overline{\kappa}_2 = \kappa_1$, the fact that the rebel leaders will optimize in period 2 implies that we can write:

$$\Delta_R^T(\overline{\kappa}_1, u_1, N_1; s) = \int_0^\infty \int_{\underline{u}}^{\overline{u}} \max\Big\{\tilde{\kappa}_1 \theta_S N_2(\tilde{\kappa}_1, \tilde{u}_2) + \delta \Delta_R^{T-1}(\tilde{\kappa}_1, \tilde{u}_2, N_2(\tilde{\kappa}_1, \tilde{u}_2); s),$$
$$\tilde{\kappa}_1\left(\theta_A N_2(\tilde{\kappa}_1, \tilde{u}_2) + \tau\right) + \delta \Delta_R^{T-1}(\tilde{\kappa}_1, \tilde{u}_2; s), \frac{\beta(1-\delta^{T-t})}{1-\delta}\Big\} g_{u_1,N_1}(\tilde{u}_2)\, d\tilde{u}_2 f_{\overline{\kappa}_1}(\tilde{\kappa}_1)\, d\tilde{\kappa}_1.$$

g is ordered FOSD by u_1, so is suffices to show that

$$\max\left\{\tilde{\kappa}_1 \theta_S N_2(\tilde{\kappa}_1, \tilde{u}_2) + \delta \Delta_R^{T-1}(\tilde{\kappa}_1, \tilde{u}_2, N_2(\tilde{\kappa}_1, \tilde{u}_2); s), \tilde{\kappa}_1\left(\theta_A N_2(\tilde{\kappa}_1, \tilde{u}_2) + \tau\right) + \delta \Delta_R^{T-1}(\tilde{\kappa}_1, \tilde{u}_2; s), \frac{\beta(1-\delta^{T-t})}{1-\delta}\right\}$$

is the upper envelope of functions that are non-increasing in $\tilde{u}_2$.

Δ_R^{T-1} is non-increasing in $\tilde{u}_2$ by the inductive hypothesis. Since the population member's strategies are monotone, N_2 is non-increasing in $\tilde{u}_2$. This establishes that if expected continuation values are non-increasing in a game of length T, they are non-increasing in a game of length $T+1$.

To complete the proof by induction, we need to show there exists an T such that the expected continuation values are non-decreasing. Continue a game of length 2. Then the expected continuation value, $\Delta_R^1(\kappa_0, u_1; s)$ can be written:

$$\int_0^\infty \int_{\underline{u}}^{\overline{u}} \max\left\{\tilde{\kappa}_1 \theta_S N_2(\tilde{\kappa}_1, \tilde{u}_2), \tilde{\kappa}_1\left(\theta_A N_2(\tilde{\kappa}_1, \tilde{u}_2) + \tau\right), \frac{\beta(1-\delta^{T-t})}{1-\delta}\right\} g_{u_1,N_1}(\tilde{u}_2)\, d\tilde{u}_2 f_{\kappa_0}(\tilde{\kappa}_1)\, d\tilde{\kappa}_1.$$

which is obviously non-increasing in u_1. ■

Lemma B.2 *Assume that $s = (\vec{s}_i, s_R)$, with s_R Markovian and $\vec{s}_i$ a collection of Markovian, monotone strategies. Then, for any T and any $t \leq T$, $\Delta_R^{T-t}(\overline{\kappa}_t, u_t, N_t; s)$ is non-decreasing in N_t.*

Proof.

The proof is by induction. Assume $\Delta_R^{T-t}(\overline{\kappa}_t, u_t, N_t; s)$ is non-decreasing in N_t for all t in a game of length T. Now consider a game of length $T+1$. In any period $t \neq 1$, $\Delta_R^{(T+1)-t}(\overline{\kappa}_t, u_t, N_t; s)$ is non-decreasing in N_t by the inductive hypothesis. Now we must prove that $\Delta_R^T(\overline{\kappa}_1, u_1, N_1; s)$ is non-decreasing in N_1. Recalling that in period 2 we will have

$\overline{\kappa}_2 = \kappa_1$, the fact that the rebel leaders will optimize in period 2 implies that we can write:

$$\Delta_R^T(\overline{\kappa}_1, u_1, N_1; s) = \int_0^\infty \int_{\underline{u}}^{\overline{u}} \max\Bigg\{\tilde{\kappa}_1\theta_S N_2(\tilde{\kappa}_1, \tilde{u}_2) + \delta\Delta_R^{T-1}(\tilde{\kappa}_1, \tilde{u}_2, N_2(\tilde{\kappa}_1, \tilde{u}_2); s),$$
$$\tilde{\kappa}_1\left(\theta_A N_2(\tilde{\kappa}_1, \tilde{u}_2) + \tau\right) + \delta\Delta_R^{T-1}(\tilde{\kappa}_1, \tilde{u}_2; s), \frac{\beta(1-\delta^{T-t})}{1-\delta}\Bigg\} g_{u_1,N_1}(\tilde{u}_2)\, d\tilde{u}_2 f_{\overline{\kappa}_1}(\tilde{\kappa}_1)\, d\tilde{\kappa}_1.$$

g is ordered FOSD by $-N_1$, so is suffices to show that

$$\max\left\{\tilde{\kappa}_1\theta_S N_2(\tilde{\kappa}_1, \tilde{u}_2) + \delta\Delta_R^{T-1}(\tilde{\kappa}_1, \tilde{u}_2, N_2(\tilde{\kappa}_1, \tilde{u}_2); s), \tilde{\kappa}_1\left(\theta_A N_2(\tilde{\kappa}_1, \tilde{u}_2) + \tau\right) + \delta\Delta_R^{T-1}(\tilde{\kappa}_1, \tilde{u}_2; s), \frac{\beta(1-\delta^{T-t})}{1-\delta}\right\}$$

is the upper envelope of functions that are non-increasing in $\tilde{u}_2$.

Δ_R^{T-1} is non-increasing in $\tilde{u}_2$ by the inductive hypothesis. Since the population member's strategies are monotone, N_2 is non-increasing in $\tilde{u}_2$. This establishes that if expected continuation values are non-decreasing in N_t a game of length T, they are non-decreasing in N_1 in a game of length $T+1$.

To complete the proof by induction, we need to show there exists an T such that the expected continuation values are non-decreasing. Consider a game of length 2. Then the expected continuation value, $\Delta_R^1(\kappa_0, u_1, N_1; s)$ can be written:

$$\int_0^\infty \int_{\underline{u}}^{\overline{u}} \max\left\{\tilde{\kappa}_1\theta_S N_2(\tilde{\kappa}_1, \tilde{u}_2), \tilde{\kappa}_1\left(\theta_A N_2(\tilde{\kappa}_1, \tilde{u}_2) + \tau\right), \frac{\beta(1-\delta^{T-t})}{1-\delta}\right\} g_{u_1,N_1}(\tilde{u}_2)\, d\tilde{u}_2 f_{\kappa_0}(\tilde{\kappa}_1)\, d\tilde{\kappa}_1.$$

which is obviously non-decreasing in N_1. ∎

Lemma B.3 *Assume that $s = (\vec{s}_i, s_R)$, with s_R Markovian and $\vec{s}_i$ a collection of Markovian, monotone strategies. Then, for any T and any $t \leq T$, $\Delta_R^{T-t}(\overline{\kappa}_t, u_t, N_t; s)$ is non-decreasing in $\overline{\kappa}_t$.*

Proof.

The proof is by induction. Assume $\Delta_R^{T-t}(\overline{\kappa}_t, u_t, N_t; s)$ is non-decreasing for all t in a game of length T. Now consider a game of length $T+1$. In any period $t \neq 1$, $\Delta_R^{(T+1)-t}(\overline{\kappa}_t, u_t, N)t; s)$ is non-decreasing in $\overline{\kappa}_t$ by the inductive hypothesis. Now we must prove that $\Delta_R^T(\overline{\kappa}_1, u_1, N_1; s)$ is non-decreasing in $\overline{\kappa}_1$. Recalling that in period 2 we will have

$\overline{\kappa}_2 = \kappa_1$, the fact that the rebel leaders will optimize in period 2 implies that we can write:

$$\Delta_R^T(\overline{\kappa}_1, u_1, N_1; s) = \int_0^\infty \int_{\underline{u}}^{\overline{u}} \max\Big\{\tilde{\kappa}_1\theta_S N_2(\tilde{\kappa}_1, \tilde{u}_2) + \delta\Delta_R^{T-1}(\tilde{\kappa}_1, \tilde{u}_2, N_2(\tilde{\kappa}_1, \tilde{u}_2); s),$$
$$\tilde{\kappa}_1\left(\theta_A N_2(\tilde{\kappa}_1, \tilde{u}_2) + \tau\right) + \delta\Delta_R^{T-1}(\tilde{\kappa}_1, \tilde{u}_2; s), \frac{\beta(1-\delta^{T-t})}{1-\delta}\Big\} g_{u_1,N_1}(\tilde{u}_2)\, d\tilde{u}_2 f_{\overline{\kappa}_1}(\tilde{\kappa}_1)\, d\tilde{\kappa}_1.$$

Consider the expectation (with respect to $\tilde{u}_2$ of the upper envelope inside this integral:

$$\int_{\underline{u}}^{\overline{u}} \max\Big\{\kappa_1\theta_S N_2(\kappa_1, \tilde{u}_2) + \delta\Delta_R^{T-1}(\kappa_1, \tilde{u}_2, N_2(\kappa_1, \tilde{u}_2); s),$$
$$\kappa_1\left(\theta_A N_2(\kappa_1, \tilde{u}_2) + \tau\right) + \delta\Delta_R^{T-1}(\kappa_1, \tilde{u}_2; s), \frac{\beta(1-\delta^{T-t})}{1-\delta}\Big\} g_{u_1,N_1}(\tilde{u}_2)\, d\tilde{u}_2.$$

I will show that this function is non-decreasing in κ_1.

Δ_R^{T-1} is non-decreasing in κ_1 by the inductive hypothesis. Since the population member's strategies are monotone, N_2 is non-decreasing in κ_1.

Hence, $\Delta_R^T(\overline{\kappa}_1, u_1; s)$ is the expected value of a function which is non-decreasing in $\tilde{\kappa}_1$. By the definition of FOSD, an FOSD increase in the distribution of $\tilde{\kappa}_1$ must increase $\Delta_R^T(\overline{\kappa}_1, u_1; s)$. Hence, since $f_{\overline{\kappa}_1}$ is ordered by FOSD in $\overline{\kappa}_1$, $\Delta_R^T(\overline{\kappa}_1, u_1; s)$ is non-decreasing in $\overline{\kappa}_1$. This establishes that if expected continuation values are non-decreasing in a game of length T, they are non-decreasing in a game of length $T+1$.

To complete the proof by induction, we need to show there exists an T such that the expected continuation values are non-decreasing. Consider a game of length 2. Then the expected continuation value, $\Delta_S^1(\kappa_0, u_1; s)$ can be written:

$$\int_0^\infty \int_{\underline{u}}^{\overline{u}} \max\Big\{\tilde{\kappa}_1\theta_S N_2(\tilde{\kappa}_1, \tilde{u}_2), \tilde{\kappa}_1\left(\theta_A N_2(\tilde{\kappa}_1, \tilde{u}_2) + \tau\right), \frac{\beta(1-\delta^{T-t})}{1-\delta}\Big\} g_{u_1,N_1}(\tilde{u}_2)\, d\tilde{u}_2 f_{\kappa_0}(\tilde{\kappa}_1)\, d\tilde{\kappa}_1,$$

which is obviously non-decreasing in κ_0. ■

Lemma B.4 *Assume that $s = (\vec{s}_i, s_R)$, with s_R Markovian and $\vec{s}_i$ a collection of Markovian, monotone strategies. Then, for any T and any $t \leq T$, $v_R^{T-t}(\overline{\kappa}_t, u_t; s)$ is decreasing in u.*

Proof. We can write v_R^{T-t} as

$$\max\left\{\overline{\kappa}_t\theta_S N_t(\overline{\kappa}_t,u_t)+\delta\Delta_R^t(\overline{\kappa},u_t,N_t;s),\overline{\kappa}_t\left(\theta_A N_t(\overline{\kappa}_t,u_t)+\tau\right)+\delta\Delta_R^t(\overline{\kappa},u_t,N_t;s),\frac{\beta(1-\delta^{T-(t-1)})}{1-\delta}\right\}.$$

By Lemma B.1, Δ_R^t is non-increasing in u_t. Further, since the population's strategy is monotone, N_t is decreasing in u_t. This establishes the result. ■

Proposition B.1 *An equilibrium exists. In any period t, equilibrium is characterized as follows:*

- *The rebel leaders strategy is given by Lemma 3.1.*
- *Given beliefs $(\overline{\kappa}_t, N_t)$, a population member i mobilizes if and only if*

$$\max\{\overline{\kappa}_t\theta_S N_t, \overline{\kappa}_t(\theta_A N_t+\tau)\geq u_t+\eta_i.$$

Consequently, in any period t, the equilibrium correspondence is characterized as follows.

(i) (N,S) *if and only if* $\overline{\kappa}_t \geq \frac{u_t+\overline{\eta}+c}{\theta_S N}$.

(ii) $(N_t^S(\overline{\kappa}_t,u_t),S)$ *if and only if* $\frac{(u_t+\underline{\eta})(\theta_S-\theta_A)}{\tau\theta_S N}+\frac{\overline{\eta}-\underline{\eta}}{\theta_S}\leq\overline{\kappa}_t<\frac{u_t+\overline{\eta}+c}{\theta_S N}$.

(iii) $(N_t^A(\overline{\kappa}_t,u_t),A)$ *if and only if* $\frac{u_t+\overline{\eta}+c}{\tau}<\overline{\kappa}_t<\max\{\frac{(u_t+\underline{\eta})(\theta_S-\theta_A)}{\tau\theta_S N}+\frac{\overline{\eta}-\underline{\eta}}{\theta_S},\frac{u_t+\overline{\eta}+c}{\theta_S N}\}$.

(iv) $(0,A)$ *if and only if* $\underline{\kappa}_{T-t}(u_t,\beta)<\overline{\kappa}_t<\max\{\frac{u_t+\underline{\eta}+c}{\tau},\frac{u_t+\overline{\eta}+c}{\theta_S N}\}$.

(v) (O,W) *if and only if* $\overline{\kappa}_t<\max\{\underline{\kappa}_{T-t}(u_t,\beta),\frac{u_t+\overline{\eta}+c}{\theta_S N}\}$.

Proof. Existence is by construction. The rebel leaders' strategy follows from Lemma 3.1. The population members' strategy is established as follows. From Lemma 3.2, a population member knows that if she mobilizes, the rebel leader will not withdraw. Further, all population members are measure zero, so they do not effect continuation values. Hence, a population member mobilizes, given her beliefs, if her expected instantaneous payoff from the tactic the rebel leader will choose (given her beliefs about mobilization) are higher than the outside option. That she believes the rebel leader will choose whichever tactic yields higher instantaneous payoffs follows from the rebel leaders' strategy and consistency of beliefs with actions.

To see that this implies the equilibrium paths specified consider the following:

(i) Follows from Lemmata 3.4 and 3.8.

(ii) The lower bound follows from Lemma 3.9. The upper bound follows from Lemma 3.8.

(iii) The lower bound follows from Lemma 3.9. The upper bound follows from Lemmata 3.9 and 3.8.

(iv) The lower bound follows from Lemma 3.5. The upper bound follows from Lemmata 3.9 and 3.8.

(v) Follows from Lemma 3.6.

■

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