Bargaining Between Rebel Groups and the 
Outside Option of Violence.∗

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Abstract

Abstract: Although military cooperation among rebel groups in multi-party civil wars could help rebels defeat or extract concessions from an incumbent government, violent conflict among rebel groups is empirically prevalent. Why do rebel groups in multi-actor civil wars choose to fight one another? This paper models the strategic dilemma facing rebel groups in multi-party civil wars as an alternating-offer bargaining game of incomplete information with an outside option. The game-theoretic model explores the relationship between the status quo distribution of power among rebel groups, the costs of fighting, and the likelihood that one rebel group will opt to unilaterally end bargaining over a set of goods, such as access to supply routes, natural resources, and control over civilian populations. We show that the likelihood of violent conflict between rebel groups is lowest when the status quo distribution of benefits reflects the existing distribution of power.

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1 Introduction

The First Liberian Civil War, fought between 1989 and 1995 (Gleditsch et al., 2002), resulted in approximately 200,000 fatalities from a total population of fewer than three million.\(^1\) For a time, rebel groups such as the National Patriotic Front of Liberia (NPFL) and the United Liberation Movement of Liberia for Democracy (ULIMO) existed alongside one another without incident while fighting the government and preying brutally upon civilians (Ellis, 2006). Over time, however, some of the many Liberian rebel groups split apart into multiple splinter groups.\(^2\) ULIMO, for example, split into ULIMO-K and ULIMO-J, which existed peacefully side by side until fighting erupted between them in March 1994. What caused this violent rupture? Ostensibly, fighting broke out after a protracted period of bargaining between the groups over nominations of rebels to ministerial positions for the newly formed transitional government (Ellis, 1995).

The dynamics of the First Liberian Civil War suggest a puzzle: although military cooperation among rebel groups in multi-party civil wars could help rebels defeat or extract concessions from an incumbent government, violent conflict among rebel groups is empirically prevalent. Cunningham, Gleditsch and Salehyan (2009, 572) note that rebel organizations “often spend as much time fighting one another as the government.” In the Democratic Republic of the Congo, Burundi, and Myanmar, for example, rebel groups have fought one another for the loyalty of civilians, control over lootable natural resources, and access to strategically important territory (Fjelde and Nilsson, n.d.). As in the Liberian context, conflicts between rebels frequently move beyond mere skirmishes between undisciplined foot soldiers: military confrontations between the National Patriotic Front of Liberia (NPFL) and the United Liberation Movement of Liberia for Democracy (ULIMO) between 1991 and 1992 resulted in up

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\(^1\) For a history of the conflict, see Ellis (2006).

\(^2\) The Liberian rebel groups were comparatively organizationally unsophisticated, which stands in marked contrast to the sophistication of many Marxist insurgent groups. See Kalyvas and Balcells (2010). We discuss the literature on rebel group splintering in civil war in the next section.
to 2,000 fatalities (Eck, Kreutz and Sundberg, 2010). In South Africa, the African National Congress and the Inkatha Freedom Party’s armed encounters produced approximately 600 fatalities in 1990 alone (Eck, Kreutz and Sundberg, 2010).

Why do rebel groups in multi-actor civil wars choose to fight one another? Such conflicts divert crucial resources from the fight against the government. If rebel groups seek accommodations that can only be granted by governments, or if they seek to seize the state itself, allocating resources toward fighting another rebel group appears sub-optimal. What accounts for this behavior?

We represent the strategic interaction between two rebel groups in civil war as an alternating-offer bargaining model, where one side has the ability to impose a settlement - to use violence against the other - should bargaining fail. In our model, rebel groups bargain with one another over goods, including access to resources and the civilian population, as well as control over the wartime economy. Control of these goods positions rebels to obtain concessions from the government or to militarily defeat the government outright; their acquisition is therefore highly desirable in the civil war context. We argue that our game-theoretic model captures core features of the strategic dilemma facing rebel groups when they operate alongside both a government and another rebel group. In such situations, rebels are forced to choose whether to peacefully divide access to goods among themselves or go to war against one another to impose a preferred solution, even though such conflict weakens each group relative to the government.

This paper makes three main contributions to the literature on civil war and rebel group behavior. First, we show how the balance of power and the status quo distribution of goods among rebel groups affects the kind of bargaining solutions that obtain, which can help explain why rebels divide territory and access to spoils in the ways that they do. Second, we show how the balance of power and the status quo distribution of goods among rebel groups affects the probability of conflict among them, which can begin to explain patterns
of inter-rebel group violence. Third, we discuss possible ways of testing the implications of our game-theoretic model, something we intend to pursue in later iterations of the project.

In addition to contributing to the scholarly literature on civil war, these conclusions have broad policy relevance: violence between rebel groups has consequences for civilians. The international community, however, has typically focused on abuse of civilians wrought by violence between governments and rebel groups. Expanding the breadth of our attention to include inter-rebel group violence, and thinking through ways to dampen the incentives for rebels to fight – that is, to accept a bargained division of goods among themselves – could help mitigate the physical, economic, and emotional damages done to innocent civilians.3

This paper proceeds as follows. In the second section we review the existing literature on inter-rebel group dynamics in multi-party civil wars. The third section presents our theory of why rebel groups fight and models inter-rebel group dynamics as an alternating-offer bargaining model and an outside option, under complete information. The fourth section explores a similar game-theoretic model with incomplete information. The fifth section discusses the implications of our results and proposes extensions to our model. The sixth section concludes.

2 The Literature on Inter-Rebel Group Dynamics

Although the literature on civil war has expanded rapidly, studies of rebel group behavior in civil war have principally focused on the use of violence against civilians, not on strategic interactions among rebel groups.4 The only existing systematic study of inter-rebel group

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3 Following Kalyvas (2006), we might also consider how civilians may be active participants in the production of violence among rebel groups.

4 The literature is vast. See, for example, Balcells (2010); Humphreys and Weinstein (2008b); Johnston Johnston (2008); Kalyvas (2006); Kalyvas and Kocher (2007); Metelits (2008); Metelits (2010); Stanton n.d.; Valentino, Huth and Balch-Lindsay (2001); Weinstein (2007); Wood (2003); and Wood (2010). The majority of the literature on civilian victimization does not speak to inter-rebel group dynamics. One exception is Metelits (2008), which argues that when rebels compete with one another over natural resources, they are more likely to abuse civilians. Although she does not explicitly develop theory about when rebels are likely to
violence of which we are aware remains unpublished (Fjelde and Nilsson, n.d.). It is useful to review here the results of the Fjelde and Nilsson paper, so that we may have a baseline against which to compare the findings from our game-theoretic model. Using data from the Uppsala Conflict Data Program Non-State Conflict Dataset (Eck, Kreutz and Sundberg, 2010) from the years 1989-2008, Fjelde and Nilsson (n.d.) find that rebel against rebel violence can be explained as strategic actions, rather than opportunistic moves. More specifically, they identify four conditions under which rebel against rebel violence is more likely to occur: “when rebel groups control territory, when they have experienced a splintering of the organization, when the state is weak and no longer holds the monopoly power to determine territorial or political stakes, and when the rebel group is strong in relation to the other groups in the conflict” (Fjelde and Nilsson, n.d., 3). They find that neither the presence of drugs nor gemstones in the conflict area has an effect on the likelihood of inter-rebel group fighting. They find no relationship between rebel group organizational structure (whether groups have a strong central command) and the likelihood of violence among rebels. Finally, they find that groups mobilized along ethnic lines increases the probability of groups’ engaging in inter-group violence. We summarize their results in Table 1.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Effect on Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Territory</td>
<td>Probability Increased</td>
</tr>
<tr>
<td>Splintering</td>
<td>Probability Increased</td>
</tr>
<tr>
<td>Weak State</td>
<td>Probability Increased</td>
</tr>
<tr>
<td>Strong Group</td>
<td>Probability Increased</td>
</tr>
<tr>
<td>Ethnically Mobilized</td>
<td>Probability Increased</td>
</tr>
<tr>
<td>Drugs</td>
<td>No Effect</td>
</tr>
<tr>
<td>Gemstones</td>
<td>No Effect</td>
</tr>
<tr>
<td>Organizational Structure</td>
<td>No Effect</td>
</tr>
</tbody>
</table>

A small but growing literature on inter-rebel group cooperation and alliances in civil fight with one another, her hypothesis implies that competition over resources spurs competitive dynamics among rebel groups. This line of argument - that competition over resources is likely to lead to inter-rebel group conflict - is challenged by the findings of Fjelde and Nilsson (n.d.), which we address below.
wars has emerged, but such studies explicitly forego explanations of conflict among rebel
groups to focus on the conditions under which cooperation is likely to emerge. We briefly
review that literature here. Bapat and Bond (N.d.) argue that “while [violent non-state]
groups that are less vulnerable to government repression rely on the shadow of the future to
enforce cooperation, weaker groups require an enforcer to sustain alliance cooperation.” They
include both terrorist organizations and rebel groups in their study. Cross-national data lend
empirical support to their game-theoretic model. In her dissertation, one of the authors of the
previous study (Bond, 2010), argues that identity characteristics of violent non-state actors
play a large role in determining the onset of cooperation among such actors, while power
characteristics are better at explaining the design of such cooperative arrangements. Christia
(2008) argues that civil war alliances in multiethnic failed states are not driven by the politics
of ethnic kinship, but rather are consummated to secure minimum winning coalitions that
guarantee participants the largest share of the spoils possible, while also making victory
achievable. However, because shifting balances among participants result in “a process of
constant defection, alliance reconfiguration, and group fractionalization,” alliance stability “is
only attained when an external arbiter can enforce cooperation” (Christia, 2008). Christia
uses careful case studies of Bosnia and Afghanistan, including Geographical Information
System (GIS) analysis, to support her claims. Furtado (2007) likewise opts for a small-N study, choosing Sri Lanka, Kashmir, and Assam as cases, and uses a formal model to highlight
the importance of credible commitments to the formation of rebel group alliances. Furtado
develops a typology of rebel groups, based on rebel goals and the level of resources available
to groups to accomplish those goals, to argue that rebel groups are more likely to form
cooperative agreements with other groups that are able to make a credible commitments and
when the government undertakes large-scale counterinsurgency operations. Finally, Furtado
finds that groups that have symmetric goals and asymmetric resource endowments are more
likely to form alliances.
Others have looked at how the number of rebel groups affects outcomes of interest, including the likelihood of reaching a conflict-ending agreement. Cunningham (2006) shows that civil wars that include multiple actors who must approve a settlement - what he calls “veto players” - tend to be longer than those that feature fewer veto players. Nilsson (2008) disagrees, and argues that although parties excluded from peace agreements may to continue to fight once an agreement is concluded, “settlements leaving out one or more rebel groups should not necessarily make the signatories any more likely to engage in violence,” because “we can expect that the signatories have considered the possibility that excluded parties may continue to engage in armed conflict” and have factored such a possibility into their decision-making calculus (Nilsson, 2008, 480).

A related and younger literature on rebel group splintering deals with the dynamics of multi-actor civil wars, with relevance to the puzzle addressed in this paper. Findley and Rudloff (Forthcoming) show that fragmentation has uneven effects across the full universe of civil war cases: when combatants undergo fragmentation, the duration of war does not always increase (contrary to the findings of Cunningham (2006) above), and that such wars often end in negotiated agreements rather than decisive victory. Both Metelits (2008) and Wood (2010) argue that rebel group fragmentation is frequently associated with violence against civilians, given that one-sided violence is a cheaper form of ensuring short-term civilian loyalty than investing in costly social service provision: benefits to rebels of the latter strategy may not be realized until well into the future. 5 Cunningham, Bakke and Seymour (Forthcoming) show that the existence of competing factions "is associated with higher instances of violence against the state and the out-group, as well as more factional fighting and attacks on co-ethnic civilians" and that the “entry of a new faction prompts violence from existing factions in both the contest with the state and competition among co-ethnics.” 6 Cunningham (2011) examines

\[5\]See Metelits (2008), Metelits (2010), Wood (2010).

\[6\]Seymour, Bakke and Cunningham (N.d.) provide the most rigorous attempt to date to conceptualize and delimit the concept of rebel group fragmentation.
whether internally divided separatists movements are more or less likely to be accommodated by governments. She finds that “internally divided movements receive concessions at a much higher rate than unitary ones and that the more divided the movement is the more likely it is to receive concessions,” but “concessions to unitary movements appear to work better to settle these disputes.” In looking at splintering among terrorist groups, Bueno de Mesquita (2008) argues that “[g]iven an ideological position for the original terrorist faction, the higher the expected cost of splintering (k), the less likely a splinter group is to emerge.” Finally, Staniland (Forthcoming) identifies an alternative mechanism that leads co-ethnics to fight against one another: what he calls “fratricidal flipping,” which prompts some individuals to defect to the state “when there is lethal, but incomplete, fratricide across or within insurgent groups. When an armed group decides to consolidate and maintain hegemony over a rebel movement, it may engage in intense violence to eliminate rivals. This strategy creates losers among organizations and factional leaders,” who defect to the state (Staniland, Forthcoming, 2-3). Although an important contribution to understanding the mechanisms driving violence among co-ethnics, Staniland’s piece does not provide us with analytical purchase on what prompts groups to deploy violence against one another in the first place.

In sum, these studies have expanded our knowledge about important facets of civil war processes, yet few generate concrete hypotheses about what might affect the likelihood of conflict among independent rebel groups, especially beyond cases of violence among splinter groups.

The same author finds that strengthening the economy or institutions for the nonviolent expression of grievance increase the extremism of terrorist factions but decrease the likelihood of a splinter faction forming.
3 Theory and the Model

This section begins by describing the strategic dilemma that rebel groups face in civil wars that also feature other rebel groups.\(^8\) It then argues that an alternating-offer bargaining model with an outside option to use violence captures essential features of this dilemma. After fully describing the model - including actors, sequence of moves, payoffs, and information - we characterize the equilibria and generate informal comparative statics to evaluate how changes in parameter values affect behavior in equilibrium.

3.1 The Strategic Dilemma for Rebel Groups in Multi-Actor Civil Wars

At first blush, it seems that rebels in multi-actor civil wars would be better off coming together to challenge the government rather than fighting one another. Although rebel groups have diverse preferences - some wish to capture the state, others hope to secede, others favor a more equitable division of spoils, and so forth - setting aside those differences in the short term to focus on conquering the government might make sense, which would kick down the road resolution of tough inter-group disagreements.\(^9\) Given that conflict is costly and destroys resources that could be used to challenge the government, even if two rebel groups were unable to come together to coordinate militarily, these groups may be better off simply ignoring one another rather than fighting. Why, then, do rebels resort to violence among themselves?

\(^8\)Kalyvas and Kocher (2007) argue that civil wars in strong states often take the form of irregular wars characterized by power asymmetry, while failed states give birth to conventional civil wars with front lines. Although testing that hypothesis is beyond the scope of this paper, the existence of multiple rebel groups likely signals a weak state: civil wars in these states are fought as irregular wars because rebels cannot hope to match the strength of the government. See also Butler and Gates (2009) on power asymmetry and civil war.

\(^9\)On rebel group goals and their relationship to relative capabilities, see Buhaug (2006).
3.2 The Strategic Dilemma Facing Rebel Groups as an Alternating-Offer Bargaining Game with an Outside Option

Imagine two rebel groups, $R_1$ and $R_2$, operating within a single territorial state, bargaining over rights to the best supply routes, control over crucial natural resources in the present and future, and access to civilian populations that can provide food, shelter, and information on government troop movements. These resources may mean the difference between group extinction, just barely surviving in a difficult environment, or profiting handsomely from the wartime economy (Reno, 2000). We begin by sketching more specifically what these resources are, what advantages they confer in a competitive, violent environment, and how rebels may attain them.

Support from the civilian population is critical to insurgent rebel groups (Galula, 1964; Petraeus, Nagl and Sewall, 2007), providing rebels access to supplies such as food and shelter, allowing them to remain hidden from government forces, providing a pool of potential new recruits, and furnishing critical information on government forces’ location, tactics, and strength (Mason, 1996; Migdal, 1974; Wood and Gibney, 2010). Rebels obtain civilian support through two principal methods. First, rebels can provide goods to civilians to cultivate support. Such goods may include security against government incursions, provision of social services like education, health care, or other quasi-state-like functions, or private “selective incentives” like bribes (Olson, 1965; Popkin, 1979; Lichbach, 1995; Humphreys and Weinstein, 2008a). Second, rebels can gain popular support by threatening or applying selective violence against civilians for non-cooperation, thereby eliciting defection against the government (Kalyvas, 2006).

Soldiers, or military manpower, are necessary for rebels to militarily challenge the government, protect civilians loyal to rebels from government raids, and intimidate civilians into

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10 On the latter, see Kalyvas (2006).
cooperation. Without a physical presence in civilian areas, rebels will be unable to make
civilians feel sufficiently secure, making them more likely to succumb to government pressure
to denounce rebel sympathizers and report on rebel movements. Rebels have three principal
ways to recruit soldiers: forced recruitment (Beber and Blattman, n.d.; Humphreys and We-
instein, 2008a), offering material incentives immediately to those who join and/or promising
such goods in the future (Olson, 1965), and promising a desired social outcome, such as
righting historical injustices or initiating class struggle. Civilian support, discussed above, is
related to a group’s ability to attract recruits, although the two are not likely to be perfectly
correlated. Even if civilian support is low, and a rebel group eschews forced recruitment,
civilians may prefer to join the insurgency if the dangers of remaining a civilian exceed the
dangers of joining the fight (Kalyvas and Kocher, 2007).

The third requisite for rebel group survival is military technology and materiel. Rebels
fighting an insurgency obviously do not need advanced missile systems, but they do require
basic arms that will allow them to impose losses on government forces, deter attacks from
other rebel groups, and coerce civilians into cooperating.¹¹ Methods for obtaining military
technology include raids, battlefield scavenging, arms deals with other rebel groups or foreign
arms dealers, and military aid from patron states.¹²

Finally, rebel groups need some form of revenue to support their operations. Revenue
allows rebels to purchase civilian support through bribes or social services, to incentivize
recruits into joining the armed struggle, and to buy weapons. Sources of revenue provide

¹¹Although more sophisticated military technology helps reduce the number of soldiers needed to pursue
the same tactical goals, given that advancements in military technology breed efficiency (Quinlivan, 1995),
in insurgency such advantages are not as pronounced as in conventional civil wars or non-conventional
symmetric civil wars (Kalyvas and Balcells, 2010).

¹²Small Arms Survey 2001: Profiling the Problem (2001) finds that “[i]nsurgent groups, for example, acquire
most of their armaments through raiding, battlefield seizures, grey market activity and to a lesser extent
the black market. Indigenous production among non-state actors is rare but does exist. The largest illicit
transfers in recent history appear to have occurred in the 1970s and 1980s, as the United States and Soviet
Union armed their ‘clients’ in Africa, Asia and Latin America. These grey market weapons were an important
part of subsequent black market transfers” (Small Arms Survey 2001: Profiling the Problem, 2001).
rebels with a fungible good, unlike the other requisites mentioned above. A secure stream of revenue therefore makes acquiring the other means of survival easier and more likely. Revenue can be obtained by securing financial support from diaspora groups (Collier and Hoeffler, 2004; Fearon and Laitin, 2003; Sambanis, 2004), building relationships with foreign patron states (Byman et al., 2001), exploiting natural resource wealth (Ross, 2003, 2004; Humphreys, 2005), or extracting rents from civilians, either forcibly or in exchange for the provision of public goods.

The requisites for organizational endurance, the advantages these requisites confer to rebel organizations, and the ways that rebels obtain these requisites are summarized in the table below.

<table>
<thead>
<tr>
<th>Requisites</th>
<th>Advantages Requisites Confer</th>
<th>How Rebels Obtain Requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civilian Support</td>
<td>Recruits, Information on government activities, Supplies, Remain hidden from government</td>
<td>Uses of force, Threats of force, Goods provision</td>
</tr>
<tr>
<td>Recruits/Manpower</td>
<td>Militarily challenge government, Intimidate civilians into cooperation, Compete with other rebel groups</td>
<td>Promise of material benefits, Promise of desired social outcomes, Forced recruitment</td>
</tr>
<tr>
<td>Military technology</td>
<td>Challenge government, Capture strategic territory, Intimidate civilians into cooperation, Reduce number of recruits needed</td>
<td>Raids or battlefield seizures, Arms deals, Military aid from patron states</td>
</tr>
<tr>
<td>Revenue</td>
<td>Purchase civilian support, Incentivize new recruits, Buy military materiel</td>
<td>Rents from civilians, Diaspora groups, Natural resource wealth</td>
</tr>
</tbody>
</table>

**Our principal assumption driving this paper is that rebel groups bargain over access to and control over the above-mentioned resources.** We have chosen to conceive of this bargaining process as an alternating-offer bargaining game, similar to a Rubinstein bargaining game in which two players bargain over the division of a pie. In a traditional Rubinstein bargaining...

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13 We recognize that “access to” and “control over” are analytically distinct concepts, yet we leave that distinction aside for present purposes.
game each player makes alternating-offers until one accepts what is offered by the other (Rubinstein, 1982). In that setup, $R_1$ begins by making an offer to $R_2$. $R_2$ can either accept that initial offer or reject it and make a counteroffer in the second round. The game ends when an offer (or counteroffer) is accepted by one of the parties. There exists “pressure” to secure a deal because of time-discounting: players are impatient and therefore wish to secure the same offer in the present as opposed to the future.

In the civil war context, as in other social situations, either rebel group has another option should it receive an unsatisfactory offer: it may deploy violence to obtain a preferred solution. In game-theoretic parlance, this is known as an “outside option.” The subsection that follows begins with an alternating-offer bargaining game of complete information with an outside option. We then turn to a game of incomplete information in which each player has private information over how costly it is for his adversary to resort to the violent outside option. We use the game-theoretic model to focus primarily on the relationship between the status quo distribution of power among rebel groups and the likelihood that one rebel group will opt for the outside option of violence to impose a solution.

### 3.3 A Model with Complete Information and the Outside Option

Prior to beginning the bargaining process, resources are apportioned between $R_1$ and $R_2$ according to some status quo division. Let $b$ equal the total per round flow of benefits until the time that either an agreement is reached or one player exercises its outside option. We set $b \leq 1$. To make this more concrete, imagine that both rebel groups continue to receive some flow of benefits via extraction of rents from civilians, from businesses that must pay tributes, or from natural resources under their control while bargaining takes place. Let $q$ be

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14 The outside option in other contexts may take the form of an aggrieved party bringing a dispute to court (Cooter, Marks and Mnookin, 1982) or a political party withdrawing from the government to force new elections (Lupia and Strøm, 1995). For an overview, see Powell (1996, 1999, 2002).

15 The model that follows tracks nearly perfectly that of Powell (1996).
### Table 3: Notational Key

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_1$</td>
<td>Rebel Group 1</td>
<td>$R_2$</td>
<td>Rebel Group 2</td>
</tr>
<tr>
<td>$\delta$</td>
<td>Discount Factor</td>
<td>$b$</td>
<td>Total per round benefits until agreement/conflict</td>
</tr>
<tr>
<td>$q$</td>
<td>$R_1$’s per round share</td>
<td>$b - q$</td>
<td>$R_2$’s per round share</td>
</tr>
<tr>
<td>$p$</td>
<td>Probability of $R_1$ Victory in Conflict</td>
<td>$1 - p$</td>
<td>Probability of $R_2$ Victory in Conflict</td>
</tr>
<tr>
<td>$r_1$</td>
<td>Cost to $R_1$ of Using Violence</td>
<td>$r_2$</td>
<td>Cost to $R_2$ of Using Violence</td>
</tr>
<tr>
<td>$r_1^L$</td>
<td>“Least Resolute” Type of $R_1$</td>
<td>$r_2^L$</td>
<td>“Least Resolute” Type of $R_2$</td>
</tr>
<tr>
<td>$r_1^M$</td>
<td>“Most Resolute” Type of $R_1$</td>
<td>$r_2^M$</td>
<td>“Most Resolute” Type of $R_2$</td>
</tr>
</tbody>
</table>

$R_1$’s per round share of $b$, and $b - q$ be $R_2$’s per round share of $b$. Assume that each player discounts the future, such that the discount factor for each is $\delta$, and that $0 < \delta < 1$. In other words, delay is costly.\(^{16}\)

Players make alternating-offers to revise the status quo division of benefits. In each round a player can accept an offer, reject and make a counteroffer (in the subsequent round), or opt to impose a new division of benefits using force. When an offer is accepted, or when one player opts to impose its outside option, the game ends, with payoffs assigned to each. More precisely, the sequence of moves in the game is as follows: $R_1$ makes some offer to revise the status quo. This offer can be accepted, rejected, or responded to with violence (“the outside option”).\(^{17}\)

If an offer is accepted, the players get the payoffs equivalent to the bargain struck, less some discounted value due to their impatience. Thus, if $R_1$ and $R_2$ agree to a bargain $(x, y)$ at time $t$, such that $R_1$ receives $x$ and $R_2$ receives $y$, $R_1$’s utility to possessing $q$, its per round

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\(^{16}\)To reduce the complexity of the model we make the discount factor $\delta$ the same for both players.

\(^{17}\)We constrain $R_1$ to only making an offer during the first round of play such that she cannot play her outside option in the first round, which would end the game before bargaining begins. Additionally, in an identical model that examines interstate bargaining over territory, Powell (1996) finds that “as long as the discount factor $[\delta]$ is close enough to one, then the probabilities of an imposed settlement are approximately the same regardless of which bargainer makes the first offer [our emphasis].” We use this finding to sidestep the need to solve two variants of the same models with different players moving first.
share of $b$, is, from the initial round of play until the $t$th round of play, $(1 - \delta^t)U_{R_1}(q) + \delta^tU_{R_1}(x)$, where $U'_{R_1} > 0$ and $U''_{R_1} \leq 0$. Likewise, $R_2$’s utility to that agreement is $(1 - \delta^t)U_{R_2}(b - q) + \delta^tU_{R_2}(y)$, where $U'_{R_2} > 0$ and $U''_{R_2} \leq 0$. More informally, $R_1$’s payoff to agreeing to $x$ at time $t$ is the payoff to controlling $q$ until time $t$ plus its payoff to having $x$ from time $t$ onward. In a parallel fashion, $R_2$’s payoff to agreeing to $x$ at time $t$ is the payoff to controlling $1 - q$ until time $t$ plus its payoff to having $1 - x$ from time $t$ onward.

If an offer is rejected by $R_2$, then $R_2$ makes a counteroffer to which $R_1$ responds in the next round. If, instead of accepting or counter-offering, $R_1$ exercises her outside option at time $w$, then she wins the entirety of the flow of benefits with some probability $p$, and obtains zero benefits with probability $1 - p$. Because $p$ is the probability that $R_1$ prevails in a conflict between $R_1$ and $R_2$, $p$ represents the distribution of power between them, such that a larger $p$ corresponds to a relatively more powerful $R_1$.\(^{18}\) We assume that war can end in only one of two ways: with victory for the initiator or with victory for the non-initiator. If $R_1$ wins, it takes all the relevant goods being bargained over, giving it a payoff of 1 in each period. However, given that fighting is costly, we assign $r_1$ to be the costs to $R_1$ of fighting and $r_2$ the costs to $R_2$ of fighting. When $r_1$ is small, $R_1$ is more willing to use force. Therefore, the per-period benefits to $R_1$ from time $w$ (when parties go to war) into the future is equivalent to $\delta^w(1 - r_1) + \delta^{w+1}(1 - r_1) + \delta^{w+2}(1 - r_1) + \cdots$. The first term is the discounted value of the per-period benefit $R_1$ receives during period $w$, while the second term if the discounted benefit $R_1$ receives during $w + 1$, and so on. Note that if $R_1$ loses, it is left with nothing but the cost of fighting. Therefore, the per-period payoff to losing is $-r_1$, such that the total payoff to losing is $\delta^w(-r_1) + \delta^{w+1}(-r_1) + \delta^{w+2}(-r_1) + \cdots$. $R_1$’s payoff to exercising its outside option at time $w$ is its payoff of controlling $q$ through time $w - 1$ plus its payoff to winning multiplied by its probability of winning plus its payoff to losing multiplied by its probability of losing.

\(^{18}\)If $p = \frac{1}{2}$, a balance of power exists: each rebel group has an equal probability of winning.
We need to fix player “types” before we explore in detail the equilibria, both with complete and incomplete information: a player-type is considered “dissatisfied” if he or she has a payoff to fighting that exceeds that of remaining in the status quo. More formally, $R_1$ is dissatisfied if its per-period expected payoff to attacking is greater than its per-period status quo payoff. We can therefore say that $R_1$ is dissatisfied if $p - r_1 > q$. Whether $R_1$ is dissatisfied is contingent upon the distribution of power, $p$, $R_1$’s status quo division of benefits, $q$, and $R_1$’s cost of fighting, $r_1$. Given this definition, $R_2$ is dissatisfied if $1 - p - r_2 > 1 - q$. At most, one player can be dissatisfied; if both were dissatisfied then the sum of both players’ payoffs to fighting would be greater than the sum of their payoffs to living with the status quo, which is impossible given that conflict is costly.\footnote{See Powell (1999, 93) for a more complete explanation.} In contrast, both rebels may be satisfied at any given time.

We believe that such a setup approximates the options available to rebel groups as they bargain in an alternating fashion to exact the best possible deal while retaining the possibility of using violence to increase their leverage. It is worthwhile to note that this setup mirrors that of Powell (1999) and Powell (1996), which - if our specification captures the
“real world” of rebel group competition - suggests considerable similarity between bargaining at the international level among states and bargaining at the substate level among violent non-state actors. We explore this in Section 5 below.

### 3.4 Equilibrium with Complete Information

To explore the equilibrium with complete information we need to consider two cases: when both states are satisfied, and when one state is dissatisfied while the other is satisfied. With complete information, rebel groups are perfectly informed about the other player’s payoffs. With such information in hand, a rebel group would know how much it would need to offer an opponent to have its offer accepted or, if it did not offer that reserve price to its opponent, it would encounter violence with probability 1.

Thus, when both rebel groups are satisfied and players are fully informed, each player’s payoff to remaining in the status quo is greater than or equal to the payoff to attacking. Any threats to use force by either rebel group when both are satisfied and fully informed would be unbelievable and seen for what they are: attempts to convince the other that one’s payoff to fighting is higher than remaining in the status quo. However, in complete information each player is fully informed about the other player’s payoffs, such that bluffing of this sort is not possible. Thus, there is no risk of conflict among groups when both rebel groups are satisfied and there do not exist informational asymmetries.

We now turn to the case where one rebel group, $R_2$, is satisfied but the other group, $R_1$, is dissatisfied. The satisfied rebel group, $R_2$, has two options in this case. First, it may either refuse the demands of the dissatisfied rebel group, and go to war with probability 1. If it undertakes this course of action, it receives a payoff of $1 - p - r_2$. Second, it may offer the minimum amount possible to convince $R_1$ not to go to war, thereby avoiding costly conflict.

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20This does not mean that a satisfied rebel group wouldn’t prefer to gain more of the good bargained over, but only that the payoff it receives in the status quo exceeds that of the payoff from electing the outside option. See Powell (1999, 93).
Any offer $x^*$ to $R_1$ when $R_1$ is dissatisfied must satisfy the condition that $x^* \geq p - r_1$. If the cost of fighting, $r_1$, is small, then the offer that $R_2$ makes will be roughly equal to $p$. Agreements when one side is satisfied and the other is dissatisfied with complete information will therefore reflect the underlying distribution of power between rebel groups.

In the unique subgame perfect equilibrium in a game of complete information, $R_2$ offers $R_1$ the value of $R_1$’s outside option; $R_2$ need only make $R_1$ indifferent between accepting its offer and pursuing its outside option in order to convince $R_1$ to agree to the bargain.\(^{21}\) In the complete information setup, such offers are always accepted, given that both players know $p$ and $1 - p$, each player’s likelihood of triumphing in a violent conflict. In equilibrium, then, $R_2$ will offer some division in the first round that will always be greater than $R_1$’s value for fighting, such that $R_1$ will accept that offer, thereby ending the game. In the complete information model, therefore, war is always averted.

### 4 A Model with Incomplete Information and the Outside Option

#### 4.1 The Role of Informational Asymmetries in Civil War

The previous subsection evaluated an alternating-offer bargaining model with complete information. Like prominent models of crisis bargaining, the model presented in this section is a bargaining game of incomplete information. The model is driven by the uncertainty that players possess about one another’s military capabilities; this setup may capture more accurately the complexities of social interactions, especially in the midst of violent conflict.\(^{22}\) However, our paper differs in a few ways from well-known models of bargaining with in-

\(^{21}\) A strategy profile is a subgame perfect equilibrium if it represents a Nash equilibrium of every subgame of the original game. See, for example, Morton (1999).

\(^{22}\) We begin to evaluate whether this is the case in Section 5.
complete information in international relations. First, in our model, bargaining does not automatically revert to war after a set number of rounds should a bargain fail to be struck (Morrow, 1989). We allow bargaining to continue until one side either accepts an offer or exercises his or her outside option. Second, in the civil war context, as compared with interstate crises, depending on the size of the territory in question, the geographical separation imposed by topological features, and other features “given” by nature, a rebel group’s commanders may witness first-hand the military capabilities of another rebel group with whom it is presently bargaining.  

This may seem to lessen the importance of private information about relative capabilities: when $R_2$ has seen $R_1$ battle with the government, it may be easier for $R_2$ to calculate the professionalism or heroism of $R_1$’s soldiers and, therefore, the likely probability of victory in any future conflict with $R_1$. Fearon (2004) puts forth an argument against such an information-revelation mechanism between a government and rebel group, arguing that: “it strains credulity to imagine that the parties to a war that has been going on for many years, and that looks very much the same from year to year, can hold any significant private information about their capabilities or resolve. Rather, after a few years of war, fighters on both sides of an insurgency typically develop accurate understandings of the other side’s capabilities, tactics, and resolve.”  

Yet we can draw two contrasts between the government/rebel group dyadic relationship that Fearon (2004) puts forth and the rebel group/rebel group dyad our paper seeks to explain. First, new rebel groups appear on the scene with some frequency, such that repeated interactions between groups may not always occur prior to the opening of bargaining between...
them.\footnote{This is especially true if the “new” group is not a splinter of a preexisting group.} Second, even if the two rebel groups have existed for some extended period of time, such that $R_2$ witnessed $R_1$ fighting the government, it may be difficult for $R_2$ to gauge $R_1$’s resolve in bargaining over the relevant issue at stake in the rebel group/rebel group interaction wholly based on $R_1$’s behavior in bargaining or fighting with the government. $R_1$ is likely to have different preferences over strategies and outcomes when bargaining with a rebel group than when bargaining or fighting with the government. This is an open empirical question: we ought not assume \textit{ex ante} that informational asymmetries about resolve and the distribution of capabilities are unimportant to rebel/rebel interactions.

Readers should note that for the sake of modeling simplicity, we have elided what has become the most important fulcrum for hypotheses about the role of information in civil war: what civilians know about rebel or government troop movements and how that knowledge incentivizes governments and rebels to deploy selective violence (Kalyvas, 2006). We leave for future work the task of incorporating such factors into a game-theoretic model of interactions between rebel groups.

### 4.2 Inter-Rebel Group Bargaining with Incomplete Information

When one rebel group is unsure of what it would take to appease its adversary, because it does not know its adversary’s value for conflict, it may be quite difficult to avoid violence. Why? Although an increasingly attractive offer by the satisfied rebel group to the dissatisfied group decreases the likelihood of reverting to conflict, “sweetening the deal” results in a lower payoff to the satisfied group should the dissatisfied group accept that offer.\footnote{Powell (1999) calls this the “risk-reward tradeoff.”}

To evaluate a model of incomplete information we need to formally introduce the fact that players do not know their adversary’s cost of fighting. $R_1$ is therefore unsure how costly conflict is for $R_2$; likewise, $R_2$ is unsure how costly conflict is for $R_1$.\footnote{The players do know their own costs for fighting.} We can assume
that each has beliefs about the distribution of types in the population. $R_1$ thinks that $R_2$’s
types are distributed uniformly on $[R_2, R_2]$, while $R_2$ thinks that $R_1$’s types are distributed
uniformly on $[R_1, R_1]$. These correspond to “least resolute” types that have high costs to
fighting, $\overline{R_1}$ and $\overline{R_2}$, and “most resolute” types, $\overline{R_1}$ and $\overline{R_2}$, that have low costs to fighting.
Neither player assumes that any particular value is more likely than any other: $R_1$ believes
he is as likely to be facing a “most resolute” rebel group, $\overline{R_2}$, as he is to face a “least resolute”
group, $\overline{R_2}$.

To capture the asymmetric setup above, we introduce a third type of player, the “poten-
tially dissatisfied” rebel group. Recall that a player is dissatisfied if they prefer fighting to the
status quo. Therefore, one type of $R_1$ is potentially dissatisfied, denoted $R'_1$, if $p - R'_1 > q$,
while $R_2$ is potentially dissatisfied, denoted $R'_2$, if $1 - p - R'_2 > 1 - q$. More informally, a
rebel group is potentially dissatisfied if there is some chance that they prefer fighting rather
than remaining in the status quo. $R_1$ is potentially dissatisfied if the most resolute type of
$R_1$, $\overline{R_1}$, is dissatisfied, while $R_2$ is potentially dissatisfied if $\overline{R_2}$ is dissatisfied. To restate this
in terms of $p$ and $q$, we can say that $R_1$ is potentially dissatisfied if $p - R'_1 > q$ while $R_2$ is
potentially dissatisfied if $1 - p - R'_2 > 1 - q$.

4.3 Equilibria with Incomplete Information

To obtain the equilibria, we again consider two cases: one when both rebel groups are satisfied
and one when one rebel group is potentially dissatisfied while the other is satisfied. In the
former case, as in the complete information model, neither state can credibly threaten to use
force, given that each is certain that the other’s cost of engaging in violence is too high. In
equilibrium, then, neither rebel group opts to use violence when both are satisfied.

When one rebel group, $R_1$, is potentially dissatisfied, the satisfied rebel group, $R_2$, makes
an offer that maximizes its expected payoff. What is this offer? $R_2$’s optimal offer depends
on how $R_1$ responds. If $R_1$ is actually dissatisfied, meaning if $p - r_1 > q$, then $R_1$ never
rejects an offer in order to make a counteroffer. Instead of counteroffering, the potentially dissatisfied group either accepts the satisfied group’s offer or exercises its outside option.

If $R_1$ is actually satisfied, then any offer to it by $R_2$ will be accepted. Because the satisfied group is unsure whether it is facing a satisfied or a dissatisfied rebel group, it will opt to offer some division of the pie that is greater than the status quo, as it wishes to avoid conflict. Given that $R_1$ is actually satisfied, $R_1$ will not opt to use violence, because, by definition, it prefers the status quo to fighting. As such, $R_1$ will always accept an offer or propose a counteroffer. However, if it were to make a counteroffer rather than accepting an offer, $R_1$ would be worse off, given that by making a counteroffer its adversary, $R_2$, would be able to infer that $R_1$ was satisfied. This is so because $R_1$ was unwilling to resort to force; with this knowledge in hand, that $R_1$ is satisfied, $R_2$ would be able to offer less than it would have had it been uncertain of whether it was facing a satisfied or dissatisfied adversary. Such a revelation of information would leave $R_2$ better off but leave $R_1$ worse off than had it accepted the initial offer. Therefore, $R_1$ will not counteroffer when it is satisfied.

What is the potentially dissatisfied group’s payoff to rejecting an offer, $x$? The dissatisfied group’s payoff to fighting is $(p - r_1) + \delta(p - r_1) + \delta^2(p - r_1) \cdots$. Its payoff to accepting whatever division, $x$, that $R_2$ proposes is $x + \delta x + \delta^2 x \cdots$. Therefore, $R_1$ attacks if $p - r_1 > x$. In other words, the probability that the dissatisfied group will reject an offer is the probability that $r_1$ is less than $p - x$. This is an important value for our analysis. $R_2$ knows that $r_1$ and $\bar{r}_1$ are uniformly distributed. Thus, if $p - x$ is halfway between $\bar{r}_1$ and $\underline{r}_1$, then the probability that $r_1$ is $< p - x$ equals one half. More broadly, the probability that $R_1$ rejects an offer, $x$ and attacks is $\left(\frac{(p-x)-r_1}{\bar{r}_1-\underline{r}_1}\right)$. Given that $R_1$ will always either accept $x$ or reject $x$ by attacking, the probability that $R_1$ accepts $x$ is $1 - \left(\frac{(p-x)-r_1}{\bar{r}_1-\underline{r}_1}\right)$.

What are $R_2$’s payoffs to offering $x$? If its offer is accepted, $R_2$ obtains a per-period

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28 Although we do not have the space to explore this here, we refer readers to Powell (1999, 102) where this is extensively discussed and mathematically proven.
payoff of $1 - x$, and a per-period payoff of $1 - p - r_2$ if it is rejected and $R_1$ attacks. Therefore, $R_2$'s expected payoff to offering $x$ is its total payoff should the offer of $x$ be accepted multiplied by the probability that offer will be accepted, plus the total payoff if the offer is rejected multiplied by the probability of rejection. More formally, $U_{R_2}(x) = \left( \sum_{t=0}^{\infty} \delta^t(1 - x) \right) \left[ 1 - \frac{p-x-r_2}{r_2-r_1} \right] + \left( \sum_{t=0}^{\infty} \delta^t(1 - p - r_2) \right) \left[ \frac{p-x-r_2}{r_2-r_1} \right].$

This is the paradox of the bargaining situation for $R_2$ when it considers how much to offer $R_1$, to stave off the possibility of conflict: the more $R_2$ offers, the lower its payoff should the offer be accepted; yet the more it offers, the greater likelihood that the offer will be accepted and war will be avoided. A higher offer consequently insulates $R_2$ from the possibility that it will end up fighting a war that it doesn’t want. Recall that $R_2$ does not want war because it is satisfied.

There exists an optimal offer, such that $x$ maximizes the payoff $U_{R_2}(x)$. To find that optimal offer we need to differentiate $U_{R_2}(x)$ with respect to $x$, or $\frac{dU_{R_2}(x)}{dx}$. After differentiating, we are left with $x^* = p + \frac{r_2-r_1}{r_2}.29$ If each group’s costs for fighting are not extremely large (or very different from one another), $x^*$ will be close in value to $p$, which suggests that, as in the model with complete information, any agreement between two rebel groups in an alternating-offer bargaining model with incomplete information and outside options will reflect the underlying distribution of power between the rebel groups. As $p$ grows, meaning as $R_1$ becomes more powerful, the optimal offer that $R_2$ makes also increases.

Table 4 below plots $R_2$’s optimal offers at various values of $p$, while holding $r_2$ constant at 0.3 and $r_1$ constant at 0.2. Table 5 demonstrates how $R_2$’s optimal offers change with different levels of $p$ when $R_2$’s cost for conflict are high (held at 0.8) and $r_1$ remains set at 0.2. As expected, Table 4 shows that increases in $p$ result in increasingly larger offers to $R_1$ to try to avoid conflict. Table 5 shows that when $R_2$’s cost for conflict, $r_2$, are high - we

$^{29}$As Powell (1999, Appendix 3) shows, $x^*$ must be $\geq q$ because $R_2$ is conceding some ground by making such an offer in the first place.
arbitrarily set \( r_2 \) at 0.8 - it will offer \( R_1 \) more to prevent it from attacking, relative to a world in which its costs for conflict are lower but the other parameter values are the same.

Table 4: Values of \( R_2 \)'s Optimal Offer \( x^* \)

<table>
<thead>
<tr>
<th>( x^* )</th>
<th>( p )</th>
<th>( r_2 )</th>
<th>( \bar{r}_1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.95</td>
<td>0.8</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>0.85</td>
<td>0.7</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>0.75</td>
<td>0.6</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>0.65</td>
<td>0.6</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>0.55</td>
<td>0.5</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>0.45</td>
<td>0.4</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>0.35</td>
<td>0.3</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>0.25</td>
<td>0.2</td>
<td>0.3</td>
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</tr>
<tr>
<td>0.15</td>
<td>0.1</td>
<td>0.3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Table 5: Values of \( R_2 \)'s Optimal Offer \( x^* \) When \( R_2 \)'s Costs for Conflict Are High

<table>
<thead>
<tr>
<th>( x^* )</th>
<th>( p )</th>
<th>( r_2 )</th>
<th>( \bar{r}_1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>0.7</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>0.9</td>
<td>0.6</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>0.8</td>
<td>0.5</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>0.7</td>
<td>0.4</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>0.6</td>
<td>0.3</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>0.5</td>
<td>0.2</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>0.4</td>
<td>0.1</td>
<td>0.8</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Following Powell (1999), the model presented here demonstrates that the likelihood of violent conflict between rebel groups is lowest when the status quo distribution of benefits reflects the existing distribution of power.

To summarize, if only \( R_1 \) has a positive expected payoff to inter-group fighting, then in equilibrium, \( R_2 \) makes its optimal take-it-or-leave-it offer which \( R_1 \) either accepts or rejects by fighting. The stronger \( R_1 \) is, the more likely bargaining is to break down, leading \( R_1 \) to resort to its outside option. Therefore, the probability of violent conflict in this model is smallest when the distribution expected from fighting approximates the status quo. Why is this? The probability of achieving victory through conflict diminishes when the distribution from
fighting is close to the status quo distribution, such that \( R_1 \) has little to gain from attacking \( R_2 \). On the other hand, when \( R_1 \) is much stronger than \( R_2 \), \( R_1 \) has a much higher expected value of pursuing its outside option. While intuitive, this is far from a trivial conclusion. We explore the implications of this finding for the literature on civil war in the following section.

5 Discussion

The results from the model presented above do not provide a “test” of Fjelde and Nilsson (n.d.) in any meaningful sense, but they do provide greater analytical purchase on how the distribution of capabilities between rebels is likely to influence the probability of conflict. They may also help make sense of their null finding regarding the “opportunistic” motives driving inter-rebel group conflict.

Most econometric models of civil wars implicitly assume an environment of complete information. In many instances this may be an assumption that is hard to justify. In thinking through the effect that control over gemstones and diamonds may have on rebel group violence, for example, the complete information game may have some interesting theoretical insights. Consider a civil war with two rebel groups, \( R_1 \) and \( R_2 \), where only \( R_1 \) controls diamonds or gemstones. If we assume that \( R_2 \) can observe that \( R_1 \) controls diamonds or gemstones, it is also plausible to assume that the \( R_2 \) would know something about the profit that \( R_1 \) could extract from controlling those resources. This profit would in turn influence both \( R_1 \)’s capabilities, since it would presumably allow it buy more weapons, to offer bribes to civilians in exchange for information and goods, to frontally attack the government, and so forth, and it would also affect any offer \( R_1 \) would make to \( R_2 \) when bargaining. This means that the situation resembles one of asymmetric information, rather than than one of fully incomplete information. Even though \( R_2 \) does not know everything about \( R_1 \)’s utility for war function, the group does have some knowledge about this utility, stemming from the
simple fact that $R_2$ knows $R_1$ can extract rents from its diamond mines. From this, $R_2$ can infer something about $R_1$’s broader capabilities and, thus, its utility of going to war. $R_1$, for its part, knows that $R_2$ holds this information. For $R_1$, therefore, this means that it has to take $R_2$’s knowledge into account when making its initial offer, increasing the chance that $R_2$ will accept the offer or at the very least decreasing the chance that $R_2$ would want to impose a settlement, given that violent conflict with a more powerful adversary is more costly. Observe, though, that this dynamic has nothing to do with the groups being “opportunistic” in the sense employed by Fjelde and Nilsson (n.d.), but rather represents strategic play in the common game-theoretic sense.

This points to a potentially more interesting general insight from the complete information model. The private information players hold is composed of elements - players’ types, costs of fighting, and strength - are not uniformly hard (or easy) for the other player to observe. Utility from war and resolve, for example, are quantities which are intrinsically difficult to directly observe, and players therefore have to rely on signals to learn anything about these parameters. Capabilities and costs of war, on the other hand, are in many cases more easily observable. Utility, cost, resolve and capabilities are correlated and thus depend to some degree on one other. By knowing something about one of these quantities, then, $R_2$ may be well positioned to make inferences about the other quantities as well. In essence, then, diamonds and gemstones, and potentially other facets of the war economy that directly affect a rebel group’s ability to wage war and are easily observable by all players in the game, turn out to be rather powerful information-revelation mechanisms. In other words, such factors turn an incomplete information game into a game of asymmetric or complete information.

Unfortunately, such a recognition may make it even harder to develop precise predictions about rebel group behavior. On the one hand, the information revealed may increase $R_2$’s utility for war, depending on the status quo distribution of goods and $R_2$’s type (related to its cost for going to war), or it might decrease it, since $R_2$’s utility for war always will be a
function of, among other things, its probability of winning. Yet such logic does explain why
the effects of diamonds and gemstones, and other natural resources in general, are contested
in the literature, such that different scholars have divergent explanations about the likely
effects of each on conflict onset, duration, and termination (Ross, 2004a; Humphreys, 2005).
As far as prediction on conflict onset is concerned, our model implies essentially a non-
significant effect in the aggregate.

The upshot of our model, as in the international context in Powell (1996), is that the
disparity between the status quo distribution and what could be achieved through violence
is what matters in prompting violence. One way of thinking about this distribution is to
consider the players “continuation values” (McCarty and Meirowitz, 2007, 285-87). Both R1
and R2 get some utility from continuing the bargaining. In many cases this is assumed to
be of equal value to the two players. Consider instead a situation where the players get d1
and d2 in every period until they reach an agreement or one of them exercises the outside
option. The values of d1 and d2 are constrained to be > 1. If they reach an agreement each
gets some payoff (x1,x2). If R1 makes an offer, then, R2’s payoff from accepting that offer is
δx2, while the value from rejecting but continuing the bargaining is d2 in this round plus the
continuation value, cv2, for every subsequent round. In every round, then, R2 will continue
bargaining if cv2 > δd2. In other words R1’s price of continuing the bargaining increases
as the group’s utility for breaking the bargaining increases, and decreases as R2’s price for
continuing the bargaining decreases (McCarty and Meirowitz, 2007, 286).

Situations where d1 ≠ d2 are those with an uneven status quo distribution, in that what
each group receives from continued bargaining is different. Empirically, this could represent
a situation where one of the players is more impatient than the other for a new status quo
given differing rewards to remaining in the bargaining stage.\footnote{In an everyday sense, this is similar to the degree to which one of the actors is dissatisfied. We say “in an everyday sense” since we defined dissatisfied types as those that strictly prefer imposing a settlement to a bargained solution, whereas a situation in which d1 ≠ d2 captures the weaker notion of dissatisfaction, in

27
the status quo distribution in statistical models, to be able to test the implications of the
game-theoretic model proposed throughout as well as those extensions to the model that we
propose below?

As is clear from the prior discussion, testing the effect of the status quo distribution
on the probability of inter-rebel group conflict is intrinsically complicated. For one, this is
not a directly observable and is potentially an unquantifiable quantity. As discussed above,
continuation payoffs and disagreement values proxy this power distribution; one avenue is
therefore to attempt to proxy these, in turn. The continuation value of each player is the
present value of the equilibrium pay-off for each round for every player, while the disagree-
ment value is the value for breaking the status quo for each player. First of all, this implies
that the risk of conflict onset is dyadic in nature. This recommends against statistically test-
ing the correlates of inter-rebel group violence using a monadic research design, as Fjelde
and Nilsson (n.d.) do. According to the model, therefore we would be more likely to see non
state conflict onset in dyads where: 1. either player has made significant gains against the
government, because the price of continuing the bargaining will increase rapidly for such
dyads, since the pie over which rebels are bargaining has increased; and 2. either player has
been significantly weakened by the government or a third rebel group when compared with
earlier bargaining rounds. The latter would raise the price of satisfying the player that was
unharmed, given that the new distribution of power between players differs dramatically
from the pre-bargaining distribution of power.

The parsimony of the model we have presented, combined with the difficulty of empirically
unobserving of some of the variables thought to influence the dependent variable, makes it
difficult to pin down testable implications. On the one hand, parsimony is a strength. It
makes it possible to focus on one central issue, the status quo distribution, and how that
interacts with costs of conflict and the probability of conflict initiation. On the other hand,
which continuing to bargain is worse for one of the players than the other.
hypotheses such as those advanced here do not lend themselves easily to empirical testing. One way forward would be to extend the model, both to improve our ability to find more tractable implications to test and to improve the model’s empirical validity, to capture more of the complexity of the social world. For example, we might consider including three players - adding the government to the mix - to better model the central dilemma of resource allocation that motivates this paper. Oftentimes rebels exist in environments of more than three rebel groups, which may affect their willingness to engage in bargaining and to use violence to impose a settlement. Another avenue of future inquiry includes focusing more centrally on the commitment problem that would plague any inter-rebel group agreement, such that fighting appears the only option.31

The possibility of adding additional players to the game should also prompt a consideration of the costs of failing to animate our model (or any model) with heterogeneous actors: rebel groups are not monolithic entities and display varying forms of discipline, distinct command-and-control structures, recruitment techniques, fighting styles, and so forth (Weinstein, 2007; Humphreys and Weinstein, 2008b; Staniland, Forthcoming). These dynamics could be modeled, at least simplistically. For example, we could stipulate that some rebel commanders discipline “rogue” rebels who engage in provocative actions against other rebel groups while others do not, to see how skirmishes affect the probability of all-out conflict among groups.32

Some narrow changes to our model may likewise produce compellingly novel results, with assumptions that more closely resemble empirical realities. In our model, for example, we assume that \( p \) and \( 1 - p \) are consistent across time, i.e. that no power shifts occur across bargaining periods.Allowing this parameter to fluctuate across time would make

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31 Focusing too narrowly on the commitment problem has its own risks: it does not explain why we see cooperation emerge in some cases, “mutual tolerance” in others, and outright conflict in still others.

32 This may look something like the model in Fearon and Laitin (1996), in which individuals can be punished by their own group for defecting against those in another group. It should be noted that such a setup may be better modeled using agent-based models. See, for example, Epstein (2002).
the model both more dynamic and realistic. Introducing different discount rates for each player would also allow us to see how the probability of conflict among groups varies absent simplifying modeling assumptions. We should expect that large asymmetries in the discount rate - potentially due to government pressure exerted on one group rather than another - could have large consequences for the prospect of reaching a bargained agreement or resorting to violence.

Bargaining games have traditionally been used in the literature on interstate conflict. The discussion in this paper suggests that there may be significant overlaps between the kinds of strategic dilemmas facing rebel groups and those facing states in an anarchic environment. A full consideration of the connection between the two is beyond the scope of this paper, but such a line of inquiry resonates with recent attempts to break down barriers between the study of civil war and that of interstate war (Lake, 2003; Cunningham and Lemke, N.d.) and calls out for greater attention.

Finally, we have rendered civilians passive observers to the bargaining process between rebel groups. There are good reasons to think that civilians are active participants in the production of violence, given that they provide critical information to government forces and rebel groups that is then used to selectively target others (Kalyvas, 2006; Balcells, 2010). While incorporating civilian agency into a formal model of this sort would be extremely challenging, it is likely to pay dividends in the form of greater consonance between a formal model and the explanatory power of that model. Having discussed potential extensions to our model, the next section concludes.
6 Conclusion

The causes of inter-rebel group violence demand explanation.\textsuperscript{33} Such violence poses a puzzle for theorists of civil war, given that there exists significant variation in patterns of cooperation and conflict among distinct rebel group across time and space, and given that rebels would seem to benefit from coming together to fight against the one party, the government, that could offer accommodations rebels purportedly seek. Inter-rebel group violence also presents a challenge to third-party actors and international organizations that are so frequently called upon to change belligerents’ incentives by deploying peacekeeping or brokering civil war-ending agreements (Fortna, 2008; Howard, 2008). The complex constellation of belligerents in civil war, the distribution of capabilities they bring to the table, and their ability and willingness to bargain with one another rather than engage in violence have profound consequences for civilians and a state’s long-term prospects for peace.

In this paper we presented a game-theoretic model that has allowed us to begin to generate testable implications about how the status quo distribution, players’ costs of resorting to conflict, and other factors affect each group’s willingness to go to war rather than strike a negotiated bargain over access to crucial resources, markets, and civilians. As the previous section highlighted, and as with any formal model, we have simplified empirical reality substantially, and have not incorporated into our model many relevant features of the strategic environment that are likely to affect rebel groups’ decisions to fight one another.

Our model argues against neatly dividing rebel behavior into “opportunistic” and “strategic” motives (Fjelde and Nilsson, n.d.). Rebels often have strong incentives to bargain hard over resources that are crucial to their survival and/or those that are necessary for their ultimate success in achieving stated goals. Like states in the international system, rebel groups possess private information about their capabilities and have incentives to misrepresent that

\textsuperscript{33}The consequences of inter-rebel group violence also demand explanation, but that remains a task for future study.
information. In seeking to obtain the best possible deal, bargaining over the distribution of goods may lead to violent conflict. In equilibrium in the game of incomplete information, we saw how a satisfied group might present a “lowball” offer to a potentially dissatisfied state, which may be rejected by the latter, resulting in violent conflict. Such bargaining is “strategic,” in that it helps rebel groups achieve their long-run goals, but such bargaining is also “opportunistic” in the sense that exploitation of resources is necessary (but not sufficient) to ensure survival and to battle the government. While conflict between rebel groups may make it more difficult for rebel groups to match the military might of their government adversaries, given that resources for such battles will necessarily be diverted away from the fight against the government, securing the goods over which rebel groups bargain is, under certain circumstances, well worth the costs of conflict. Our model shows that this is particularly so when the status quo distribution of goods is not commensurate with the military balance of power between groups.

The work that we have undertaken here is highly preliminary: future research on rebel group behavior should rigorously and deductively probe the causes and consequences of inter-rebel group behavior, whether modeled as bargaining situations with informational asymmetries, simple repeated games with commitment problems (as in the repeated Prisoner’s Dilemma), or more complex dynamic programming models. The empirical implications of those formal models may then be tested using existing quantitative data, whether cross-national or sub-national, or careful qualitative process-tracing of sets of cases. The emerging literature on interactions among rebel groups in civil war has only just begun to allow researchers to draw contingent generalizations about the conditions under which rebel groups will bargain among themselves, what those struck bargains might look like, and when and why, should bargaining fail, rebels might choose to deploy deadly force against one another to achieve their desired ends.
References


Furtado, Christina. 2007. Inter-Rebel Group Dynamics: Cooperation or Competition, the Case of South Asia PhD thesis University of Illinois at Urbana-Champaign.


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