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Bargaining Between Rebel Groups and the Outside Option of Violence

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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-party civil wars choose to fight one another? This article 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.

Keywords bargaining, civil war, multiparty civil wars, non-state actors, rebel groups

Introduction

The First Liberian Civil War, fought between 1989 and 1995, resulted in approximately 200,000 fatalities from a total population of fewer than three million.¹ In the first part of the conflict, rebel groups such as the National Patriotic Front of Liberia (NPFL) and the United Liberation Movement of Liberia for Democracy (ULIMO)

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existed alongside one another without incident while fighting the government and preying upon civilians. Over time, however, several of these groups split into multiple splinter groups. ULIMO split into ULIMO-K and ULIMO-J, which existed peacefully side by side until fighting erupted between them in March of 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.²

The dynamics of the First Liberian Civil War suggest a puzzle: although military co-operation 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. Rebel organizations “often spend as much time fighting one another as the government.”³ This may be particularly pronounced when armed groups are young: “particularly in the early stages of their existence, terrorist organizations purporting to fight for a common cause frequently attack each other more than their mutually declared enemy.”⁴ Inter-rebel violence has taken place in conflicts ranging from Colombia, where two leftist insurgent groups, the FARC and the ELN, frequently clash with one another despite similar ideological outlooks,⁵ to Afghanistan, where the mujahadeen “shocked the world and their staunchest supporters by engaging in fratricidal warfare, with many organizations reserving their most aggressive behavior for their ideological kin.”⁶ In the Democratic Republic of the Congo, Burundi, and Myanmar, rebel groups have fought one another for the loyalty of civilians, control over lootable natural resources, and access to strategically important territory.⁷ Conflicts between rebels frequently move beyond mere skirmishes between undisciplined foot soldiers: military confrontations between the NPFL and the ULIMO between 1991 and 1992 resulted in up to 2,000 fatalities.⁸ In South Africa, the African National Congress and the Inkatha Freedom Party’s armed encounters produced approximately 600 fatalities in 1990 alone.⁹

Why do rebel groups in multi-party 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 study 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. Given that control over these goods positions rebels to obtain concessions from the government or to militarily defeat the government outright, their acquisition is highly desirable. 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 article makes two 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.

In addition to contributing to the scholarly literature on civil war, these conclusions have broad policy relevance: violence between rebel groups has dire consequences for civilians. The international community, however, has typically focused on abuse of civilians wrought by violence between one government and a rebel group. 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 damage done to innocent civilians.¹⁰

This article 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 with an outside option, using 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.

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.¹¹ The only existing systematic study of inter-rebel group violence of which we are aware is by Hanne Fjelde and Desirée Nilsson.¹² It is useful to review here the results of that article, 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 from the years 1989–2008,¹³ Fjelde and Nilsson 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: “inter-rebel conflict is more likely when the rebel group fights in an area with drug cultivation, when the group is in control of territory beyond government reach, when the group is either militarily strong or weak in relation to other rebels, and where state authority is weak.”¹⁴

A small but growing literature on inter-rebel group cooperation and alliances in civil wars has also emerged, but such studies explicitly forgo explanations of conflict among rebel groups to focus on the conditions under which cooperation is likely to emerge. We briefly review that literature here. Navin Bapat and Kanisha Bond 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.”¹⁵ 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, Kanisha Bond, 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.¹⁶ Fotini Christia 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.¹⁷ However, shifting balances among participants result in “a process of constant defection, alliance reconfiguration, and group fractionalization.”¹⁸ Christia uses careful case studies of Bosnia and Afghanistan, including Geographical Information System (GIS) analysis, to support her claims. Christina Furtado 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.¹⁹ 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 co-operative agreements with other groups that are able to make 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. David Cunningham 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.²⁰ Desirée Nilsson disagrees, and argues that although parties excluded from peace agreements may 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.²¹

A related and younger literature on rebel group splintering deals with the dynamics of multi-party civil wars, with relevance to the puzzle addressed in this article. Stig Jarle Hansen studies the conflict in Somalia and shows how the failure to redistribute funds within a rebel group leads to splintering.²² Michael Findley and Peter Rudloff 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 above), and that such wars often end in negotiated agreements rather than decisive victory.²³ Both Claire Metelits and Reed Wood 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.²⁴

Kathleen Gallagher Cunningham, Kristin M. Bakke, and Lee Seymour 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.”²⁵ In another article, those same authors provide the most rigorous attempt to date to conceptualize and delimit the concept of rebel group fragmentation.²⁶ In a 2011 article, Kathleen Gallagher Cunningham examines whether internally divided separatist movements are more or less likely to be accommodated by governments.²⁷ 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, Ethan Bueno de Mesquita argues that “given 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.”²⁸ Paul Staniland 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.”²⁹ When an armed group decides to consolidate and maintain hegemony over a rebel movement, it may engage in intense violence to eliminate rivals.”³⁰ Finally, Andrew Kydd and Barbara Walter argue that groups may use an “outbidding” strategy (which may include attacks against other armed groups as well as civilians) as a way to signal to the public that they have “greater resolve to fight the enemy than rival groups, and therefore are worthy of support.”³¹

An armed group might choose to undermine its political campaign by engaging in violence with other like-minded organizations if group survival is more important than achieving organizational objectives.³² Drawing on insights from organization theory,³³ scholarship on terrorist campaigns and insurgent struggles for territorial control has shown that armed organizations are frequently most interested in “perpetuating their existence—even when doing so undermines their official goals—whenever members attach utmost importance to the social benefits of the organization.”³⁴ If social solidarity is a principal motivating factor driving individuals’ participation in high-risk collective action, then intra-movement violence may usefully be explained as an attempt to destroy other groups that compete for recruits. While the desire for social solidarity helps explain why groups privilege organizational survival, it is unable to predict the rich variation we see in violence and peaceful coexistence among armed groups across conflicts, and among armed groups within individual conflicts. The theoretical framework that we provide here is capable of doing both.

Many studies have focused on within-rebel group relationships. Scott Gates draws on a principal-agent model to study how the organizational structure of a rebel group affects recruitment and retention.³⁵ He shows that especially three factors—geography, ethnicity and ideology—shape how groups recruit and retain members. Jeremy Weinstein argues that the resource endowment of a group—specifically whether the group has access to minerals—affects how violent toward civilians the group is.³⁶ Macartan Humphreys and Jeremy Weinstein find that particularly violent groups are characterized by an inability to police members of the group, due to ethnic fragmentation.³⁷ Such groups must rely on material incentives to keep members in line. In an in-depth study of groups engaged in the conflict in Afghanistan, Abdulkader H. Sinno finds that more centralized groups have generally been much more effective at war.³⁸ Nicholai Lidow argues that leaders exert control over their troops—and therefore are able to control abuse of civilians—when they can offer cash payments and credible promises of future rewards.³⁹ When they are unable to do so, leaders must allow troops to loot, which results in civilian abuse. With the exception of the Gates article,⁴⁰ these intra rebel-group studies remain silent on the relationship between groups.

Finally, realist approaches to interstate and intrastate conflict can potentially shed light on the causes of inter-rebel group violence. In a realist world, security is scarce and self-help the only alternative. The security dilemma, in particular, predicts that attempts to improve one’s own security can have the opposite effect, leading to spirals of arming and eventual conflict.⁴¹ The security dilemma is thought to be acute when offensive and defensive weapons are indistinguishable, such that states are unable to signal that defensive arming poses no offensive threat, and when military technology favors offensive rather than defensive operations.⁴² The first condition

holds in almost all cases of irregular war—which are characterized by light arms and highly mobile insurgent forces—while the second condition is likely to be less important in such conflicts, given that insurgents' military technology is rudimentary compared to that of states, and is typically uniform across armed organizations.

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.

Theory and the Model

This section begins by describing the strategic dilemma that rebel groups face in multi-party civil wars.⁴³ 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.

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

At first blush, it seems that rebels in multi-party 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 difficult road through inter-group disagreements.⁴⁴ 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?

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.⁴⁵ These resources may mean the difference between group extinction, just barely surviving in a difficult environment, or profiting handsomely from the wartime economy.⁴⁶ 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; these are summarized in Table 1.

Support from the civilian population is critical to insurgent groups,⁴⁷ 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.⁴⁸ Rebels obtain civilian support through two principal methods. First, they 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

Table 1. Rebel group requisites

Requisites	Advantages requisites confer	How rebels obtain requisites
Civilian support	Recruits	Uses of force
	Information on government activities	Threats of force
	Supplies	Goods provision
	Remain hidden from government	
Recruits/ manpower	Militarily challenge government	Promise of material benefits
	Intimidate civilians into cooperation	Promise of desired social outcomes
Military technology	Compete with other rebel groups	Forced recruitment
	Challenge government	Raids or battlefield seizures
	Capture strategic territory	Arms deals
	Intimidate civilians into cooperation	Military aid from patron states
Revenue	Reduce number of recruits needed	
	Purchase civilian support	Rents from civilians
	Incentivize new recruits	Diaspora groups
	Buy military materiel	Natural resource wealth

quasi-state-like functions, or private “selective incentives” like bribes.⁴⁹ Second, rebels can gain popular support by threatening or applying selective violence against civilians for non-cooperation, thereby eliciting defection against the government.⁵⁰

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 cooperation. Without a physical presence in civilian areas, rebels will be unable to make civilians feel sufficiently secure, rendering 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,⁵¹ offering material incentives immediately to those who join and/or promising such goods in the future,⁵² 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.⁵³

The third requisite for rebel group survival is military technology and materiel. Rebels fighting an insurgency 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.⁵⁴ 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.⁵⁵

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 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,⁵⁶ building relationships with foreign patron states,⁵⁷ exploiting natural resource wealth,⁵⁸ 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.

*Our principal assumption driving this article is that rebel groups bargain over access to and control over the above-mentioned resources.*⁵⁹ 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 game, each player makes alternating offers until one accepts what is offered by the other.⁶⁰ 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, 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.”⁶¹ The subsection that follows begins with an alternating-offer bargaining game of *complete* information and 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. A notational key for the model appears in Table 2.

Table 2. Notational key

Symbol	Meaning
R_1	Rebel group 1
δ	Discount factor
q	R_1 's per round share
p	Probability of R_1 victory in conflict
r_1	Cost to R_1 of using violence
\bar{r}_1	“Least resolute” type of R_1
\underline{r}_1	“Most resolute” type of R_1
R_2	Rebel group 2
b	Total per round benefits until agreement/conflict
$b - q$	R_2 's per round share
$1 - p$	Probability of R_2 victory in conflict
r_2	Cost to R_2 of using violence
\bar{r}_2	“Least resolute” type of R_2
\underline{r}_2	“Most resolute” type of R_2

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.⁶² 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 R_1 's per round share of b , and $b - q$ R_2 's per round share of b . Assume that each player discounts the future, such that the discount factor for each is δ , and that $0 < \delta < 1$. In other words, delay is costly.⁶³

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 violence. 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").⁶⁴

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 share of b , is, from the initial round of play until the t th round of play, $(1 - \delta^t)U_{R_1}(q) + \delta^t U_{R_1}(x)$, where $U'_{R_1} > 0$ and $U''_{R_1} \leq 0$. Likewise, R_2 's utility to that agreement is $(1 - \delta^t)U_{R_2}(b - q) + \delta^t U_{R_2}(y)$, 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 y at time t is the payoff to controlling $1 - q$ until time t plus its payoff to having $1 - y$ 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 .⁶⁵ We assume that war can end in only one of two ways: with victory for the initiator or with victory for the non-initiator.⁶⁶ 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 $\delta^w(1 - r_1) + \delta^{w+1}(1 - r_1) + \delta^{w+2}(1 - r_1) + \dots$. The first term is the discounted value of the per-period benefit R_1 receives during period w , while the second term is 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 $\delta^w(-r_1) + \delta^{w+1}(-r_1) + \delta^{w+2}(-r_1) + \dots$. 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

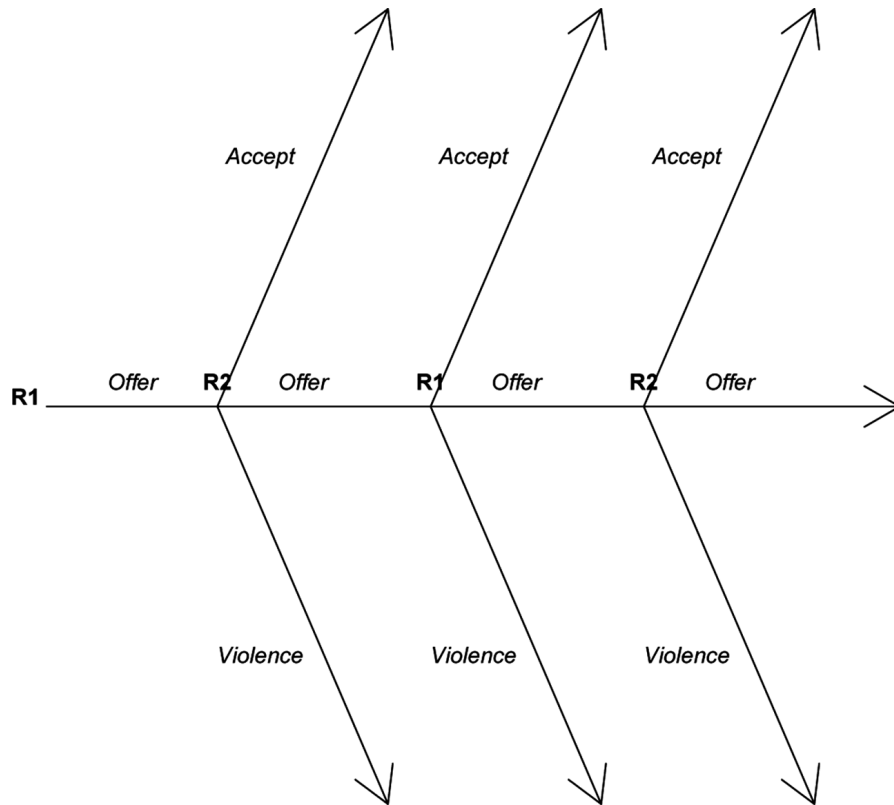


Figure 1. A model of the alternating-offer rebel bargaining game.

multiplied by its probability of winning, plus its payoff to losing multiplied by its probability of losing.

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. 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 . 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 $p - r_1 > q$. 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.⁶⁷ 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 Robert Powell’s model of international bargaining,⁶⁸ 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 sub-state level among violent non-state actors. We explore this in the discussion section below.

Equilibrium With Complete Information

To explore the equilibrium with complete information, we need to consider two cases: when both groups are satisfied, and when one group 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.⁶⁹ Any threats to use force by either rebel group when both are satisfied and fully informed would not be credible and would be seen for what they are: false attempts to convince the other that one's payoff to fighting is higher than remaining in the status quo. However, with 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 informational asymmetries do not exist.

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 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. 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 of perfect equilibrium, 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.⁷⁰ 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, 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.

A Model With Incomplete Information With an Outside Option

The Role of Informational Asymmetries in Civil War

Like prominent models of crisis bargaining in international relations, 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.⁷¹ However, our article differs in a few ways from well-known models of bargaining with incomplete 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.⁷² 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, a rebel group's commanders may witness first-hand the military capabilities of another rebel group with whom it is presently bargaining.⁷³

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 . James Fearon 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."⁷⁴

Yet we can draw two contrasts between the government/rebel group dyadic relationship that Fearon studies,⁷⁵ and the rebel group/rebel group dyadic relationship we examine. 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. 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 *ex ante* that informational asymmetries about resolve and the distribution of capabilities are unimportant to rebel/rebel interactions.

More specifically, it is worthwhile to consider how the results we generate might change if we modify the model from a game of two-sided incomplete information to one in which one of the players (say, R_1) has complete information over a rival's distribution of capabilities ($1 - p$) and the other player's cost of using violence (r_2). A simple thought experiment suffices to demonstrate how the model might generate different equilibria and comparative statics. Consider the appearance of a new rebel group, funded by a patron state. Such occurrences were particularly common during the Cold War, in the context of superpower competition,⁷⁶ and persist to the present.⁷⁷ Members of the new group (R_1) have observed the conflict from the sidelines for some time, including the existing group's resolve and the cost it assigns to using violence.⁷⁸ Given complete information over R_2 's cost of using violence, R_1 does not face a tradeoff between making an attractive offer to R_2 , who would have accepted a lower offer due to a low tolerance for violence, and offering an unattractive offer that would push both into conflict. We discuss this tradeoff in much greater detail below.

Readers should note that for the sake of modeling simplicity, we have elided what has become an 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.⁷⁹ We leave for future work the task of incorporating such factors into a game-theoretic model of interactions between rebel groups.

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.⁸⁰

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 .⁸¹ 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 $[\underline{R}_2, \overline{R}_2]$, while R_2 thinks that R_1 's types are distributed uniformly on $[\underline{R}_1, \overline{R}_1]$. These correspond to "least resolute" types that have high costs to fighting, \overline{R}_1 and \overline{R}_2 , and "most resolute" types, \underline{R}_1 and \underline{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, \underline{R}_2 , as he is to be facing "least resolute" group, \overline{R}_2 .

To capture the asymmetric setup above, we introduce a third type of player, the "potentially dissatisfied" rebel group. Recall that a player is dissatisfied if it prefers fighting to the status quo. Therefore, one type of R_1 is potentially dissatisfied, denoted R'_1 , if $p - R'_1 > q$, where R'_1 is the cost of violence for a potentially dissatisfied group. R_2 is potentially dissatisfied, denoted R'_2 , if $1 - p - R'_2 > 1 - q$, where R'_2 is the cost of violence for a potentially dissatisfied group. Informally, a rebel group is potentially dissatisfied if there is some chance that it prefers fighting rather than remaining in the status quo. R_1 is potentially dissatisfied if the most resolute type of R_1 , \underline{R}_1 , is dissatisfied, while R_2 is potentially dissatisfied if \underline{R}_2 is dissatisfied. To restate this in terms of p and q , we can say that R_1 is potentially dissatisfied if $p - \underline{R}_1 > q$ while R_2 is potentially dissatisfied if $1 - p - \underline{R}_2 > 1 - q$.

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 group 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 counter-offer.⁸² Instead of counter-offering, 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 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 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; knowing 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,

$$(p - r_1) + \delta(p - r_1) + \delta^2(p - r_1) \dots$$

Its payoff to accepting whatever division, x , that R_2 proposes is,

$$x + \delta x + \delta^2 x \dots$$

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 \underline{r}_1 and \bar{r}_1 are uniformly distributed. Thus, if $p - x$ is halfway between \underline{r}_1 and \bar{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 equal to,

$$\left(\frac{(p - x) - \underline{r}_1}{\bar{r}_1 - \underline{r}_1} \right).$$

Given that R_1 will always either accept x or reject x by attacking, the probability that R_1 accepts x is,

$$1 - \left(\frac{(p - x) - \underline{r}_1}{\bar{r}_1 - \underline{r}_1} \right).$$

What are R_2 's payoffs to offering x ? If its offer is accepted, R_2 obtains a per-period 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 the offer will be accepted, plus the total payoff if the offer is rejected multiplied by the probability of rejection. More formally,

$$U_{R_2}(x) = \left(\sum_{t=0}^{\infty} \delta^t (1 - x) \right) \left[1 - \frac{p - x - \underline{r}_2}{\bar{r}_2 - \underline{r}_2} \right] + \left(\sum_{t=0}^{\infty} \delta^t (1 - p - r_2) \right) \left[\frac{p - x - \underline{r}_2}{\bar{r}_2 - \underline{r}_2} \right].$$

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 $dU_{R_2}(x)/dx$. After differentiating, we are left with,

$$x^* = p + \frac{r_2 - \bar{r}_1}{2}.$$

Powell shows that x^* must be $\geq q$ because R_2 is conceding some ground by making such an offer in the first place.⁸³ 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 3 below plots R_2 's optimal offers at various values of p , while holding r_2 constant at 0.3 and \bar{r}_1 constant at 0.2. Table 4 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)

Table 3. Values of R_2 's optimal offer x^*

x^*	p	r_2	\bar{r}_1
0.95	0.8	0.3	0.2
0.85	0.7	0.3	0.2
0.75	0.6	0.3	0.2
0.65	0.6	0.3	0.2
0.55	0.5	0.3	0.2
0.45	0.4	0.3	0.2
0.35	0.3	0.3	0.2
0.25	0.2	0.3	0.2
0.15	0.1	0.3	0.2

Table 4. Values of R_2 's optimal offer x^* when R_2 's costs for conflict are high

x^*	p	r_2	\bar{r}_1
1.0	0.7	0.8	0.2
0.9	0.6	0.8	0.2
0.8	0.5	0.8	0.2
0.7	0.4	0.8	0.2
0.6	0.3	0.8	0.2
0.5	0.2	0.8	0.2
0.4	0.1	0.8	0.2

and \bar{r}_1 remains set at 0.2. As expected, Table 3 shows that increases in p result in increasingly larger offers to R_1 to try to avoid conflict. Table 4 shows that when R_2 's cost for conflict, r_2 , are high—we 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.

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.⁸⁴

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 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.

Discussion

The results from the model provide greater analytical purchase on how the distribution of capabilities between rebels is likely to influence the probability of conflict. Most econometric models of civil wars implicitly assume an environment of complete information, which 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 to 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 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 access to resources. 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.

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—that are not uniformly

hard or easy for the other player to observe. Utility from war and resolve, for example, are quantities that are intrinsically difficult to directly observe, and players therefore have to rely on signals to learn 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. Such factors turn an incomplete information game into a game of asymmetric or complete information.

Unfortunately, this makes 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, 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. Such a logic explains 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.⁸⁵ 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,⁸⁶ is that both R_1 and R_2 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 player R_1 gets d_1 and player R_2 gets d_2 in every period until they reach an agreement or one of them exercises the outside option. The values of d_1 and d_2 are constrained to be <1 . If they reach an agreement, each gets some payoff (x, y) . If R_1 makes an offer, then, R_2 's payoff from accepting that offer is δy , while the value from rejecting but continuing the bargaining is δd_2 in this round plus the discounted continuation value, $\delta d_2, \delta^2 \dots$ in subsequent rounds. In every round R_2 will continue bargaining if the discounted continuation value is greater than the discounted payoff from reaching an agreement. Situations where $d_1 \neq d_2$ are those where one of the players receives relatively greater rewards for continuing bargaining. An example of such a situation would be one with an exogenous and rapid change in the distribution of power, such as a shipment of arms from a foreign patron that changes a group's capabilities and therefore its willingness to bargain.

The parsimony of the model we have presented, combined with the difficulty of observing 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, hypotheses such as those advanced here do not lend themselves easily to empirical testing. One way forward would be to extend the model to improve our ability to find more tractable implications, to increase the model's empirical validity, and 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 article. Oftentimes rebels exist in environments of more than three rebel groups, or multiple

rebel groups and state-aligned militias, which may affect groups' willingness to both engage in bargaining and to use violence in order 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 viable option.⁸⁷

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. 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.⁸⁸

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 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 article 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 article, 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,⁸⁹ 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.⁹⁰ While incorporating civilian agency into a formal model of this sort would be challenging, it is likely to pay dividends in the form of greater consonance between a formal model and the explanatory power of that model.

Conclusion

The causes of inter-rebel group violence demand explanation. 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 groups across time and space, and given that rebels would seem to benefit from coming together to fight against the government, the one party that could offer accommodations that 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.⁹¹ 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 article 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 use violence 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.

Rebels often have strong incentives to bargain hard over resources that are crucial to their survival and 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 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. Conflict between rebel groups diverts resources away from the fight against the government, but 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 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 quantitative data, whether cross-national or sub-national, or through careful qualitative process-tracing on sets of cases. The emerging literature has only just begun to generate contingent generalizations about when rebel groups will bargain among themselves, what those struck bargains might look like, and when and why—should bargaining fail—rebels might choose to use violence against other rebel groups to achieve their desired ends.

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Notes

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4. Max Abrahms, "What Terrorists Really Want: Terrorist Motives and Counterterrorism Strategy," *International Security* 32, no. 4 (2008): 90.
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6. Abdulkader H. Sinno, *Organizations at War in Afghanistan and Beyond* (Ithaca, NY: Cornell University Press, 2008), 3.
7. Hanne Fjelde and Desirée Nilsson, "Rebels Against Rebels: Explaining Violence Between Rebel Groups," *Journal of Conflict Resolution* 56, no. 4 (2012): 604–628.
8. Kristine Eck, Joakim Kreutz, and Ralph Sundberg, *Introducing the UCDP Non-State Conflict Dataset* (Uppsala: Uppsala University, 2010).
9. *Ibid.*
10. Following Stathis N. Kalyvas, *The Logic of Violence in Civil War* (Cambridge: Cambridge University Press, 2006), we might also consider how civilians may be active participants in the production of violence among rebel groups.
11. The literature is vast. See, for example, Benjamin A. Valentino, Paul K. Huth, and Dylan Balch-Lindsay, "Draining the Sea: Mass Killing, Genocide, and Guerilla Warfare" (paper presented at the annual meeting of the American Political Science Association, San Francisco, CA, 2001); Elisabeth Jean Wood, *Insurgent Collective Action and Civil War in El Salvador*, Cambridge Studies in Comparative Politics (Cambridge and New York: Cambridge University Press, 2003); Kalyvas, *The Logic of Violence in Civil War* (See note 10 above); Stathis N. Kalyvas and Matthew A. Kocher, "How 'Free' Is Free Riding in Civil Wars? Violence, Insurgency, and the Collective Action Problem," *World Politics* 59, no. 2 (2007): 177–216; Jeremy M. Weinstein, *Inside Rebellion: The Politics of Insurgent Violence*, Cambridge Studies in Comparative Politics (Cambridge and New York: Cambridge University Press, 2007); Patrick Johnston, "The Geography of Insurgent Organization and its Consequences for Civil Wars: Evidence from Liberia and Sierra Leone," *Security Studies* 17, no. 1 (2008): 107–137; Claire Metelits, "The Consequences of Rivalry: Explaining Insurgent Violence Using Fuzzy Sets," *Political Research Quarterly* 62, no. 4 (2008): 673–684; Macarthan Humphreys and Jeremy M. Weinstein, "Who Fights? The Determinants of Participation in Civil War," *American Journal of Political Science* 52, no. 2 (2008): 436–455; Claire Metelits, *Inside Insurgency: Violence, Civilians, and Revolutionary Group Behavior* (New York University Press, 2010); Laia Balcells, "Rivalry and Revenge: Violence against Civilians in Conventional Civil Wars," *International Studies Quarterly* 54, (2010): 291–313; Reed Wood, "Rebel Capability and Strategic Violence Against Civilians," *Journal of Peace Research* 47 (2010): 601–614; Jessica Stanton, "Strategies of Restraint in Civil War" (Presented at Georgetown University International Theory and Research Seminar, 2009). The majority of the literature on civilian victimization does not speak to inter-rebel group dynamics. One exception is Metelits, "The Consequences of Rivalry: Explaining Insurgent Violence Using Fuzzy Sets," 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 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, "Rebels Against Rebels: Explaining Violence Between Rebel Groups" (see note 7 above), which we address below.
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13. Eck, Kreutz, and Sundberg, "Introducing the UCDP Non-State Conflict Dataset" (see note 8 above).
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22. "The availability of separate sources of income, and the failure of the warlords to create a functioning system of financial redistribution within the faction, made it tempting for sub-lieutenants to create their own factions": Stig Jarle Hansen, "Civil War Economies: The Hunt for Profit and the Incentives for Peace" (AE Working Paper Number 1, 2007), 47.
23. Michael Findley and Peter Rudloff, "Combatant Fragmentation and the Dynamics of Civil Wars," *British Journal of Political Science* 42, no. 4 (2012): 879–901.
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26. Kristin M. Bakke, Kathleen Gallagher Cunningham, and Lee J. M. Seymour, "A Plague of Initials: Fragmentation and Cohesion, and Infighting in Civil Wars," *Perspectives on Politics* 10, no. 2 (2012): 265–283.
27. Kathleen Gallagher Cunningham, "Divide and Conquer or Divide and Concede: How Do States Respond to Internally Divided Separatists?" *American Political Science Review* 105, no. 2 (2011): 275–297.
28. Ethan Bueno de Mesquita, "Terrorist Factions," *Quarterly Journal of Political Science* 3, (2008): 399–418. The same author finds that strengthening the economy or institutions for the nonviolent expression of grievance increases the extremism of terrorist factions but decreases the likelihood that a splinter faction will form.
29. Paul Staniland, "Between a Rock and a Hard Place: Insurgent Fratricide, Ethnic Defection, and the Rise of Pro-State Paramilitaries," *Journal of Conflict Resolution* 56, no. 1 (2012): 16–40.
30. Ibid., 17.
31. Andrew H. Kydd and F. Walter Barbara, "The Strategies of Terrorism," *International Security* 31, no. 1 (2006): 51.
32. Mia Bloom, *Dying to Kill: the Allure of Suicide Terror* (New York: Columbia University Press, 2005).
33. Chester L. Barnard, *The Functions of the Executive* (Cambridge, MA: Harvard University Press, 1938).
34. Abrahms, "What Terrorists Really Want" (see note 4 above), 96.
35. Scott Gates, "Recruitment and Allegiance: The Microfoundations of Rebellion," *Journal of Conflict Resolution* 46, no. 1 (2002): 111–130.
36. Weinstein, *Inside Rebellion* (see note 11 above).
37. Macartan Humphreys and Jeremy M. Weinstein, "Handling and Manhandling Civilians in Civil War," *American Political Science Review* 100, no. 3 (2006): 429–447.
38. Sinno, *Organizations at War in Afghanistan and Beyond* (see note 6 above).
39. Nicholai Hart Lidow, "Violent Order: Rebel Organization and Liberia's Civil War" (PhD diss., Stanford University, 2011).
40. Gates, "Recruitment and Allegiance" (see note 35 above).

41. Barry R. Posen, "The Security Dilemma and Ethnic Conflict," *Survival* 35 (1993): 27–47.
42. Robert Jervis, "Cooperation Under the Security Dilemma," *World Politics* 30 (1978): 167–174.
43. Stathis N. Kalyvas and Laia Balcells 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. See Stathis N. Kalyvas and Laia Balcells, "International System and Technologies of Rebellion: How the End of the Cold War Shaped Internal Conflict," *American Political Science Review* 104 (2010): 415–429. 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 Christopher Butler and Scott Gates, "Asymmetry, Parity, and (Civil) War: Can International Theories of Power Help Us Understand Civil War?," *International Interactions* 35 (2009): 330–340 on power asymmetry and civil war.
44. On rebel group goals and their relationship to relative capabilities, see Halvard Buhaug, "Relative Capability and Rebel Objective in Civil War," *Journal of Peace Research* 43, no. 6 (2006): 691–708.
45. On the latter, see Kalyvas, *The Logic of Violence in Civil War* (see note 10 above).
46. William Reno, "Shadow States and the Political Economy of Civil War," in Mats Berdal and David M. Malone, eds., *Greed and Grievance Economic Agendas in Civil War* (Boulder, CO: Lynne Rienner, 2000), 43–68.
47. David Galula, *Counterinsurgency Warfare: Theory and Practice* (Santa Barbara, CA: Praeger, 1964); David Howell Petraeus, James F. Amos John A. Nagl, and Sarah B. Sewall, *The U.S. Army/Marine Corps Counterinsurgency Field Manual: U.S. Army Field Manual No. 3-24: Marine Corps Warfighting Publication No. 3-33.5* (Chicago: University of Chicago Press, 2007).
48. T. David Mason, "Insurgency, Counterinsurgency, and the Rational Peasant," *Public Choice* 86, no. 1 (1996): 63–83; Joel Migdal, *Peasants, Politics, and Revolutions* (Princeton: Princeton University Press, 1974); Reed M. Wood and Mark Gibney, "The Political Terror Scale (PTS): A Re-introduction and a Comparison to CIRI," *Human Rights Quarterly* 32 (2010): 367–400.
49. Mancur Olson, *The Logic of Collective Action* (Cambridge, MA: Harvard University Press, 1965); Samuel L. Pop-kin, *The Rational Peasant: The Political Economy of Rural Society in Vietnam* (Berkeley, CA: University of California Press, 1979); Mark Irving Lichbach, *The Rebel's Dilemma* (Ann Arbor, MI: University of Michigan Press, 1995); Macartan Humphreys and Jeremy M. Weinstein, "Who Fights? The Determinants of Participation in Civil War," *American Journal of Political Science* 52, no. 2 (2008): 436–455.
50. Kalyvas, *The Logic of Violence in Civil War* (see note 10 above).
51. Bernd Beber and Christopher Blattman, "The Logic of Child Soldiering and Coercion," *International Organization* 67, no. 1 (2013): 65–104; Humphreys and Weinstein, "Who Fights?" (see note 11 above).
52. Olson, *The Logic of Collective Action* (see note 49 above).
53. Kalyvas and Kocher, "How 'Free' Is Free Riding in Civil Wars?" (see note 11 above).
54. Although 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, in insurgency such advantages are not as pronounced as in conventional civil wars or non-conventional symmetric civil wars. On efficiency and military technology see James T. Quinlivan, "Force Requirements in Stability Operations," *Parameters* 25 (1995): 59–69.
55. Insurgent groups typically acquire "most of their armaments through raiding, battle-field 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." See *Small Arms Survey 2001: Profiling the Problem* (Oxford: Oxford University Press, 2001).
56. Paul Collier and Anke Hoefler, "Greed and Grievance in Civil War," *Oxford Economic Papers* 56, no. 4 (2004): 563–595; James D. Fearon and David D. Laitin, "Ethnicity, Insurgency, and Civil War," *American Political Science Review* 97, no. 1 (2003): 75–90;

Nicholas Sambanis, "Using Case Studies to Expand Economic Models of Civil War," *Perspectives on Politics* 2, no. 2 (2004): 259–279.

57. Daniel Byman, Peter Chalk, Bruce Hoffman, William Rosenau, and David Brannan, *Trends in Outside Support for Insurgent Movements* (Santa Monica, CA: RAND Corporation, 2001).

58. Michael L. Ross, "Oil, Drugs and Diamonds: The Varying Roles of Natural Resources in Civil War," in Karen Ballentine and Jake Sherman, eds., *The Political Economy of Armed Conflicts: Beyond Greed and Grievance*, (Boulder, CO: Lynne Rienner, 2003), 47–70; Michael L. Ross, "How Does Natural Resource Wealth Influence Civil War? Evidence from 13 Cases," *International Organization* 58, no. 1 (2004): 35–67; Macartan Humphreys, "Natural Resources, Conflict, and Conflict Resolution: Uncovering the Mechanisms," *Journal of Conflict Resolution* 49, no. 4 (2005): 538–562.

59. We recognize that "access to" and "control over" are analytically distinct concepts, yet we leave that distinction aside for present purposes.

60. Arield Rubinstein, "Perfect Equilibrium in a Bargaining Model," *Econometrica* 50 (1982): 97–110.

61. The outside option in other contexts may take the form of an aggrieved party bringing a dispute to court or a political party withdrawing from the government to force new elections. On the former, see Robert Cooter, Stephen Marks, and Robert Mnookin, "Bargaining in the Shadow of the Law: A Testable Model of Strategic Behavior," *Journal of Legal Studies* XI (1982): 225–251. On the latter, see Arthur Lupia and Kaare Strøm, "Coalition Termination and the Strategic Timing of Parliamentary Elections," *American Political Science Review* 89 (1995): 648–665. For an overview, see Robert Powell, "Bargaining in the Shadow of Power," *Games and Economic Behavior* 15 (1996): 255–289; Robert Powell, *In the Shadow of Power* (Princeton: Princeton University Press, 1999); Robert Powell, "Bargaining Theory and International Conflict," *Annual Review of Political Science* 5 (2002): 1–30.

62. The model that follows tracks nearly perfectly that of Powell, "Bargaining in the Shadow of Power" (see note 61 above).

63. To reduce the complexity of the model we make the discount factor δ the same for both players. We use the common exponential discounting model. See John T. Warner and Saul Pleeter, "The Personal Discount Rate: Evidence from Military Downsizing Programs," *American Economic Review* 91, no. 1 (2001): 33–53.

64. 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, Robert Powell finds that "as long as the discount factor [δ] 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. See Powell, "Bargaining in the Shadow of Power" (see note 61 above).

65. If $p = \frac{1}{2}$, a balance of power exists: each rebel group has an equal probability of winning.

66. A third option theoretically exists: the war could end in stalemate. We do not model this option explicitly.

67. See James D. Fearon, "Rationalist Explanations for War," *International Organization* 49, no. 3 (1995): 379–414.

68. Powell, "Bargaining in the Shadow of Power" (see note 61 above); Powell, *In the Shadow of Power* (see note 61 above).

69. This does not mean that a satisfied rebel group would not 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, *In the Shadow of Power* (see note 61 above), 93.

70. A strategy profile is a subgame perfect equilibrium if it represents a Nash equilibrium of every subgame of the original game. See, for example, Scott Gates and Brian D. Humes, *Games, Information and Politics: Applying Game Theoretic Models to Political Science* (Ann Arbor, MI: University of Michigan Press, 1997).

71. We begin to evaluate whether this is the case in the discussion section.

72. James D. Morrow, "Capabilities, Uncertainty, and Resolve: A Limited Information Model of Crisis Bargaining," *American Journal of Political Science* 33, no. 4 (1989): 941–972.

73. This depends on the size of the territory in question, the geographical separation imposed by topological features, and other features "given" by nature. We acknowledge that conflict dynamics, and the formation of rebel groups themselves, are likely to be endogenous to these "given" features of the natural environment. On the role of geography in civil war see, e.g., Halvard Buhaug and Jan K. Rød, "Local Determinants of African Civil Wars, 1970–2001," *Political Geography* 25, no. 3 (2006): 315–335; Halvard Buhaug and Scott Gates, "The Geography of Civil War," *Journal of Peace Research* 39, no. 4 (2002): 417–433; Johnston, "The Geography of Insurgent Organization and its Consequences for Civil Wars" (see note 11 above).

74. See James D. Fearon, "Why Do Some Civil Wars Last So Much Longer Than Others?" *Journal of Peace Research* 41, no. 3 (2004): 275–301.

75. Ibid.

76. Kalyvas and Balcells, "International System and Technologies of Rebellion" (see note 43 above).

77. Idean Salehyan, "The Delegation of War to Rebel Organizations," *Journal of Conflict Resolution* 54, no. 3 (2010): 493–515; Kristian Gleditsch Salehyan Idean and David Cunningham, "Explaining External Support for Insurgent Groups," *International Organization* 65, no. 4 (2011): 709–744.

78. The cost of conflict in such a scenario is not dyad-specific; that is, the new group (R_1) possesses complete information over R_2 's cost of using violence *vis-à-vis* the government, but still possesses some uncertainty about R_2 's cost of using violence against one's own group (R_1).

79. Kalyvas, *The Logic of Violence in Civil War* (see note 10 above).

80. Robert Powell calls this the "risk-reward tradeoff." See Powell, *In the Shadow of Power* (see note 61 above).

81. The players do know their own costs for fighting.

82. Although we do not have the space to explore this here, we refer readers to *ibid.*, 102, where this is extensively discussed and mathematically proven.

83. *Ibid.*, Appendix 3.

84. *Ibid.*

85. Michael Ross, "What Do We Know About Natural Resources and Civil War," *Journal of Peace Research* 41, no. 3 (2004): 337–356; Humphreys, "Natural Resources, Conflict, and Conflict Resolution" (see note 58 above).

86. Powell, "Bargaining in the Shadow of Power" (see note 61 above) 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." Nolan McCarty and Adam Meirowitz, *Political Game Theory: An Introduction* (Cambridge: Cambridge University Press, 2007), 285–287.

87. 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.

88. This may look something like the model in James D. Fearon and David D. Laitin, "Explaining Interethnic Cooperation," *American Political Science Review* 90 (Dec. 1996): 715–735. In that model 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 and more computational approaches.

89. David A. Lake, "International Relations Theory and Internal Conflict: Insights from the Interstices," *International Studies Review* 5, no. 4 (2003): 81–89; David E. Cunningham and Douglas Lemke, "Combining Civil and Interstate Wars" (n.d.).

90. Kalyvas, *The Logic of Violence in Civil War* (see note 10 above); Balcells, "Rivalry and Revenge" (see note 11 above).

91. Michael W. Doyle and Nicholas Sambanis, *Making War & Building Peace: United Nations Peace Operations* (Princeton: Princeton University Press, 2006); Virginia Page Fortna, *Does Peacekeeping Work?: Shaping Belligerents' Choices After Civil War* (Princeton: Princeton University Press, 2008); Lise Morjé Howard, *UN Peacekeeping in Civil Wars* (Cambridge: Cambridge University Press, 2008).