Information, Commitment, and War*

Clifford Carrubba
Dan Reiter
Scott Wolford

Department of Political Science
Emory University
Atlanta, GA 30322
dreiter@emory.edu

March 24, 2006

Abstract

This paper presents the first formal bargaining model of war which allows bargaining and strategic behavior before, during, and after war. The central theoretical innovation is to endogenize the decision of belligerents to comply with the terms of a war-ending agreement. We demonstrate that endogenizing the decision to comply with a post-war agreement provides conditions under which one of the central hypotheses of most bargaining model of war literature does not uphold. Specifically, if a belligerent fears that its adversary is likely not to comply with the terms of a war-ending settlement and reattack, then the fearful state becomes more likely to pursue an absolute war outcome and prevent such defection, even as information about capabilities and resolves streams in from combat outcomes and wartime diplomatic activity. Empirical evidence is also presented.

*Note: Early draft. Do not cite or circulate without authors permission. Order of the authors is alphabetical. For feedback, thanks to participants in the Leitner seminar at Yale University and Allan Stam. For research assistance, thanks to Phillip Fuerst and Maryann Gallagher. Comments welcome.
1 Introduction

Bargaining models of war have taken important strides towards opening up the black box of war. These models see war as part of the process by which states allocate scarce goods in the international system. Most importantly, bargaining models have cast the actual fighting of war as a fundamentally political process, in which the primary purpose of fighting is to reveal information to all sides about power and preferences. This new information in turn informs intrawar diplomacy, and eventually helps push the belligerents to end the war with a political settlement of the disputed issue.

However, existing scholarship has left unopened one remaining black box: the peace following wars end. Existing bargaining models assume that there is bargaining before and during war, but once the belligerents settle on a war-ending agreement (re)dividing the disputed good, all sides adhere to this war-ending agreement. This is a problematic assumption. A central claim of international relations scholarship has been that the absence of world government means that states can not be forced to comply with agreements. Compliance is not automatic, and states only comply with agreements when they choose to do so.

This paper offers advances over existing bargaining model of war scholarship by endogenizing the decision to accept a war-ending settlement. We present the first formal theory which incorporates the prewar, intrawar, and postwar phases, by modeling the decisions to start war, end war, and accept peace after wars end. Doing so offers a number of important theoretical advances. Most critically, we demonstrate that the shadow of post-war behavior affects behavior during and before war, in ways unpredicted by existing formal models. Existing bargaining models of war generally propose that the occurrence of battles during war
reveals information to all sides, causing them to update their beliefs about capabilities and resolve. States which win battles demand more of the opponent as a condition of war termination, and states which lose battles demand less. Eventually, the revelation of information drives the two sides war termination offers together and helps them end the war with a new division of the good, short of the absolute defeat of one side. This has been called by some the “principle of convergence.”

Our model shows that when one side fears that the other may not comply with a war-ending agreement, the principle of convergence may not hold, in that the wartime revelation of information may not hasten the end of war in a limited outcome. The fearful side may not alter its war termination offers in the direction of achieving a limited war outcome, even in the face of battlefield defeats. Rather, the fearful side will press on towards achieving an absolute war outcome, recognizing that its fears of the other sides willingness to comply with a war-ending agreement require an absolute outcome which will eliminate the sovereignty of its opponent, thereby forcibly preventing the other side from reneging. Our model predicts a number of otherwise puzzling historical patterns, such as the American decision to seek the conquest of North Korea before the tide of the Korean War had turned, and the Allied decision to pursue the unconditional surrender of the Axis powers in World War II in the midst of a string of decisive Axis victories. This prediction can only be generated by endogenizing the decision to comply with a postwar agreement, a feature unique and novel to our model.

The rest of this paper proceeds in 5 sections. First, we summarize the existing bargaining model of war scholarship. Second, we present our formal model, which builds on a version of a standard bargaining model, Filson and Werner (2002). Third, we present the theoretical results from the model. Fourth, we discuss some empirical evidence which offers support for
our hypotheses, including discussion of systematic empirical patterns as well as case studies of the American Civil War, the Franco-Prussian War, the Korean War, and World War II. Lastly, we conclude.

2 The Bargaining Model of War

The bargaining model of war assumes that international politics is fundamentally about the division of scarce goods like territory (Reiter 2003). The status quo represents a division of all scarce goods. States may demand the reallocation of scarce goods, and threaten war if their demands are not met. War itself can culminate in the reallocation of the disputed good, either through a limited war outcome, in which neither side suffers total military defeat and war ends when the two sides agree on a new division of the good, or through an absolute war outcome, in which one side suffers total military defeat and gives all of the good to the other side. James Fearon (1995) proposed that if both sides knew exactly how a war would reallocate the disputed good, then both sides would avoid war and reallocate the good according to the reallocation the war would produce, in order to each avoid paying the sunk costs of fighting the war. War may occur, then, if the two sides disagree about the likely outcome of a possible war, if the good in dispute does not lend itself to war-avoiding division, and/or if one side fears the other side may not stand by a war-avoiding division of the good.

A series of formal models have followed, building on Fearon’s insights. All generally share a similar structure: the status quo represents the division of a good, there is one-sided incomplete information about the balance of military capabilities and/or resolve, one side may demand the redivision of the good, if the demand is rejected then it may attack, the
fighting of war provides information to the uninformed side about the relative balance of military capabilities and/or resolve of each, and war can end either when the two sides agree on a reallocation of the good each prefers to continued fighting or when one side has been completely defeated militarily. Much of this work was framed in a Clausewitzian context, in which states fought limited wars to learn about what would happen if an absolute fight to the finish occurred, and the information gathered from a limited war meant that an absolute war often did not need to be fought. A frequent condition for the start of war is disagreement between the two sides over the balance of capabilities and/or resolve (Wagner 2000; Filson and Werner 2002; Slantchev 2003; Powell 2004; Smith and Stam 2004).

A central prediction of this scholarship is that fighting war reveals information to the uninformed side, about the balance of power and/or the balance of resolve. This revelation of information through combat outcomes and intrawar diplomacy helps the uninformed side update its beliefs about the other side, which in turn pushes it to change its war termination offer, thereby bringing the two sides war termination offers closer together and making war termination short of an absolute war outcome more likely. Geoffrey Blainey (1988, 56) explained the dynamic: “The start of a war is—almost by the definition of warfare—marked by conflicting expectations of what that war will be like. War itself then provides the stinging ice of reality. And at the end of a war those rival expectations, initially so far apart, are so close to one another that terms of peace can be agreed upon.” Specifically, when the uninformed side wins a battle, it demands more, and when it loses a battle, it demands less. Again, this idea in one form or another is at the heart of essentially all of the formal bargaining model scholarship (Wagner 2000, 477; Filson and Werner 2002, 828; Slantchev 2003b, 626; Smith and Stam 2004, 795; Powell 2004, 348). Branislav Slantchev (2003, 628)
framed this idea as the Principle of Convergence, which “posits that warfare ceases to be useful when it loses its informational content, which occurs when strategic and involuntary revelations make beliefs ‘irreversible’ in the sense that both sides can agree on the relative likelihoods of different outcomes.”

Significantly, all of these models end when the war ends, and the payoff for each player is the final division of the good minus the costs of war. The assumption, then, is that former belligerents always adhere to war-ending settlements, and do not renege on them by reattacking their former adversaries. However, international relations scholarship has long challenged the assumption that states always abide by international agreements, for the simple reason that there is no world government to enforce contracts. Certainly, theories of international relations differ over the conditions under which states will abide by their international commitments: realism claims states will only do so when it serves their narrow self-interests; institutionalism claims that properly crafted international institutions increase the likelihood of compliance; and constructivism claims that the presence of a common identity amongst signatories can increase the likelihood of compliance. But all three agree that compliance is a variable determined by the choices of signatory states, not a constant to be assumed away.

Among the class of international agreements, war-ending agreements are especially prone to compliance problems, as the payoffs for unilateral defection may be very high. Defecting on a war-ending agreement may allow a state to capture greater amounts of valuable territory. Additionally, the costs of not defecting may be great, as if the adversary defects first then this may pose the risk of losing territory or even being conquered. Indeed, of the 48 cease-fire agreements concluded between warring nation-states from 1946-1998, nearly half (22)
were broken by 1998 (Fortna 2004). Barbara Walter (2002) applied this insight to civil wars, arguing that fears about defection on a civil war-ending agreement are quite severe, and that third party participation to ensure that the terms of the agreement are respected can be a critical step towards achieving peace.

The international cooperation literature has proposed that assuming that agreements enjoy automatic compliance can bias analysis of other phases of cooperation, as well. Specifically, when actors enter agreements, they naturally consider whether or not parties to the agreement will abide by its terms. George Downs et al. (1996; see also Fearon 1998; von Stein 2005) proposed that because states recognize enforcement problems, they are more likely to sign shallow agreements and less likely to sign deeper agreements. This explains why those agreements which do exist enjoy relatively high degrees of compliance, as shallow agreements with lesser enforcement problems get signed and deeper agreements with greater enforcement problems do not.

The central contribution of our formal model, described in detail in the next section, is to relax the assumption that war-ending agreements enjoy automatic compliance. We allow a former belligerent to attack after peace has been settled, and propose that a changing postwar balance of power might encourage it to reattack. One central finding is that if a state fears that its adversary will reattack after a war ends in a limited outcome, then during the war the fearful state will not seek a limited war outcome as it gains information from combat outcomes and intrawar diplomacy, but will instead pursue an absolute outcome to forcibly prevent the other side from reneging on an agreement and reattacking in the future. In one sense, we are turning Clausewitz on his head. Rather than arguing that the shadow of absolute war makes limited war more likely, we propose that the shadow of limited war,
and specifically the possible instability of a limited war settlement, makes absolute war more likely.

Two bargaining model papers make efforts to relax the automatic compliance assumption. Robert Powell (2006, see also Powell 2004) developed a complete information model of war in which there are an infinite number of rounds, in each of which two states may fight. He shows that if one state perceives the other state to be growing relatively stronger over time, then the first state may under certain conditions attack before this change in the balance of power takes place. Once war occurs, the game ends in a costly lottery in which one side or the other is eliminated with a certain probability. Fearons (2004) model of civil wars has some similarities to our model. In it, the government starts off as strong or weak, and if it is weak, the rebels can start a civil war. Under some conditions, the rebels may prefer to start a civil war rather than accept a governments offer, as the rebels fear that a government growing strong in the future will renge on its offer, and, for the rebels, fighting the war offers the possibility of winning on the battlefield, establishing regional autonomy, and ending the game, thereby avoiding the possibility of the government reneging on the deal.

Our model builds on the insights of this past work, offering some important theoretical advances. Powell (2006) is primarily interested in explaining the outbreak of war, and perhaps as a result he blackboxes the actual fighting of war, as in his model once fighting commences its outcome is absolute one way or the other, determined by a costly lottery. Our theory endeavors to explain the causes of war, war termination behavior, and postwar behavior, and directly models strategic decision-making before, during, and after war. Besides being theoretically richer, our approach generates some key predictions which do not emerge from Powells model. Most centrally, because our model incorporates incomplete informa-
tion, we can draw more direct comparisons to information-oriented bargaining models which incorporate information. More specifically, incorporating incomplete information allows us to show more directly how endogenizing the decision to comply with a war-ending settlement can show the conditions under which one of the central propositions of the bargaining model, the convergence principle that fighting battles provide information and facilitate war termination, is not valid. Fearon’s (2004) model is a bit closer to our approach. Like in our model, Fearon allows for one side to challenge a division of goods even after conflict has occurred. However, like Powell’s model, Fearon’s model assumes complete information, which impedes the usefulness of making direct comparisons between it and more information-centered approaches.

3 The Model

Figures 1 and 2 present the structure of the game. Two states, $A$ and $D$, have strictly opposed preferences for the distribution of a disputed good whose value is normalized to 1. $D$ begins the game in control of the good, and $A$ makes the first move with proposal $\gamma_1$ for a division of the good such that $D$ transfers $\gamma_1$ to $A$ and keeps $1 - \gamma_1$ for itself. If $D$ accepts the offer, $\text{Acc}_1$, the game ends with these payoffs. If $D$ rejects the offer, $\text{Rej}_1$, $A$ chooses whether to quit, $\text{Quit}$, which leaves the status quo intact, or to attack, $\text{Att}_1$, and initiate a war. If $A$ attacks, a battle ensues that $D$ wins with probability $d_i$ such that $i = \{h, l\}$ constitutes $D$’s type and $d_h > d_l$. $A$ begins the game uncertain over $D$’s type, believing that it faces $d_h$ with probability $\lambda_1$ and $d_l$ with probability $1 - \lambda_1$.

We assume that $A$ can sustain only one loss before its resources are exhausted and it
suffers a total defeat, while $D$ can sustain two. Thus, if $A$ loses the first battle, the game ends and $D$ retains control of the disputed good, while each state pays costs $c_a$ and $c_d$. If $A$ wins, it makes a subsequent offer $\gamma_2$. Again, $D$ can accept, Acc$_2$, or reject, Rej$_2$. If $D$ accepts the offer after the first battle, it plays a lottery in which its probability of victory $d_i$ experiences a stochastic shock: with probability $\alpha$, its probability of victory is increased to $d_i + \theta$, and with probability $1 - \alpha$, its probability of victory is decreased to $d_i - \theta$. After observing the outcome of the shock, $D$ can continue to honor the settlement, Hon$_\alpha$ or Hon$_{1-\alpha}$, in which case the distribution implied by $\gamma_2$ stands, or reattack with a different probability of victory, Att$_\alpha$ or Att$_{1-\alpha}$, forcing a decisive battle that it wins with probability $d_i + I\theta$ where $I = 1$ if a positive shock occurs and $I = -1$ if a negative shock occurs. Again, each state pays costs $c_a$ or $c_d$ in the battle. We assume that, if $A$ demands the entire good such that $\gamma_2 = 1$, then
Figure 2: Peace and postwar commitment

After D Accepts $\gamma_2$

$D$ cannot experience the postwar shock to its probability of victory after accepting such an aggressive offer.\(^1\) A effectively removes $D$’s capacity to renege on its commitment.

If $D$ rejects $\gamma_2$, $A$ chooses between retreating, Ret, in which case $D$ remains in control of the good and the war ends with both sides paying the costs of the first battle, and attacking, Att\(_2\), which forces a final battle in which the loser exhausts its capacity to fight and the victor wins the disputed good less the costs of fighting an additional battle.

### 4 Equilibrium Results and Discussion

We solve for a Perfect Bayesian Equilibrium of the game, which requires that all strategies be sequentially rational and consistent with beliefs updated according to Bayes’ Rule wherever

\(^1\)From a technical standpoint, this ensures that $D$ does not have a dominant strategy of simply accepting any offer and waiting for the chance at a positive shock to its probability of victory; otherwise $A$ could not use war to solve the commitment problem of the peace phase. Substantively, it ensures that $A$ can make a sufficiently aggressive offer that, if accepted, eliminates $D$’s capacity to renege on its commitment to the termination offer $\gamma_2$. Note that this is isomorphic to endogenizing the effects of the postwar shock to $A$’s offer such that $D$’s chance of victory after accepting the offer are reduced by some function of $A$’s offer $d_i - f(\gamma_2) + \theta$. 
possible. While some of the results conform to those found in previous work, the relaxation of the stable-peace assumption produces novel predictions. Both the probability and size of postwar shifts in the distribution of power shape the initiator’s incentives in its war termination offer, which are often at odds with the usual patterns predicted by the principle of convergence in most screening models. We describe these dynamics in the following sections, with particular emphasis on the conditions under which the initiator may (1) lower its demands after winning a battle and (2) raise it demands so high as to pursue an absolute war even after beliefs converge about the distribution of power.

While the sections that follow use a minimum of notation in order to explicate the logic behind the equilibrium, we characterize the solution formally in the appendix.

### 4.1 Committing to Peace

Begin with $D$’s decision to honor a settlement based on $A$’s war termination offer, represented above in Figure 2. To reach this point in the game, $A$ initiates a war and wins the first battle, after which it makes an offer $\gamma_2$ that $D$ accepts, bringing hostilities to an end, with each side having paid the costs of one battle and $D$ still in possession of the disputed good. This peace phase of the game begins with Nature determining whether $D$ grows stronger or weaker, after which $D$ chooses whether to honor the settlement it accepted or to reattack $A$, forcing a decisive battle in which it might regain the whole disputed good.

We show in the appendix that $D$’s postwar decision is determined by $A$’s war termination offer, which can be of three sizes. First, $A$ can propose *perfect appeasement*, in which case it offers $D$ enough that it will choose not to reattack even if it grows stronger. Second, $A$ can
offer partial appeasement, an offer sufficient to induce $D$ to honor the peace if it becomes weaker but to reattack if it grows stronger. Finally, $A$ can propose no appeasement, which we represent as a demand for the whole of the disputed good and which, if accepted, renders $D$ unable to reattack after a shift in power.

Perfect and partial appeasement offers both induce $D$’s acceptance when $A$ can credibly threaten to attack in its final move if its termination offer is not accepted.\(^2\) In the first case, perfect appeasement gives $D$ a share of the good equal to what it would receive if it fought from a position of strength, i.e., if its probability of victory increased to $d_i + \theta$, which it always prefers to being attacked by $A$ and fighting with its original probability of victory $d_i$.

**Definition 1.** Perfect appeasement leads $D$ to honor a peaceful settlement even if it grows stronger after accepting a war termination offer.

Partial appeasement also induces $D$ to accept, as $A$ offers $D$ just enough to render it indifferent over fighting now and accepting but not enough that it will not choose to reattack in the event of an increase in its probability of winning battles.

**Definition 2.** Partial appeasement leads $D$ to honor a peaceful settlement if it grows weaker, but $D$ will reattack if it grows stronger.

Finally, an offer of no appeasement, which denies $D$ the capacity to renge on any future settlement and leaves it with none of the disputed good, always forces $D$ to reject and sets up a final, decisive battle in which one state wins all the disputed good and the other suffers total defeat.

\(^2\)We show in the appendix the conditions under which $A$’s threat of attack is credible. Note that when this threat is incredible and $A$ prefers to retreat rather than attack, both types of $D$ reject any offer, which induces $A$ not to attack and initiate the first battle.
Definition 3. A no-appeasement offer leads D to reject immediately and forego a peaceful settlement.

This potential increase in D’s probability of winning battles, then, creates a commitment problem: while D may prefer to end hostilities after the first battle, it cannot resist the temptation of reattacking if it grows stronger. Rather than a stable, costless settlement for which A runs some risk of war in making its offers, peace in this model is a risky venture fraught with the possibility of future losses that fundamentally alters many of the dynamics of the principle of convergence.

4.2 Ending Hostilities

Given the inherent risks of peace, A’s incentives to terminate the war after winning the first battle are a function of what it has learned about D up to this point and what it knows about the riskiness of a potential peace. We introduce two concepts relevant to A’s choice of offer: (1) the costs of appeasement, or the difference between what A must offer D in order to prevent it from reattacking and what A expects to gain from pursuing a decisive battle that solves the commitment problem inherent in a negotiated peace and (2) the riskiness of peace, or the probability which with D will grow stronger and require appeasement.

The costs of appeasement are determined by $\theta$, or the size of a potential increase in D’s probability of winning battles: the stronger D may become, the more A must offer in order to prevent D from reattacking in the future, and the costlier appeasement becomes relative to fighting a decisive battle. The riskiness of peace is determined by $\alpha$, or the probability with which D becomes stronger after accepting a termination offer, which determines the
likelihood that, regardless of how strong $D$ may become, an opportunity for it to renege on the peace will exist. As we explain in more detail below, the costs of appeasement determine precisely what it takes to appease a strengthened $D$, while the riskiness of the peace determines whether $A$ will accept some risk of reattack in the hopes of terminating the war short of a decisive battle without giving up too much.

We represent $A$’s potential war termination offers as $\gamma_j^j$, where $j$ indicates the strongest type of $D$ that is induced to accept the offer and any type that does no accept rejects. When $j = h + \theta$, the strong type with an increased probability of winning battles equal to $d_h + \theta$, is induced to honor the peace; this constitutes an offer of perfect appeasement, or $\gamma_{h+\theta}^j$. When $j = h - \theta$, $d_h$ is appeased only when it grows weaker during the peace, and it reattacks if it grows stronger; this is equivalent to a partial appeasement offer, or $\gamma_{h-\theta}^j$. Finally, if $j = \emptyset$, $d_h$ rejects the offer immediately; this is a no-appeasement offer, $\gamma_{\emptyset}^j$. Each representation is analogous for offers to $d_l$, although a no-appeasement offer in this case is $\gamma_{X}^j$. We assume that any offer designed for $d_h$, where $j = \{h + \theta, h - \theta, \emptyset\}$ will be accepted by $d_l$ and that any offer designed for $d_l$, where $j = \{l + \theta, l - \theta, X\}$, will be rejected by $d_h$, since it is always easier for $A$ to induce $d_l$ to accept due to $d_l < d_h$.

Focusing on the case in which $A$ faces only the strong type, $d_h$, after winning the first battle, it is easy to see how the costs of appeasement, $\theta$, and the riskiness of peace, $\alpha$, shape $A$’s incentives. If only $d_h$ remains in the game, then $A$ has updated its beliefs sufficiently that both states agree on the probability of victory, and convergence models predict that wars should be most likely to end under precisely these conditions.

Figure 3 plots an equilibrium space as a function of $\alpha$ and $\theta$, showing how changes in both quantities lead to changes in $A$’s optimal war termination offer. When the riskiness
of peace, $\alpha$, is low, $A$ pursues partial appeasement, because, however large the increase in $D$'s strength, such a shift happens with a sufficiently low probability that $A$ is willing to run the risk of being reattacked, which allows $A$ to avoid being too generous. In these circumstances, war ends short of total defeat for $A$ or $D$, and $A$’s partial appeasement offer, as stated above, resembles a bargain that gives $D$ what it would receive in expectation from fighting an additional battle at its current strength. Note that this is precisely what the “principle of convergence” would predict a limited-war settlement to look like (Slantchev 2003), but we show that it requires a minimal risk of reattack following a termination of hostilities. It is important to note that, while the model predicts an end to the war, it also predicts, with low probability, the re-initiation of hostilities if $D$ does in fact become stronger.
Lemma 1. When the risk of a postwar shift in power favoring the defender is low, the attacker makes a partial appeasement offer that resembles the limited settlement predicted by the principle of convergence. If the defender does grow stronger, hostilities will resume.

When the riskiness of the peace is high, or as a postwar shift in the defender’s favor becomes more likely, but the costs of appeasement are low, or as $D$ does not grow too strong, $A$ pursues perfect appeasement, offering $D$ at least as much as it expects to gain from reattacking after growing stronger. In this case, $A$ offers more than $D$ would gain by continuing the war to a decisive end, because, while the probability of $D$ growing stronger is high, the costs of appeasement are low relative to the costs of continued fighting. In this circumstance, $A$ may actually make a more generous offer after winning its first battle, because it believes with higher probability that it faces a stronger type, $d_h$, that was willing to reject the initial offer. (We discuss this in greater detail in the following section.)

Lemma 2. When the risk of a postwar shift in power favoring the defender is high and the costs of appeasement are low, the attacker makes a perfect appeasement offer that is more generous than the limited settlement predicted by the principle of convergence. Hostilities will not resume even if the defender grows stronger.

Finally, when both the costs of appeasement and the probability that $D$ grows stronger are high, $A$ makes a no-appeasement offer that forces $D$ to reject. $A$ then follows by attacking a forcing a decisive battle resulting in the total defeat of one side, denying $D$ the ability to grow stronger and renege on a limited-war settlement. Despite the revelation of information about the true probability of winning the war ($A$ knows it to be $d_h$ at this point), $A$ realizes that the costs of appeasement are too high, and it would rather fight to the finish than allow
to agree to a limited war settlement that it cannot credibly commit to honor. Rather than making increasingly generous offers, as predicted by screening models, $A$ makes an extremely aggressive offer that, rather than increasing the chances of peaceful settlement, makes continued hostilities inevitable.

**Lemma 3.** When both the risk of a postwar shift in power favoring the defender and the costs of appeasement are high, the attacker foregoes a limited settlement in favor of a total victory that destroys the defender’s capacity to renege on the peace.

Figure 4 shows that a similar dynamic occurs when $A$ faces both types of $D$ after winning the first battle. Beliefs have yet to converge about the likely victor under these conditions. For very low costs of appeasement—i.e., when $\theta$ is low—$A$ continues to perfectly appease a strengthened $d_h$, an offer that also perfectly appeases $d_l$. However, because $A$ believes that it might still be facing a weak type of defender $d_l$, and because it always does better against weak defenders than strong defenders, it is more willing to assume some risk of war against a strong type by making offers that the weak type will accept. As a result, as the costs of appeasement increase slightly at high risks of a postwar shift—or as $\theta$ increases while $\alpha$ remains low—$A$ chooses to perfectly appease $d_l$ with $\gamma_{l+\theta}^t$, which it knows that $d_h$ will reject in order to force a final battle. This also leads $A$ to partially appease only $d_l$ when the probability of a shift in power is low, expecting the gains from doing so to outweigh the probability that it faces $d_h$, which will lead to a rejection and a final battle.

Finally, when both the costs of appeasement and the probability of a shift in power favoring the defender are high, $A$ opts to make an offer that forces both $d_h$ and $d_l$ to reject, to which $A$ responds by initiating a final battle. Just as before, victory in such a battle
allows $A$ to gain the entire disputed good and to destroy the defender’s capacity to renege on a future settlement.

In this section we have shown that (1) wars need not end when beliefs converge on the probability of victory, (2) commitment problems created by a limited-war settlement can lead to both increases and decreases in war termination offers. Perhaps most strikingly, we show that, even when the game reduces to one of complete information—i.e., when $A$ knows that it faces $d_h$—the attacker in our model foregoes the chance to save the costs of continued fighting, pursuing an absolute war against the defender when the potential costs of appeasement are greater. This result is a formal analogue of Powell’s (2006) suggestion that states may learn while bargaining that they face an opponent they are unwilling to appease, which leads to continued fighting beyond what a convergence model would predict.
Were the analysis to stop here, however, the claims in Lemmas 1-3 would be subject to bias from a selection effect, because \( A \) and \( B \) both anticipate the war termination dynamics under all these conditions in order to decide whether to begin hostilities in the first place. We turn in the following section to a discussion of how the costs of appeasement and the riskiness of the peace affect which wars begin and which dynamics identified in Lemmas 1-3 are allowed to play out.

4.3 Initiating Hostilities

As shown in Figure 1, a war begins when \( A \) chooses to attack after \( D \) rejects the initial proposal. \( A \) conditions each of these decisions on the anticipated nature of the war and the ensuing peace, which is a function of the costs of appeasement and the riskiness of the peace, as stated above. Given the strategies for both \( A \) and \( D \) that emerge in the equilibrium spaces in Figures 3 and 4, there are five regions, or states of the world, in which \( A \) plays a unique combination of strategies when facing only \( d_h \) and when facing both types. Intuitively, a region is defined by a unique overlap of optimal offers in Figures 3 and 4, which occur in for specific combinations of \( \alpha \) and \( \theta \). Since \( A \) knows the value of \( \alpha \) and \( \theta \) at the beginning of the game, it knows which region is the true state of the world, and it chooses its war initiation strategies based on that knowledge.

Each of these regions is represented in Table 1 with bold lines, each characterizing a unique strategy profile that \( A \) follows after winning the initial battle. Below, we discuss each region according to the substantive combinations of \( \alpha \) and \( \theta \) it represents, identify the war initiation strategies available to \( A \) in each region, and then characterize the conditions
under which $A$ chooses to initiate a war. We relate each strategy to a potential equilibrium path or hypothetical war, which we list under the figure in Table 1. Despite increasing complexity of the results, we continue to employ non-formal language as much as possible in order to sustain the intuition underlying the results.

Within each region outlined in bold, $A$ will choose to attack if $\gamma_1$ is rejected under different circumstances, and where its willingness to attack conditional on which type it faces leads to a unique first offer, we denote these area with non-bold lines and assign them to particular equilibrium paths, labeled $E.1$ through $E.12$ in Table 1.

It is useful to characterize $A$’s choice of initial offer in terms of generalities that hold across the equilibrium space. Recall from Figure 1 that there is no commitment problem if $D$ accepts $\gamma_1$: if the offer is accepted, the game ends with $A$ receiving $\gamma_1$ and $D$ receiving $1 - \gamma_1$. In each region, then, $A$ can make one of three offers: one that both types accept, one that $d_l$ accepts but that $d_h$ rejects, and one that both types reject. In order to induce both types to reject, $A$ again simply demands the entire good, or $\gamma_1 = 1$. However, given the offers it will make to each type in each region after winning a battle, $A$ has to tailor a different set of offers designed to induce either both or only one type to accept. In other words, in order to make an acceptable offer, $A$ must offer at least one type of $D$ at least as much as that type can expect to gain from rejecting the initial offer.

Again, $A$ anticipates how the riskiness of the peace and the costs of appeasement will affect its war termination offer in each region, which affects (1) its decision to attack if its first proposal is rejected and (2) the precise size of its initial proposal. In each region, when $A$ is unwilling to attack under any circumstances—i.e., when any type of defender rejects the offer—it anticipates quitting and never makes a demand, so war does not start. When $A$
Table 1: Equilibrium Paths As a Function of $\alpha$ and $\theta$

<table>
<thead>
<tr>
<th>$\alpha$</th>
<th>$\theta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

E.1 A makes no demand and war does not start.
E.2 $A$ proposes $\gamma_{h,h}^{h,h-\theta}$, both types of $D$ accept, and war does not start.
E.3 $A$ proposes $\gamma_{h}^{p1}$, $d_h$ rejects and $d_l$ rejects with probability $p_1$. $A$ quits with probability $q_1$. If it attacks and wins, $A$ pursues an absolute war against $d_h$ and partially appease $d_l$, which reattacks if it grows stronger.
E.4 $A$ makes no demand and war does not start.
E.5 $A$ proposes $\gamma_{h,h}^{h,h-\theta}$, both types of $D$ accept, and war does not start.
E.6 $A$ proposes $\gamma_{1}^{p2}$, $d_h$ rejects and $d_l$ rejects with probability $p_2$. $A$ quits with probability $q_2$. If it attacks and wins, $A$ perfectly appeases all types of $D$ and hostilities do not resume.
E.7 $A$ makes no offer and war does not start.
E.8 $A$ proposes $\gamma_{1}^{p3}$, $d_h$ rejects and $d_l$ rejects with probability $p_3$. $A$ quits with probability $q_3$. If it attacks and wins, it pursues an absolute war.
E.9 $A$ proposes $\gamma_{1}^{l,x}$, $d_l$ accepts and $d_h$ rejects. $A$ attacks and pursues an absolute war if it wins.
E.10 $A$ proposes $\gamma_{1}^{h,h+\theta}$, $d_h$ rejects and $d_l$ rejects with probability $p_4$. $A$ quits with probability $q_1$. If it attacks and wins, it pursues an absolute war against $d_h$ but perfectly appeases $d_l$.
E.11 $A$ makes no demand and war does not start.
E.12 $A$ makes no offer and war does not start.

A A proposes $\gamma_{1}^{h,h+\theta}$, both types of $D$ accept, and war does not start.
will attack if and only if both types reject its offer, A makes no offer and war does not start, because the weak type of D, \( d_l \), has an incentive to bluff and reject the offer along with \( d_h \), which forces A to quit. One of these two dynamics holds in Equilibria 1, 4, 7, and 11.

When A will attack regardless of which types reject the offer, it chooses between the kinds of \( \gamma_1 \) offers described above: inducing both to accept, only \( d_l \) to accept, or both to reject. In Equilibria 2, 5, and 12, A opts to make an offer that both types of D accept, and in Equilibrium 9 A makes an offer that \( d_l \) accepts and \( d_h \) rejects. Note that, with its first offer, A never makes an offer than both types of D reject; this is consistent with the screening dynamics of convergence models because the initial offer is not subject to a commitment problem—i.e., peace is stable and costless if an offer is accepted.\(^3\)

Finally, when A will attack if and only if both types reject, a mixed strategy equilibrium occurs. Under these conditions, the weak type of D would like to reject some offers along with the strong type, because A will quit if the strong type rejects, but if \( d_l \) always rejects, then A is willing to attack. Thus, \( d_l \) sometimes rejects, doing so with a probability \( p_r \), where \( r \) is the region in which play occurs, that makes A indifferent over attacking and quitting in the face of a rejection, and A mixes over attacking and quitting in order to keep \( d_l \) indifferent over accepting and rejecting. A quits with probability \( q_r \). In other words, D will reject A’s offer probabilistically, and A will attack in response to the offer probabilistically. What does the weak type gain from this? Rather than being forced to accept an offer or being attacked if it rejects, it forces A to quit sometimes and leave even the weak type with the whole disputed good. If a rejection and an attack occur, the war proceeds as it does in Figure 4,

\(^3\)We feel that this is a substantively sensible decision because many commitment problems that emerge in a post-hostilities phase—like intervention from a third party or arms transfers to recoup losses—may never appear unless a war starts.
where both types are present. Mixed strategies obtain in Equilibria 3, 6, 8, and 10.

With equilibrium paths established, we characterize in the following section when and why each type of equilibrium occurs as a function of the two parameters of greatest interest: the costs of appeasement, $\theta$, and the riskiness of the peace, $\alpha$.

4.4 Discussion

What can we learn from the equilibrium paths, or hypothetical wars, presented above? The two parameters identified at the outset—the riskiness of peace and the costs of appeasement—play an important role in determining which conflicts occur, how long they last, and how they end. In particular, they determine what kind of intrawar offers are made and accepted, and whether these offers lead to enduring peace, eventual reinitiation of hostilities, or the total defeat of one of the belligerents. This indicates that relaxing the stable peace assumption is a useful theoretical enterprise, providing a more detailed intuition over when and how limited and absolute wars come about.

We orient this discussion of the results around two questions. First, when do limited war settlements come about and what are their consequences? Second, when will the attacker refuse to make more generous offers even as beliefs converge on the true distribution of power in order to pursue an absolute war?

In answer to the first question, we find that limited settlements, which end the war short of either side’s decisive defeat, are possible when commitment problems are minimal: when the probability of a postwar shift in power favoring $D$ is low or when the costs of appeasement are not too high. As shown in Table 1, these limited settlements can be of two kinds: one
that partially appeases $D$ or one that perfectly appeases $D$.

In Equilibrium 3, for example, when the peace is low-risk but the costs of appeasement are high, a mixed strategy equilibrium occurs in which $A$ makes a final offer that partially appeases the weak type $d_l$ but which a strong type $d_h$ will reject on the way to an absolute war. The limited settlement that partially appeases $d_l$, of course, will not suffice to prevent it from reattacking in the future if it does grow stronger. Why would $A$ tolerate a possible absolute war against $d_h$ in this region when it does not as $\alpha$ increases slightly? The ability to partially appease $d_l$ with a very low probability of reattack makes the move sensible, but as $\alpha$ increases into the ranges where Equilibria 1 and 2 obtain, the slightly higher probability of reattack makes the tradeoff unacceptable, and no war occurs.

Equilibrium 6 ends the war with a settlement short of war that resembles a limited settlement even though $A$ perfectly appeases both types of $D$, because the costs of appeasement are quite low—low enough that $A$ would rather pay them up front instead of fight against a stronger $D$ later. Moving to the right across the equilibrium space in Table 1, the riskiness of peace increases and $A$ increasingly avoids provoking a conflict, either making no demand or asking for only enough that both types of $D$ will accept the offer. However, when the costs of appeasement increase to moderate levels along with the increase in $\alpha$, we find another instance of perfect appeasement: in Equilibrium 10, $A$ makes an offer that perfectly appeases weak types but that continues into total war for strong types. In each case, $A$ actually makes an offer that is more generous than a limited settlement with $d_l$ would require: all $A$ would need to do in order to stop the fighting is partially appease $d_l$, but because the costs of appeasement are so low in Equilibrium 6 and because the risks of peace are too high in Equilibrium 10, $A$ opts for perfect appeasement instead.
It is important to note that in none of these cases do beliefs converge about the distribution of power before $A$ makes its final offer: that is, $A$ never updates its beliefs sufficiently to believe that it faces only $d_h$ until it sees its termination offer rejected and decides to attack and force a decisive battle. Interestingly, the only case of convergence in equilibrium before a termination offer is made occurs along the way to an absolute war, as discussed below.

We find that absolute wars are most likely to occur when postwar commitment problems are most severe, or when both the costs of appeasement and the riskiness of peace are high. In fact, rather than grow more generous over time, we find that $A$’s offer actually grows less generous. In Equilibria 8 and 9, $A$ begins the game by making an offer that $d_l$ accepts either always (E.9) or probabilistically (E.8), which implies that $A$ offers to allow $d_l$ to keep at least some of the disputed good. However, in each equilibrium, $A$’s second offer demands the whole of the disputed good, which forces both types of $D$ to reject, setting up an absolute war in which $A$ either collapses or wins all the disputed good and destroys $D$’s ability to renege on the peace. As noted above, Equilibrium 9 represents the only case in which beliefs converge prior to $A$’s war termination offer, as $A$ makes an initial proposal $\gamma_1$ that weak types of $D$ accept; rather than make an efficient offer that represents the distribution of power, however, $A$ knows that $D$ is of a type it is unwilling to appease, and it presses ahead with an absolute war despite the game has become one of complete information.

In stark contrast to stable-peace models that rely on the principle of convergence to generate equilibrium behavior, our model shows that war termination offers need not approach an efficient level that reflects the distribution of power. The attacker may raise its demands well beyond a limited war settlement even when beliefs converge about the distribution of power, and it may lower its demands when it opts to perfectly appease either one or both
types of defender. We also find that, when the peace is especially risky and when the size of a potential postwar shift in power is large, an attacker may pursue an absolute war from the outset, designed to destroy its opponent’s ability to renege on the peace by bypassing a possible limited war settlement.

5 Empirics

Our model makes a number of predictions about war initiation, war termination, and postwar behavior. In this section, we focus on the empirical evidence surrounding Lemma 3, that when one belligerent fears the other may renege on a war-ending settlement, it becomes less likely to tolerate a limited settlement ending the war, and more likely to pursue an absolute war outcome as a means of solving the post-war compliance problem. This proposition has fundamental similarities to the preventive theory of war, that a changing balance of power will make war between two states more likely (Copeland 2000; Powell 1999).

What are some of the empirical implications of Lemma 3? At the most general level, this proposition predicts that absolute war outcomes ought to occur with some frequency, especially when postwar compliance concerns are great. In contrast, following Clausewitz bargaining models which do not model postwar treaty compliance routinely emphasize that absolute outcomes are quite rare, almost nonexistent (Filson and Werner 2002, 821; Slantchev 2003, 621). Wagner (2000, 472; see also Howard 2002, esp. 52) summarized, “Clausewitz claimed that because negotiated settlements of war are possible, absolute wars rarely occur. I will argue that he was right.” However, the empirical record indicates that since 1816, absolute war outcomes, defined as the loser suffering either state death or foreign imposed
regime change, are surprisingly frequent, occurring in roughly one third of interstate wars.\footnote{There are 36 cases of violent state death and foreign imposed regime change pertinent to interstate wars from 1816-2003 include Spain (1823), Papal States (1860), Two Sicilies (1861), Paraguay (1870), Hanover (1866), Saxony (1866), Hesse Electoral (1866), Peru (1880), Egypt (1882), Honduras (106), Honduras (1807), Morocco (1911), Belgium (1914), Turkey (1918), Austria-Hungary (1918), Ethiopia (1935), France (1940), Germany (1945), Greece (1941), Netherlands (1940), Luxembourg (1940), Denmark (1940), Norway (1940), Belgium (1940), Yugoslavia (1941), Romania (1941), Romania (1941), Hungary (1944), Japan (1945), Hungary (1956), South Vietnam (1975), Cambodia (1975), Uganda (1978), Kuwait (1990), Afghanistan (2001), and Iraq (2003). See Fazal (2004), Werner (1996).} Though this evidence is not definitive because neither older models which blackbox the postwar period or our model make point predictions about absolute war frequency, the relative commonality of absolute war outcomes in the historical record at least suggestively supports our models predictions.

Quantitative scholarship offers further support for Lemma 3. Suzanne Werner (1999; Werner and Yuen 2005) found that peace is more likely to break down into war when the balance of power between two former belligerents changes. She also found that absolute wars can reduce compliance problems, as wars which ended in foreign-imposed regime change are less likely to reerupt into violence after peace is established. Fearon (2004) demonstrated that the duration of some civil wars is both unexpected by the information perspective and correlated with commitment problems. Walter (2002) found that third party intervention makes the negotiated settlement of civil wars more likely, which she proposed is because such intervention reduces credible commitment fears (though she did not test an information perspective account of civil war outcomes).

A central empirical question is whether commitment concerns can in some cases negate the principle of convergence prediction that combat outcomes affect war termination offers, specifically that battle defeats cause belligerents to demand less from opponents, and battle victories cause belligerents to demand more. Lemma 3 proposes that when a belligerent has
concerns about postwar compliance, battle defeats may not cause it to demand less from its adversary, as it will essentially shrug off these defeats in the pursuit of an absolute war outcome which will permit the avoidance of the compliance problem. Quantitative evidence does not yet exist to permit testing these two hypotheses statistically, but several case studies can illustrate the central point and permit some process tracing.\footnote{Ramsay (2005) offers one attempt to test some of these hypotheses empirically. However, he uses the Historical Evaluation and Research Organization data set on battle outcomes, and this data set suffers serious drawbacks in application to this area, given asymmetries in how thoroughly it covers different wars. A number of studies have found support for implications of the principle of convergence and the general bargaining model proposition that disagreement about capabilities and/or intention makes war more likely, including that power parity makes war more likely (Reed 2003a), trade makes war less likely (Reed 2003b), and that international governmental organizations reduce the likelihood of war (Boehmer et al 2004). See also Slantchev (2004).}

The first case study is World War II. During the war, the Allies sought the unconditional surrender of the Axis. The information perspective would predict the appearance of such a demand after the Allies had rung up a streak of victories and improved their estimates of their balance of power with the Axis. However, the Allies declared a policy of unconditional surrender much earlier in the war; Roosevelt declared it informally just after Pearl Harbor, the Allies made it part of the Declaration of the United Nations in January 1942, and the American Subcommittee on Security Problems formally recommended unconditional surrender, to Roosevelt's approval, in May 1942 (Beschloss 2002, 12; Davis 2000, 371; Notter 1949, 124-133; Dallek 1979, 373).

The timing of this declaration is puzzling. By May 1942, the Axis had rolled up strings of victories in Western Europe, the Pacific, Africa, and the Soviet Union, and had not yet been stopped by key Allied victories at Midway, El Alamein, or Stalingrad. More generally, the Allies had not yet launched offensives of their own; the Operation Torch landings in North Africa, the invasion of Sicily, island-hopping in the Pacific, and the escalation of
bombing campaigns against Germany and Japan, to say nothing of the D-Day invasion, were still in the future. The information perspective would predict that the discouraging stream of information about relative capabilities would push the Allies to consider some sort of war-ending settlement short of the unconditional defeat of the Axis, anticipating that unconditional victory appeared quite unlikely. However, the Allies wanted to achieve a lasting peace, and were concerned about the possibility of defection on a peace settlement. This concern was strongly driven by a motivation to avoid repeating what were perceived as mistakes committed in the World War I-ending peace settlement of Versailles, which left open the door to renewed German aggression (on the effects of past experiences on foreign policy, see Reiter 1996). Assistant Secretary of State Breckinridge Long put it succinctly: “We are fighting this war because we did not have an unconditional surrender at the end of the last one” (quoted in O’Connor 1971, 38). Roosevelt made a similar point later in the war, declaring that the lessons of World War I were that the Allies “must not allow the seeds of the evils we shall have crushed to germinate and reproduce themselves in the future” (quoted on Beschloss 2002, 12).

A similar example came during the early stages of the Korean War. North Korea invaded South Korea on June 25, 1950. North Korean forces initially made great advances, pushing South Korean and American forces back to a relatively small toehold around the South Korean city of Pusan. The key turning point in this early stage of the war was General Douglas MacArthur’s tremendously risky amphibious landing behind enemy lines at the city of Inchon on September 15. However, even before this turning point was reached, the United States formally increased its war aims from liberating South Korea to conquering North Korea, as well (Stueck 1995).
The expansion of American war aims in Korea before the tide turned is a puzzle for earlier models which ignore postwar treaty compliance, as they would predict that facing such poor military conditions in August and September, the United Nations forces might reduce their war aims, such as seeking a cease-fire while maintaining their toehold at Pusan, but at the least would not expand their war aims beyond restoring the status quo ante. Importantly, the expansion of war aims came before the outlook on the war improved. North Korean forces in the early weeks of the war had fought better than expected. In mid-August, British officials estimated that UN forces had only a 50-50 chance just of maintaining the toehold at Pusan. The Inchon landing itself was deemed beforehand as an extremely risky endeavor, because of high sea walls around the city, unfavorable tides, and other conditions (Stueck 1995).

Understanding American concerns about North Korean compliance with a war-ending agreement can explain the anomaly of the expansion of American war aims in the face of a string of combat defeats. An important part of the American motivation for seeking the conquest of North Korea was concern that restoration of the status quo would leave South Korea vulnerable to future attacks. Concerns were expressed that stopping at the 38th parallel would provide an “asylum to the aggressor” for future attacks (Foot 1985, 70-74). These commitment concerns persisted through the war; in December 1951, Truman worried that “the Communists would build up after an armistice and then come right down the peninsula to Pusan” (Foreign Relations of the United States, 1951 1983, vol. 7, 1293).

A third case is the American Civil War. The war was characterized by continual and intense (and, therefore, informative) fighting; some 600,000 combatants were killed in more than 60 battles. The tides of war shifted dramatically from one side to the other, and earlier
models which ignore postwar compliance issues would predict much back and forth negoti-ating over the key issues of slavery and Confederate sovereignty, as after combat success, a belligerent should demand more and after combat defeat, a belligerent should demand less.

However, examination of combat outcomes and negotiation behavior during the Civil War does not support this hypothesis. Combat outcome data come from Livermore (1957), who coded the outcomes of 63 battles across the war. Data on intrawar negotiations comes from primary and secondary sources, including McPherson (1988), Basler (1953), and others. The unit of analysis was a single month during the war. For each month, the independent variable, combat outcomes, was measured by the total number of battle victories experienced by the Union minus its battle defeats. Using casualty ratios is unfortunately impractical, as there are missing data on casualties for nearly half of the battles (see Livermore 1957). The dependent variable is categorical. If there was no change in war termination offer in a particular month, the variable was coded 0. If the Union demanded more as a condition of terminating the war, the variable was coded 1. If the Union demanded less as a condition of terminating the war, the variable was coded -1. The information perspective predicts that these two variables should be positively correlated, that as the Union does better it should demand more, and as it does worse it should demand less.

Figure 5 presents this data graphically, with the $x$-axis as time (war-months). The combat outcomes are shown on one line, and negotiating behavior on the other. Again, the information perspective would predict that these lines should move together, as combat success should cause the Union to demand more, and combat defeat should cause the Union to demand less. However, a strong null relationship is evident; though there is substantial movement in combat outcomes, reflecting the ebbs and flows of the war, there is almost
Figure 5:

Combat and Negotiations During the American Civil War

Months During War

- Union Offers
- Livermore Union Win Variable

Figure 6:

Combat and Negotiations During the American Civil War

Months During War

- Confederate Offers
- Livermore Union Win Variable
no movement in negotiation behavior. Figure 6 shows the Confederate side, where the combat outcomes line codes Confederate successes and defeats, and the negotiation line shows Confederate negotiating behavior. It also indicates variance in combat outcomes but not in negotiation behavior.

These measures of the independent and dependent variable are admittedly crude proxies. However, closer examination of the war reveals that shifts in combat fortunes across the war did not cause changes in negotiating behavior. James McPherson (1988, 857-8) outlines four major turning points in the war: the summer of 1862 after Confederate victories in the West; the autumn of 1862 after Union victories at Antietam and Perryville; the summer and autumn of 1863 after Union victories at Gettysburg, Vicksburg, and Chattanooga; and summer 1864 when high Union casualties and a stalled campaign in Virginia seemed to push the Union war effort to the brink of collapse.

Yet, none of these turning points marked the hypothesized change in war termination offers. The sole exception might be the Union victory at Antietam, after which President Lincoln raised the Union war termination demand with the Emancipation Proclamation, which freed the slaves in Southern states. However, Antietam did not reveal a decisive Union military advantage, as casualties were about even and the outcome was not a rout of the Confederate army, and Lincoln himself was not reassured by the outcome at Antietam (Donald 1954, 150). Further, the Emancipation Proclamation was itself more an expression of Lincoln’s doubts about Union fighting power rather than confidence. His main motivation for the Proclamation was his hope that freeing the slaves would increase Union military power by encouraging blacks in north and south to undermine the Confederate war effort and support the Union. As Lincoln told his cabinet, emancipation “was a military necessity
absolutely essential for the salvation of the Union, that we must free the slaves or be ourselves subdued” (Beale 1960, vol. 1, p. 70).

A principal reason why neither side changed its war termination offers over the course of the war was concern about the other side credibly committing to comply with a settlement of the issues. The conflict over slavery descended to war in part because of Lincoln’s concern about the slave states’ willingness to abide by the terms of possible settlements like the 1860 Crittenden Compromise. If the national government made concessions on slavery to avoid secession and war, slave states would likely renege on this commitment and continue to demand more. Lincoln wrote one Republican congressman in January 1861, “if we surrender, it is the end of us, and of the government. They will repeat the experiment upon us ad libitum. A year will not pass, till we shall have to take Cuba as a condition upon which they will stay in the Union” (Basler 1953, vol. 4, 172). On the Confederate side, their concern was that if they made concessions on sovereignty, the Union would likely renege on any commitment for a moderate peace, as Radical Republicans would force through a harsh reconstruction (Coulter 1950, 553; McPherson 1865, 307). This explains at least in part why the Confederates refused to consider concessions at the only formal peace negotiation meeting during the war, at Hampton Roads in February 1865, when Confederate military fortunes seemed doomed because of a string of military defeats (such as the capture of Atlanta and Fort Fisher and Shermans march to the sea) and the exhaustion of the Confederate war economy.

The Franco-Prussian War is a final example. The war began in July 1870, after Otto von Bismarck maneuvered France into war over a diplomatic slight. The war proceeded well for Prussia, with a string of important victories at Metz, Sedan, and elsewhere. As the
information perspective forecasts, Prussia began to raise its war aims as it achieved early victories, especially towards seeking territorial gains from France (Kolb 1989, 154). Interestingly, however, Prussia’s desire for territorial gains were driven by credible commitment concerns; they perceived France as an enduring threat, and saw territorial acquisition as one means of making the French commitment not to attack in the future more credible by making it more difficult (costly). As Bismarck told a French representative, “Over the past 200 years France has declared war on Prussia thirty times and you will do so again; for that we must prepared, with a territorial glacis between you and us” (quoted in Wawro 2003, 227). Elsewhere, Bismarck stated that Strasbourg would become Prussia’s “Gibraltar” (Kolb 1989, 152, 213), and that Strasbourg was “the key to our house” (quoted in Howard 1962, 231-2).

By early December, a Prussian victory in arms seemed at hand, yet contrary to the expectations of the information perspective the French refused to budge on making the territorial concessions which Prussia demanded. Michael Howard (1962, 371) commented in his classic study of the war, “By all the normal customs of warfare observed by the regular armies and the traditional statesmen of Europe, the defeats suffered by the French armies between 30th November and 5th December should have made the [French] Government of National Defence sue for peace; and it was assumed by the Germans and by Europe that they would do so. ...In military logic there now seemed no prospect of defeating the Germans, nor was there any reason to suppose that a prolongation of the war would secure a more favorable peace. The struggle was kept alive only by the will and the energy of a few men at the centre of power, who inflexibly refused to admit defeat.”

---

6 Thanks to Philipp Fuerst for translation.
Part of the French motivation in rejecting a negotiated peace was the desire to inflict absolute defeat on Prussia, and thereby achieve a solution to the Prussian threat which did not rely on an incredible Prussian commitment not to attack. French Minister of War Léon Gambetta wrote in a private letter in early January 1871, “The whole country understands and wants a war to the end, without mercy, even after the fall of Paris...The simplest clearly understand that since the war has become a war of extermination covertly prepared by Prussia for thirty years past, we must, for the honour of France and for our security in the future, finish for good this odious power...We shall prolong the struggle to extermination” (quoted in Howard 1962, 372-3).

6 Conclusions

This paper has presented the first theory which formally models bargaining and strategic behavior before, during, and after war. This is an important though logistically modest improvement over previous bargaining models of war, which examined behavior only before and during war. By endogenizing the decision to comply with a war ending agreement, we construct a bargaining model of war which is consonant with the general international relations notion that compliance with international agreements should not be assumed as automatic, but is rather the product of state choice.

Our model produces a number of propositions, including most centrally an important limitation on the principle of convergence. We found that when a belligerent fears that its adversary may defect on a war-ending settlement, the new information the fearful state gathers from combat outcomes may not cause it to change its war termination offer towards
seeking a limited outcome. Rather, it may pursue an absolute war outcome, believing that only the elimination of the opponents sovereignty will truly solve the postwar compliance problem. We presented empirical evidence consistent with this theoretical argument, including summaries of existing quantitative research, description of the frequency of absolute war outcomes, and case studies of the American Civil War, the Korean War, the Franco-Prussian War, and World War II.

A next step is to conduct more extensive tests especially on war termination behavior. More comprehensive empirical tests will require widespread, systematic data on combat outcomes during war and on war termination offers, as well as data on variables likely to correlate with fears of defection on war-ending agreements. These data will permit more direct tests of the hypothesis that concerns with postwar defection affect intrawar negotiation behavior, and specifically the relationship between combat outcomes and war termination behavior.
References


7 Appendix: Proofs

7.1 D: Reattack or Honor

\[ U_d(\text{Reattack}) = (d_i + I\theta)(1 - 2c_d) + (1 - d_i - I\theta)(-2c_d) \]

where \( i = \{h, l\} \) and \( I = 1 \) if \( \alpha \) and \( I = -1 \) if \( 1 - \alpha \).

\[ U_d(\text{Honor}) = 1 - \gamma_{2A} - c_d \]

where \( \gamma_{2A} \) denotes the offer A makes after winning the first battle when it has a credible threat of attack conditional on rejection.

7.2 A: Attack\textsubscript{2} or Retreat

7.2.1 \( d_h \) Only

\[ U_a(\text{Att}_{2}) = d_h(-2c_a) + (1 - d_h)(1 - 2c_a) \]

\[ U_a(\text{Ret}) = -c_a \]

A will Attack\textsubscript{2} when \( U_a(\text{Att}_{2}) \geq U_a(\text{Ret}) \) or when

\[ d_h \leq 1 - c_a \]  \hspace{1cm} (A.1)

7.2.2 \( d_h \) and \( d_l \)

\[ U_a(\text{Att}_{2}) = \lambda^R_4[d_h(-2c_a) + (1 - d_h)(1 - 2c_a)] + (1 - \lambda^R_4)[d_l(-2c_a) + (1 - d_l)(1 - 2c_a)] \]

A will Attack\textsubscript{2} when \( U_a(\text{Att}_{2}) \geq U_a(\text{Ret}) \) or when

\[ d_h \leq \frac{1 - c_a - d_l(1 - \lambda^R_4)}{\lambda^R_4} \]  \hspace{1cm} (A.2)

7.3 A: Offer \( \gamma_2 \)

7.3.1 \( d_h \) Only

Perfect appeasement buys \( (d_h + \theta) \) with \( \gamma_{2A}^{h+\theta} \) where A indicates that (A.1) holds.
\[ U_d(\text{Rej}_2|\text{Att}_2) = d_h(1 - 2c_d) + (1 - d_h)(-2c_d) \]

\[ U_d(\text{Acc}_2, \text{Honor}|\text{Att}_2) = 1 - \gamma_{2A}^{h+\theta} - c_d \]

\[ U_d(\text{Acc}_2, \text{Reattack}|\text{Att}_2) = (d_h + \theta)(1 - 2c_d) + (1 - d_h - \theta)(-2c_d) \]

\[ \gamma_{2A}^{h+\theta} \] must satisfy \[ U_d(\text{Acc}_2, \text{Honor}|\text{Att}_2) \geq U_d(\text{Rej}_2, \text{Reattack}|\text{Att}_2) \] for \( h + \theta \), or

\[ \gamma_{2A}^{h+\theta} = 1 - \theta + c_d - d_h \tag{A.3} \]

Partial appeasement satisfies \[ U_d(\text{Acc}_2, \text{Honor}|\text{Att}_2) \geq U_d(\text{Rej}_2, \text{Reattack}|\text{Att}_2) \] for \( h - \theta \) and \[ U_d(\text{Rej}_2, \text{Honor}|\text{Att}_2) \geq U_d(\text{Acc}_2, \text{Reattack}|\text{Att}_2) \] for \( h + \theta \) with \( \gamma_{2A}^{h-\theta} \). (A.4) satisfies the first inequality and (A.5) satisfies the second.

\[ \gamma_{2A}^{h-\theta} \leq 1 + \theta + c_d - d_h \tag{A.4} \]

\[ \gamma_{2A}^{h-\theta} > 1 - \theta + c_d - d_h \tag{A.5} \]

\[ \gamma_{2A}^{h-\theta} \] must also be more attractive to \( h - \theta \) than direct rejection, so it must also satisfy

\[ 1 - \gamma_{2A}^{h-\theta} - c_d \geq d_h(1 - 2c_d) + (1 - d_h)(-2c_d) \]

such that \[ \gamma_{2A}^{h-\theta} \leq 1 + c_d - d_h \]. A then makes the highest offer that satisfies these three constraints, which is

\[ \gamma_{2A}^{h-\theta} = 1 + c_d - d_h \tag{A.6} \]

No appeasement constitutes demanding the whole disputed good such that \( \gamma_{2A}^{\emptyset} = 1 \). Given definitions of \( \gamma_{2A}^{h+\theta} \), \( \gamma_{2A}^{h-\theta} \), and \( \gamma_{2A}^{\emptyset} \), A makes each offer under the following conditions.

\[ U_a(\gamma_{2A}^{h-\theta}) \geq U_a(\gamma_{2A}^{\emptyset}) \]

\[ U_a(\gamma_{2A}^{h-\theta}) = \alpha[(d_h + \theta)(-2c_a) + (1 - d_h - \theta)(1 - 2c_a)] + (1 - \alpha)(\gamma_{2A}^{h-\theta} - c_a) \]

\[ U_a(\gamma_{2A}^{\emptyset}) = d_h(-2c_a) + (1 - d_h)(1 - 2c_a) \]

This constraint holds when
\[ \alpha \leq \frac{c_a + c_d}{c_a + c_d + \theta} \quad (A.7) \]

\[ U_a(\gamma_{2A}^{h+\theta}) \geq U_a(\gamma_{2A}^{h-\theta}) \]

\[ U_a(\gamma_{2A}^{h+\theta}) = \gamma_{2A}^{h+\theta} - c_a \]

The inequality holds when

\[ \alpha \geq \frac{\theta}{c_a + c_d + \theta} \quad (A.8) \]

\[ U_a(\gamma_{2A}^{h+\theta}) \geq U_a(\gamma_{2A}^{\emptyset}) \]

This constraint holds when

\[ \theta \leq c_a + c_d \quad (A.9) \]

When (A.1) does not hold, if \( d_h \) accepts any offer, it gets at best \( 1 - \gamma_2 - c_2 \) or the whole good at cost \( 2c_d \), so \( U_d(\text{Rej}_2|\text{Ret}) = -c_d > U_d(\text{Acc}_2|\text{Ret}) \). Thus \( d_h \) always rejects and forces \( A \) to retreat.

### 7.3.2 \( d_h \) and \( d_l \)

The terms of each relevant utility are identical to those for \( d_h \) except for the substitution of \( d_l \), so the offers are derived analogously. When (A.2) holds, perfect appeasement of the low type buys \( (d_l + \theta) \) with \( \gamma_{2A}^{l+\theta} \), which must satisfy \( U_d(\text{Acc}_2, \text{Honor}) \geq U_d(\text{Acc}_2, \text{Reattack}) \) and \( U_d(\text{Acc}_2, \text{Honor}) \geq U_d(\text{Rej}_2) \).

\[ \gamma_{2A}^{l+\theta} = 1 - \theta + c_d - d_l \quad (A.10) \]

Partial appeasement buys \( (d_l - \theta) \) but not \( (d_l + \theta) \) with \( \gamma_{2A}^{l-\theta} \), derived in identical fashion to \( \gamma_{2A}^{h-\theta} \) above.

\[ \gamma_{2A}^{l-\theta} = 1 + c_d - d_l \quad (A.11) \]

Again, no appeasement is achieved with \( \gamma_{2A}^{X} = 1 \). Given these definitions, \( A \) makes each offer under the following conditions.

\[ U_a(\gamma_{2A}^{l-\theta}) \geq U_a(\gamma_{2A}^{\emptyset}) \]
\[ U_a(\gamma_{2A}^{l-\theta}) = \lambda_3[d_h(-2c_a) + (1 - d_h)(1 - 2c_a)] + (1 - \lambda_3)[(d_l + \theta)(-2c_a) + (1 - d_l - \theta)(1 - 2c_a)] + (1 - \alpha)(\gamma_{2A}^{l-\theta} - c_a) \]

\[ U_a(\gamma_{2A}^{X}) = \lambda_3[d_h(-2c_a) + (1 - d_h)(1 - 2c_a)] + (1 - \lambda_3)[d_l(-2c_a) + (1 - d_l)(1 - 2c_a)] \]

The constraint holds when

\[ \alpha \leq \frac{c_a + c_d}{c_a + c_d + \theta} \]  \hspace{1cm} (A.12)

\[ U_a(\gamma_{2A}^{l+\theta}) \geq U_a(\gamma_{2A}^{l-\theta}) \]

The constraint holds when

\[ U_a(\gamma_{2A}^{l+\theta}) = \lambda_3[d_h(-2c_a) + (1 - d_h)(1 - 2c_a)] + (1 - \lambda_3)(\gamma_{2A}^{l+\theta} - c_a) \]

\[ U_a(\gamma_{2A}^{h-\theta}) \geq U_a(\gamma_{2A}^{l+\theta}) \]

The constraint holds when

\[ \alpha \leq \frac{\lambda_3(c_a + c_d) + (1 - \lambda_3)(\theta - d_h + d_l)}{\lambda_3(\theta + c_a + c_d)} \]  \hspace{1cm} (A.14)

\[ U_a(\gamma_{2A}^{h+\theta}) = U_a(\gamma_{2A}^{l+\theta}) \]

True when

\[ \alpha \geq \frac{\theta}{\lambda_3(c_a + c_d + \theta)} \]  \hspace{1cm} (A.15)

\[ U_a(\gamma_{2A}^{h+\theta}) \geq U_a(\gamma_{2A}^{X}) \]

True when

\[ d_h \leq \frac{c_a + c_d - \theta + d_l(1 + \lambda_3)}{1 - \lambda_3} \]  \hspace{1cm} (A.16)
True when

\[ d_h \leq \frac{\lambda_3(c_a + c_d - \theta) + d_l(1 - \lambda_3)}{1 - \lambda_3} \]  

(A.17)

\[ U_a(\gamma_{2A}^{h+\theta}) \geq U_a(\gamma_{2A}^{l-\theta}) \]

True when

\[ \alpha \geq \frac{d_h(1 - \lambda_3) - \theta - d_l - \lambda_3}{(1 - \lambda_3)(c_a + c_d + \theta)} \]  

(A.18)

\[ U_a(\gamma_{2A}^{X}) \geq U_a(\gamma_{2A}^{l+\theta}) \]

True when

\[ \theta \geq c_a + c_d \]  

(A.19)

\[ U_a(\gamma_{2A}^{X}) \geq U_a(\gamma_{2A}^{h-\theta}) \]

True when

\[ \alpha \geq \frac{c_a + c_d + (1 - \lambda_3)(d_h - d_l)}{\lambda_3(c_a + c_d + \theta)} \]  

(A.20)

\[ U_a(\gamma_{2A}^{h-\theta}) \geq U_a(\gamma_{2A}^{l-\theta}) \]

True when

\[ \alpha \geq \frac{\lambda_3(d_l - c_a - c_d) + d_h(1 - \lambda_3)}{\theta + 2c_a - \lambda_3(2\theta - c_a) - (1 - d_l)(1 + \lambda_3)} \]  

(A.21)

When (A.2) does not hold, A will retreat rather than fight both types. If A retreats, D does strictly better by rejecting and forcing a retreat: \[ U_d(\text{Rej}_2) = 1 - c_d > U_d(\text{Acc}_2). \]

When \( \frac{1 - c_a - d_l(1 - \lambda_5)}{\lambda_5} < d_h \leq 1 - c_a, \) A will attack if \( d_h \) rejects but not if both types reject. Therefore, \( d_l \) always rejects any offer and forces A to retreat, since \( U_d(\text{Rej}_2 | \text{Ret}) = 1 - c_d > U_d(\text{Acc}_2 | \text{Att}_2). \) The best \( d_l \) can do by accepting is \( 1 - 2c_d, \) and \( d_h \) also has no incentive to defect from this strategy, since \( 1 - c_d \) is strictly better for it as well.

### 7.4 A: Attack 1 or Quit

For any combination of region and strategies in the equilibrium space, A’s utility for quitting is always zero, \( U_a(\text{Quit}) = 0. \) Conditional on A’s willingness to attack if \( \gamma_2 \) is rejected, the equilibrium space is divisible into five regions.

**Region 1** A buys \( h - \theta \) if only \( d_h \) Rej 1 and \( l - \theta \) if both Rej 1
Region 2  A buys $h - \theta$ if only $d_h$ Rej$_1$ and $h + \theta$ if both Rej$_1$

Region 3  A buys $\emptyset$ if only $d_h$ Rej$_1$ and X if both Rej$_1$

Region 4  A buys $h + \theta$ if only $d_h$ Rej$_1$ and $l + \theta$ if both Rej$_1$

Region 5  A buys $h + \theta$ if only $d_h$ Rej$_1$ and $h + \theta$ if both Rej$_1$

7.4.1 Region 1

If only $d_h$ Rej$_1$,

$$U_a(Att_1) = d_h(-c_a) + (1 - d_h)(-c_a + \alpha[(d_h + \theta)(-c_a) + (1 - d_h - \theta)(1 - c_a)] + (1 - \alpha)\gamma_{2A}^{h-\theta})$$

A will Att$_1$ when

$$\theta < \frac{c_a(\alpha + d_h[1 - 2\alpha + \alpha d_h]) - \alpha c_a^2(1 - d_h) - (1 + c_d - d_h)(1 - \alpha)(1 - d_h)}{\alpha c_a(1 - d_h)} \quad (A.22)$$

If both types Rej$_1$

$$U_a(Att_1) = \lambda_2[d_h(-c_a) + (1 - d_h)(-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a))] + (1 - \lambda_2)[d_l(-c_a) + (1 - d_l)(-c_a + \alpha((d_l + \theta)(-c_a) + (1 - d_l - \theta)(1 - c_a)) + (1 - \alpha)\gamma_{2A}^{l-\theta})]$$

A will Att$_1$ when

$$\theta < \frac{1}{\alpha(1 - d_l)(1 - \lambda_2)} \times [(1 - d_l)^2 + c_d(1 - \alpha)(1 - d_l)(1 - \lambda_2) - \lambda_2(d_h - d_l)(2 - d_h - d_l) - c_a(1 + \alpha + \alpha d_l(\lambda_2 - 1) - \lambda_2(-1 + \alpha + d_h))] \quad (A.23)$$

7.4.2 Region 2

If only $d_h$ Rej$_1$, A will attack when Inequality (A.22) holds.

If both types Rej$_1$

$$U_a(Att_1) = \lambda_2[d_h(-c_a) + (1 - d_h)(-c_a + \gamma_{2A}^{h+\theta})] + (1 - \lambda_2)[d_l(-c_a) + (1 - d_l)(-c_a + \gamma_{2A}^{l+\theta})]$$

A will Att$_1$ when

$$\theta < 1 + d_h + c_d = \frac{c_a}{1 - d_l - \lambda_2(d_h - d_l)} \quad (A.24)$$
7.4.3 Region 3

If only $d_h$ Rej$_1$

$$U_a(\text{Att}_1) = d_h(-c_a) + (1 - d_h)(-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a))$$

A will Att$_1$ when

$$c_a < \frac{1}{2 - d_h} - d_h$$  \hspace{1cm} (A.25)

If both types Rej$_1$

$$U_a(\text{Att}_1) = \lambda_2(d_h(-c_a) + (1 - d_h)[-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a)]) + (1 - \lambda_2)(d_l(-c_a) + (1 - d_l)[-c_a + d_l(-c_a) + (1 - d_l)(1 - c_a)])$$

A will Att$_1$ when

$$c_a < \frac{(d_l - 1)^2 - \lambda_2(d_h - d_l)(2 - d_h - d_l)}{2 - \lambda_2 d_h - (1 - \lambda_2)d_l}$$  \hspace{1cm} (A.26)

7.4.4 Region 4

If only $d_h$ Rej$_1$

$$U_a(\text{Att}_1) = d_h(-c_a) + (1 - d_h)(-c_a + \gamma_{2A})$$

A will Att$_1$ when

$$\theta < \frac{c_d(1 - d_h) - c_a(1 - d_l(1 - \lambda_2) + d_h\lambda_2) - (d_h - d_l)(2 - d_h - d_l)(1 - \lambda_2)}{1 - d_h}$$  \hspace{1cm} (A.27)

If both types Rej$_1$

$$U_a(\text{Att}_1) = \lambda_2(d_h(-c_a) + (1 - d_h)[-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a)]) + (1 - \lambda_2)(d_l(-c_a) + (1 - d_l)(-c_a + \gamma_{2A}))$$

A will Att$_1$ when

$$\theta < c_a + c_d$$  \hspace{1cm} (A.28)
7.4.5 Region 5

If only \( d_h \) Rej, A will Att when Inequality (A.51) holds.

If both types Rej, A will Att when Inequality (A.38) holds.

7.5 A: Offer \( \gamma_1 \)

7.5.1 Region 1

When Att if both Rej, \( d_h \) always rejects, but \( d_l \) mixes in order to render A indifferent over attacking and quitting in the face of a rejection. Let \( d_l \) reject the offer with probability \( p_1 \) and let A quit with probability \( q_1 \). Also, define A’s first offer in Region 1 as \( \gamma_1^{p_1} \).

\[
U_d(\text{Acc}_1) = 1 - \gamma_1^{p_1}
\]

\[
U_d(\text{Rej}_1) = q_1(1) + (1 - q_1)(d_l(1 - c_d) + (1 - d_l)(-c_d + \alpha((d_l + \theta)(1 - c_d) + (1 - d_l - \theta)(-c_d)) + (1 - \alpha)(1 - \gamma_1^{l,\theta}))
\]

\( q_1 \) must solve \( U_d(\text{Acc}_1) = U_d(\text{Rej}_1) \).

\[
q_1 = 1 + \frac{\gamma_1^{p_1}}{c_d(d_l - 2) - (1 - d_l)(1 - \alpha\theta - d_l)}
\] (A.29)

Recall that \( U_a(\text{Quit}) = 0 \).

\[
U_a(\text{Att}_1) = p_1(\lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + (1 - d_h)(1 - c_a)) + (1 - \lambda_1)(d_l(-c_a) + (1 - d_l)(-c_a + \alpha((d_l + \theta)(1 - c_a) + (1 - d_l - \theta)(1 - c_a)) + (1 - \alpha)\gamma_1^{l,\theta}))
\]

\( p_1 \) must solve \( U_a(\text{Quit}) = U_d(\text{Att}_1) \).

\[
p_1 = \frac{\gamma_1^{p_1}(1 - \lambda_1) + \lambda_1 - \lambda_1(2 - d_h)(c_a + d_h)}{(1 - \lambda_1)(\gamma_1^{p_1} + (1 - d_l)(1 - \alpha\theta + c_d(1 - \alpha) - d_l)) + c_a(1 + \alpha - \alpha d_l))}
\] (A.30)

A then chooses the highest value of \( \gamma_1^{p_1} \) that satisfies Equations (A.29) and (A.30).

When Att, if \( d_h \) or both types Rej, A can chooses to buy both types, buy only \( d_l \), or force both types to reject. The size of the offer \( \gamma_1 \) that buys both types must render \( d_h \) indifferent over accepting now to end the game and rejecting on the way to being partially appeased later.

\[
U_d(\text{Acc}_1) = 1 - \gamma_1^{h,h-g}
\]
\[ U_d(\text{Rej}_1) = d_h(1 - c_d) + (1 - d_h)(-c_d + \alpha((d_h + \theta)(1 - c_d) + (1 - d_h - \theta)(-c_d)) + (1 - \alpha)(1 - \gamma^{h-\theta}_{2A})) \]

The offer \( \gamma^{h-\theta}_1 \) that solves \( U_d(\text{Acc}_1) = U_d(\text{Rej}_1) \) is

\[ \gamma^{h-\theta}_1 = c_d(2 - d_h) + (1 - d_h)(1 - \alpha \theta - d_h) \quad (A.31) \]

The offer that buys only \( d_l \) and achieves separation of types must make \( d_l \) indifferent over accepting now and rejecting along with \( d_h \), in which case it is partially appeased.

\[ U_d(\text{Acc}_1) = 1 - \gamma^{l-\theta}_1 \]

\[ U_d(\text{Rej}_1) = d_l(1 - c_d) + (1 - d_l)(-c_d + \alpha((d_l + \theta)(1 - c_d) + (1 - d_l - \theta)(-c_d)) + (1 - \alpha)(1 - \gamma^{l-\theta}_1)) \]

The offer \( \gamma^{l-\theta}_1 \) that solves \( U_d(\text{Acc}_1) = U_d(\text{Rej}_1) \) is

\[ \gamma^{l-\theta}_1 = c_d(2 - d_l) + (1 - d_l)(1 - \alpha \theta - d_l) \quad (A.32) \]

A then chooses \( \arg\max \{U_a(\gamma^{h-\theta}_1), U_a(\gamma^{l-\theta}_1), U_a(O_1)\} \) where

\[ U_a(\gamma^{h-\theta}_1) = \gamma^{h-\theta}_1 \]

\[ U_a(\gamma^{l-\theta}_1) = \lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + \alpha((d_h + \theta)(-c_a) + (1 - d_h - \theta)(1 - c_a)) + (1 - \alpha)(\gamma^{h-\theta}_{2A}))) + (1 - \lambda_1)\gamma^{l-\theta}_1 \]

\[ U_a(O_1) = \lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a)) + (1 - \lambda_1)(d_l(-c_a) + (1 - d_l)(-c_a + \alpha((d_l + \theta)(-c_a) + (1 - d_l - \theta)(1 - c_a) + (1 - \alpha)\gamma^{l-\theta}_{2A}))) + (1 - \lambda_1)d_l(-c_a) + (1 - d_l)(-c_a + \alpha((d_l + \theta)(-c_a) + (1 - d_l - \theta)(1 - c_a) + (1 - \alpha)\gamma^{l-\theta}_{2A}))) \]

\[ U_a(\gamma^{h-\theta}_1) \geq U_a(\gamma^{l-\theta}_1) \text{ when} \]
\[ \theta < \frac{1}{\alpha(d_h - d_l)(1 - \lambda_1)} \times (d_h^2(1 - \lambda_1) + d_l(2 + c_d)(1 - \lambda_1) - d_l^2(1 - \lambda_1) + \lambda_1(1 + \alpha)(c_a + c_d) - d_h(2 + \lambda_1(-2 + \alpha c_a) + c_d(1 - \lambda_1(1 - \alpha))) \]  
\] (A.33)

\[ U_a(\gamma_1^{h,\theta}) \geq U_a(\emptyset_1) \text{ when } \theta < \frac{1}{\alpha(d_h - d_l)(1 - \lambda_1)} \times ((d_h - d_l)(2 - d_h - d_l)(1 - \lambda_1) + c_d(-1 - \alpha + d_h - d_l(1 - \alpha)(1 - \lambda_1) - \lambda_1(1 - \alpha)) - c_a(1 + \alpha - \alpha d_l(1 - \lambda_1) + \lambda_1(1 - \alpha - d_h))) \] (A.34)

\[ U_a(\gamma_1^{l,\theta}) \geq U_a(\emptyset_1) \text{ when } \theta < \frac{(c_a + c_d)(1 + \alpha - \alpha d_l(1 - \lambda_1) - \lambda_1(2\alpha + d_h(1 - \alpha))}{\alpha \lambda_1(1 - d_h)} \] (A.35)

When \( \text{Att}_1 \) iff only \( d_h \) Rej, both types of D reject any offer and A Quits.

### 7.5.2 Region 2

When A always Quits, both types of D always Rej.

When \( \text{Att}_1 \) iff both Rej, \( d_l \) mixes, rejecting the offer \( \gamma_1^{p_2} \) with probability \( p_2 \), while A responds by quitting with probability \( q_2 \).

\( q_2 \) solves \( U_a(\text{Acc}_1) = U_a(\text{Rej}_1) \) for type \( d_l \)

\[ 1 - \gamma_1^{p_2} = q_2(1) + (1 - q_2)(d_l(1 - c_d) + (1 - d_l)(-c_d + 1 - \gamma_2^{h+\theta})) \]

such that

\[ q_2 = 1 - \frac{\gamma_1^{p_2}}{(1 - d_l)(1 - d_h - \theta) + c_d(2 + d_l)} \] (A.36)

\( p_2 \) solves \( U_a(\text{Att}_1) = U_a(\text{Quit}) \)

\[ 0 = p_2(\lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + \gamma_2^{h+\theta})) + (1 - \lambda_1)(d_l(-c_a) + (1 - d_l)(-c_a + \gamma_2^{h+\theta}))) + (1 - p_2)(\lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + \gamma_2^{h+\theta})) + (1 - \lambda_1)\gamma_1^{p_2}) \]

such that
\[ p_2 = \frac{\lambda_1 (\gamma_1^{p2} + c_a - (1 - d_h)(1 - \theta + c_d - d_h)) - \gamma_1^{p2}}{(1 - \lambda_1)(\gamma_1^{p2} + c_a - (1 - d_l)(1 - \theta + c_d - d_h))} \]  

(A.37)

A then chooses the highest value of \( \gamma_1^{p2} \) that solves Equations (A.36) and (A.37).

**When Att\(_1\) if \( d_h \) or both types Rej\(_1\),** A can choose to buy both types, to buy only \( d_l \), or force both types to reject. The size of the offer that buys both types must render \( d_h \) indifferent over accepting now to end the game and rejecting on the way to partial appeasement later. This offer is identical to the offer \( \gamma_1^{h,h,\theta} \) in Region 1 given by Equation (A.22).

The size of the offer that buys only \( d_l \) must make \( d_l \) indifferent over accepting now and rejecting along with \( d_h \), in which case it is perfectly appeased. Call this offer \( \gamma_1^{l,h,\theta} \), which must solve \( U_{d(Acc_1)} = U_{d(Rej_1)} \)

\[ U_{d(Acc_1)} = 1 - \gamma_1^{l,h,\theta} \]

\[ U_{d(Rej_1)} = d_l(1 - c_d) + (1 - d_l)(-c_d + 1 - \gamma_1^{h,\theta}) \]

This offer is

\[ \gamma_1^{l,h,\theta} = c_d(2 - d_l) + (1 - d_h - \theta)(1 - d_l) \]  

(A.38)

A then chooses \( \text{argmax}\{U_a(\gamma_1^{h,h,\theta}), U_a(\gamma_1^{l,h,\theta}), U_a(\emptyset)\} \).

\[ U_a(\gamma_1^{h,h,\theta}) = 1 - \gamma_1^{h,h,\theta} \]

\[ U_a(\gamma_1^{l,h,\theta}) = \lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + \alpha((d_h + \theta)(-c_a) + (1 - d_h - \theta)(1 - c_a)) + (1 - \alpha)\gamma_2^{h,\theta})) + (1 - \lambda_1)\gamma_1^{l,h,\theta} \]

\[ U_a(\emptyset) = \lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + \gamma_2^{h,\theta})) + (1 - \lambda)(d_l(-c_a) + (1 - d_l)(c_a + \gamma_2^{h,\theta})) \]

\[ U_a(\gamma_1^{h,h,\theta}) \geq U_a(\gamma_1^{l,h,\theta}) \text{ when } \]

\[ \theta < \frac{1}{(1 - \lambda_1)(1 - \alpha + ad_h - d_l)} \times (d_h(1 + c_d + d_l) - d_h^2(1 - \lambda_1) - d_l(1 - \lambda_1)(1 + c_d) - \lambda_1 d_h(1 + c_d - \alpha(c_a + c_d) + d_l)) \]  

(A.39)
\[ U_a(\gamma_1^{h,\theta}) \geq U_a(\emptyset) \text{ when} \]
\[ \theta < \frac{c_a + (1 - d_h)(d_h - d_l)(1 - \lambda_1) - c_d(1 + d_l - d_h(1 - \lambda_1) - \lambda_1 d_l)}{1 - \alpha + d_h(\alpha - \lambda_1) - d_l(1 - \lambda_1)} \tag{A.40} \]

\[ U_a(\gamma_1^{l,\theta}) \geq U_a(\emptyset) \text{ when} \]
\[ \theta < \frac{(c_a + c_d)(1 - \lambda_1(1 + \alpha - \alpha d_h))}{\lambda_1(1 - \alpha)(1 - d_h)} \tag{A.41} \]

**When Att, if only d_h Rej, both types of D reject all offers and force A to Quit.**

### 7.5.3 Region 3

**When Att if d_h or both Rej,** which holds when \( c_a < \frac{1}{2 - d_h} - d_h \), the size of the offer that buys \( d_h \) must render it indifferent over accepting to end the game and rejecting, in which case it is forced into a total war by A if A wins the first battle. Call this offer \( \gamma_1^{h,\emptyset} \), which must solve

\[ 1 - \gamma_1^{h,\emptyset} = d_h(1 - c_d) + (1 - d_h)(-c_d + d_h(1 - c_d) + (1 - d_h)(-c_d)) \]

by taking the value

\[ \gamma_1^{h,\emptyset} = c_d(2 - d_h) + (1 - d_h)^2 \tag{A.42} \]

The size of the offer that buys \( d_l \) must solve a similar equation—although \( d_l \) substitutes for \( d_h \)—with the value of \( \gamma_1^{l,X} \) below.

\[ \gamma_1^{l,X} = c_d(2 - d_l) + (1 - d_l)^2 \tag{A.43} \]

A then chooses argmax\{\( U_a(\gamma_1^{h,\emptyset}), U_a(\gamma_1^{l,X}), U_a(\emptyset) \}\).

\[ U_a(\gamma_1^{h,\emptyset}) = \gamma_1^{h,\emptyset} \]

\[ U_a(\gamma_1^{l,X}) = \lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a))) + (1 - \lambda_1)\gamma_1^{l,X} \]
\[ U_a(\Theta) = \lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a)) + (1 - \lambda_1)(d_l(-c_a) + (1 - d_l)(-c_a + d_l(-c_a) + (1 - d_l)(1 - c_a))) \]

\[ U_a(\gamma_{1}^{h,\Theta}) \geq U_a(\gamma_{1}^{l,x}) \text{ when} \]

\[ c_a > \frac{\lambda_1(c_d(d_l - 2) + (d_h - d_l)(d_h + d_l - 2)) - (d_h - d_l)(d_h + d_l - 2 - c_d)}{\lambda_1(2 - d_h)} \]  \( (A.44) \)

\[ U_a(\gamma_{1}^{h,\Theta}) \geq U_a(\Theta) \text{ when} \]

\[ c_a < \frac{c_d(d_h - 2) + (d_h - d_l)(d_h + d_l - 2)(\lambda_1 - 1)}{2 + d_l(\lambda_1 - 1) - \lambda_1 d_h} \]  \( (A.45) \)

\[ U_a(\gamma_{1}^{l,x}) \geq U_a(\gamma_{1}^{h,\Theta}) \text{ when} \]

\[ c_a > -c_d \]  \( (A.46) \)

**When Att \_1** if both Rej\_1, d\_l Rej\_1 with probability \( p_3 \) and A quits with probability \( q_3 \). \( q_3 \) solves \( U_d(Acc_1) = U_d(Rej_1) \) for type \( d_l \)

\[ 1 - \gamma_{1}^{p3} = q_3(1) + (1 - q_3)(d_l(1 - c_d) + (1 - d_l)(-c_d + d_l(1 - c_d) + (1 - d_l)(-c_d))) \]

such that

\[ q_3 = 1 - \frac{\gamma_{1}^{p3}}{(d_l - 1)^2 + c_d(2 - d_l)} \]  \( (A.47) \)

\( p_3 \) solves \( U_a(Quit) = U_a(Att_1) \)

\[ 0 = p_3(\lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a)) + (1 - \lambda_1)(d_l(-c_a) + (1 - d_l)(-c_a + d_l(-c_a) + (1 - d_l)(1 - c_a)))) + (1 - p_3)(\lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a)) + (1 - \lambda_1)(d_l(1 - c_a) + (1 - d_l)(d_l(-c_a) + (1 - d_l)(1 - c_a)) + (1 - \lambda_1)\gamma_{1}^{p3}) \]

such that

\[ p_3 = \frac{\gamma_{1}^{p3}(\lambda_1 - 1) - \lambda_1(c_a(d_h - 2) + (d_h - 1)^2)}{(\gamma_{1}^{p3} - c_a(d_l - 2) - (d_l - 1)^2)(\lambda_1 - 1)} \]  \( (A.48) \)
A then chooses the highest value of $\gamma_1^{p4}$ that solves both Equations (A.47) and (A.48). 

**When always Quit**, both types of D reject all offers and force A to retreat.

### 7.5.4 Region 4

**When Att**$_1$ *iff* both Rej$_1$, $d_l$ Rej$_1$ with probability $p_4$ and A Quits with probability $q_4$. 

$q_4$ solves $U_d$(Acc$_1$) = $U_d$(Rej$_1$)

$$1 - \gamma_1^{p4} = q_4(1) + (1 - q_4)(d_l(1 - c_d) + (1 - d_l)(-c_d + 1 - \gamma l + \theta_2A))$$

such that

$$q_4 = 1 - \frac{\gamma_1^{p4}}{(1 - d_l)(1 - d_l - \theta) + c_d(2 - d_l)} \quad \text{(A.49)}$$

$p_4$ solves $U_a$(Quit) = $U_a$(Att$_1$)

$$0 = p_4(\lambda_1(d_h(-c_a) + (1 - d_h)(-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a))) +$$

$$(1 - \lambda_1)(d_l(-c_a) + (1 - d_l)(-c_a + \gamma_1^{p4} + \gamma_2A)) + (1 - p_4)(\lambda_1(d_h(-c_a) +$$

$$(1 - d_h)(-c_a + d_h(-c_a) + (1 - d_h)(1 - c_a)) + (1 - \lambda_1)\gamma_1^{p4})$$

such that

$$p_4 = \frac{\gamma_1^{p4}(\lambda_1 - 1) - \lambda_1 - \lambda_1(d_h - 2)(c_a + d_h)}{\gamma_1^{p4} + c_a - (1 - d_l)(1 - d_l - \theta + c_d))(\lambda_1 - 1)} \quad \text{(A.50)}$$

A then chooses the highest value of $\gamma_1^{p4}$ that solves both Equations (A.49) and (A.50).

### 7.5.5 Region 5

**When always Quit**, both types reject all offers and A is forced to quit if it makes an offer. No offer is made.

**When Att**$_1$ *iff* $d_h$ Rej$_1$, both types reject all offers and force A to Quit, so no offer is made here either.

**When Att**$_1$ *if* $d_h$ or both Rej$_1$, the size of the offer that buys $d_h$ must leave it indifferent over accepting now to end the game and rejecting, in which case it is bought off perfectly with $h + \theta$. Call this offer $\gamma_1^{h,h+\theta}$.

$$1 - \gamma_1^{h,h+\theta} = d_h(1 - c_d) + (1 - d_h)(-c_d + 1 - \gamma_1^{h+\theta})$$

Solving the equation yields
\[ \gamma_{1,h+h+\theta} = c_d(2 - d_h) + (1 - d_h)(1 - d_h - \theta) \] (A.51)

The offer that buys \( d_l \) by leaving it indifferent over accepting and rejecting, in which case it is bought along with \( d_h \) at \( h + \theta \) is defined above as \( \gamma_{l,h+h+\theta} \) in Equation (A.38). A then chooses the offer that satisfies \( \text{argmax}\{U_a(\gamma_{1,h+h+\theta}), U_a(\gamma_{1,l+l+\theta}), U_a(\emptyset)\} \).

\[ U_a(\gamma_{1,h+h+\theta}) = \gamma_{1,h+h+\theta} \]

\[ U_a(\gamma_{1,l+h+\theta}) = \lambda_1(d_h(-c_a) + (1 - d_h)\gamma_{2A}^{h+\theta}) + (1 - \lambda_1)\gamma_{1,l+h+\theta} \]

\[ U_a(\emptyset) = \lambda_1(d_h(-c_a) + (1 - d_h)\gamma_{2A}^{h+\theta}) + (1 - \lambda_1)(d_l(-c_a) + (1 - d_l)\gamma_{2A}^{h+\theta}) \]

\[ U_a(\gamma_{1,h+h+\theta}) \geq U_a(\gamma_{1,l+l+\theta}) \] when

\[ \theta < \frac{(1 + c_d - d_h)(d_h - d_l) - (c_d(1 + d_h - d_l) - d_l + d_h\lambda_1(1 + c_a - d_h + d_l))}{(d_h - d_l)(1 - \lambda_1)} \] (A.52)

\[ U_a(\gamma_{1,h+h+\theta}) \geq U_a(\emptyset) \] when

\[ \theta < 1 + c_a + c_d - d_h - \frac{c_d + c_a d_h}{(d_h - d_l)(1 - \lambda_1)} \] (A.53)

\[ U_a(\gamma_{1,l+h+\theta}) \geq U_a(\emptyset) \] when

\[ c_a > -\frac{c_d}{d_l} \] (A.54)