Conflict as a Part of the Bargaining Process

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Abstract

This paper investigates the use of conflict as a bargaining instrument. It first revises the arguments explaining the role of confrontation as a source of information and its use during negotiations. Then it offers evidence illustrating this phenomenon by analyzing a sample of colonial and imperial wars. The second part of the paper explores a bargaining model with one-sided incomplete information. Parties can choose the scope of the confrontation they may want to engage in: An absolute conflict that terminates the game or a limited conflict that only introduces delay and conveys information about the eventual outcome of the absolute one. It is shown that confrontation has a double-edged effect: It may paradoxically open the door to agreement when the uninformed party is so optimistic that no agreement is feasible. But it can also create inefficiency when agreement is possible but the informed agent has an incentive to improve her bargaining position by fighting.

Keywords: Conflict, Bargaining, Incomplete information, Duration analysis.

JEL codes: C41, C78, D74, J52, K41.

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"War is [...] a true political instrument, a continuation of political activity by other means."

Carl von Clausewitz, (1832), *On war.*

1 Introduction

Even in the presence of mutually beneficial settlements, disagreement is pervasive. This difficulty in reaching agreements, commonly known as the *Hicks paradox*, has specially far-reaching consequences in those contexts where disagreement entails some sort of confrontation. In legal disputes, labor negotiations or international conflicts, a failure in striking a bargain provokes losses of time and money, output, equipment and human lives. It is not surprising then that understanding the bargaining process had become a key question in Economics.

Incomplete information about critical aspects of the negotiation environment (e.g. reservation price, trial value, military power) has been systematically invoked as an explanation for this puzzle[1]. The bargaining literature contains a plethora of models that have offered important insights following this approach[2]. One should, however, remain dissatisfied with the standard incomplete information explanation. Take for instance two parties who are about to engage in a conflict. It is plausible that the role of private information in preventing an agreement between them is much less important when their observable levels of strength are very unequal[3]. But we can often observe clearly small and weak countries or individuals fighting or litigating against much larger and powerful ones. We will here refer to this also

[1] Of course, this does not need to be the unique explanation: Fernandez and Glazer (1991) show that delay can occur under full information too.

[2] For a very exhaustive survey of the literature see Ausubel et al. (2002).

[3] See Blainey (1973) and Wagner (1994).

pervasive phenomenon as the *Uneven contenders paradox*.[4]

The present paper belongs to the economic tradition considering incomplete information as a powerful factor in negotiation processes. But it also explores a complementary, and perhaps more basic, line of enquiry: In order to understand how parties reach an agreement one should understand first how they disagree. A more careful analysis of the nature of disagreement reveals that *conflict is part of the bargaining process* and not only an alternative to it. This fresh look also offers new answers to the Hicks paradox and a consistent explanation to the puzzle of Uneven contenders.

In Section 2, we lay down the arguments that explain the role of conflict as a source of information and its use as a bargaining instrument. We conclude that if, due to its informative content, confrontation can be used as a negotiation tool, some patterns revealing this use should be found in the duration and termination of real conflicts. We then offer empirical evidence indicating the existence of such patterns by performing a duration analysis on a sample of colonial and imperial wars.

Section 3 analyzes the effect of the use of conflict in negotiations by constructing a simple two-stage bargaining model with one-sided incomplete information. This model presents two main features. It allows parties to choose between two types of conflicts: *Absolute Conflict*, equivalent to an outside option and that ends the game when taken, and the *Battle* (inspired by Clausewitz's "Real" conflicts), that does not rule out the possibility of reaching a settlement. The second ingredient of the model is incomplete information: We assume that the actual balance of power is only known by one side. Because parties' winning probabilities in both types of conflicts are a function of their relative strength, the Battle conveys information about

[4] This paradox was first noted by Clausewitz (1832)[1976].

the eventual outcome of the Absolute Conflict.

Section 4 characterizes the set of equilibria of this game and presents the main result of the paper: Limited confrontations have a double-edged effect in bargaining. When excessive optimism precludes agreement, the Battle may be efficiency enhancing because it can make agreement more likely and (partially) avoid Absolute Conflict. But when agreement is *a priori* feasible, the informed agent may still trigger the Battle in order to improve his bargaining position and inefficiency is created. This sheds new light on the two paradoxes outlined above: Among the bargaining tools available to them, parties may find limited confrontations too attractive for peace to prevail. And even weak contenders may be willing to engage in conflict as a way to extract concessions from mighty opponents.

The main message of this paper is thus that ordinary bargaining and confrontation are two sides of the same phenomenon. Rather than being substitutes, they are different tools that the bargaining parties have at their reach. Unions and countries engage in labor disputes or military conflicts because these are other forms of bargaining. Conflict will be pervasive as long as its returns as a bargaining instrument outweigh those of diplomacy.

2 Conflict as a bargaining instrument

2.1 The main argument

It is a bit surprising how the economic approach to disagreement still remains strongly tailored by Nash's seminal contribution. In his description of the *bargaining problem,* Nash (1950) embeds disagreement in the threat point, meant to be the outcome of a hypothetical non-cooperative game played after parties fail to agree on how to share the surplus of cooperation.

However, no information about that game or the forces that determine the location of such point is incorporated into the description of the problem.

Several arguments put forward by political scientists and sociologists suggest that economists should take a more careful look at the nature of disagreement. This exercise reveals two important facts.

First, *the conflicts often following disagreement are driven by the relative power of the parties.* Examples are the renegotiation of the terms of a contract between a soccer player and his club; the negotiations between two countries on the division of some piece of territory; between workers and management on wages; or simply how a just married couple will share the chores. When parties fail to agree in these contexts they can resort to coercive methods; they can go to court, they can go to war or strike; they can divorce. And although the outcomes of these conflicts are typically noisy, they depend on military strengths, the extent of the union membership or the quality of the lawyers. That is, they depend on *power*. Consequently, any sensible agreement will be conditioned by how the conflict ensuing disagreement is resolved.[5]

Second, *disagreement is not only an outside option.* Parties actually choose the *scope* and intensity of the conflicts they fight when disagree: India and Pakistan have not used nuclear weapons, only engaged in skirmishes; Pepsi and Coca-cola do not fight worldwide price wars, but only national; family arguments do not necessarily imply divorce. It was Clausewitz (1832) who first made this observation and who coined the concepts (that we borrow) of *Absolute war*, uniquely intended to the destruction of the enemy,

[5] The economic literature has addressed this issue from a variety of perspectives: The papers by Horowitz (1993), Anbarci et al. (2002) and Esteban and Sákovics (2002) admit that bargaining occurs in the shadow of disagreement. However, they fail to explain the actual occurrence of conflict mainly because they share a full information set-up. Other contributions, like Banks (1990) and Bester and Wärneryd (1998), followed a mechanism design approach but treated conflict as final.

and *Real war*, "simply a continuation of political activity by other means." This distinction is critical because after a limited (non-final) confrontation, bargaining can resume. Therefore, to assume that only all-out conflicts are possible prevents us to see that conflict is part of the bargaining process[6].

Incomplete information plays a crucial role here because the imperfect knowledge of the opponent's strength turns limited conflicts into a bargaining instrument. This possibility was first noticed by Simmel (1904), who pointed out that since power is not easy to measure, the most effective deterrent of conflict, the perfect revelation of relative strength, is only possible through conflict itself. In this vein, Blainey (1973) referred to war as "the stinging ice of reality" that helps to dissolve conflicting expectations about its own outcome. The logic of the argument is summarized in the following example: Suppose that two agents are uncertain about the strength of their opponent in case of conflict, and that both parties are "strong" but believe they are facing a "weak" rival. Then, no peaceful settlement can satisfy both of them and the result of the negotiation is inevitably total confrontation. But if parties can engage in a non-final conflict whose outcome is also determined by their relative power, it will convey information about the true balance of strengths and, perhaps, open the door to agreement.

Furthering this reasoning, Wittman (1979) noted that if conflict is a source of information, disagreement might occur even if there is no optimism. A limited confrontation that makes the opponent revise her beliefs, can induce her to lower her demands. Hence, limited conflicts introduce delay when incomplete information does not preclude agreement but parties fight

[6] With a few exceptions, economists have overlooked this point. Dasgupta and Maskin (1989) explored the effect of destructive power in bargaining in a model where parties can destroy parts of the bargaining set without terminating the game. In a similar spirit to ours, Cramton and Tracy (1992) presented a model in which unions can choose the intensity of the dispute by opting between strikes and holdouts.

in order to obtain advantage at the bargaining table. This double-edged effect of conflict in negotiations is the central point of the present paper.[7]

2.2 Illustrative evidence

We next present empirical evidence illustrating the arguments outlined above. The aim of this exercise is to substantiate the claims put forward in the previous Section and to motivate the formal analysis of the next one.

If confrontation reveals information about the parties involved, some pattern in their duration and termination should indicate it[8]. Following this line of reasoning, our hypothesis here will be that whenever incomplete information is relevant, *real conflicts should display an increasing hazard rate*, that is, they should be more likely to end the more they last.

Two factors suggest that the probability of a dispute ending should increase over time. First, the returns of conflict as a bargaining tool should decrease as more skirmishes are fought because if standard Bayesian updating were employed, one additional victory would induce an increasingly negligible change in beliefs. Hence, as long as battles are costly or future rents discounted, there must exist a certain point in time from which no more lim-

[7] In International Relations, Wagner (2000) incorporated both Clauswetiz's and Blainey's ideas into an incomplete information set-up but did not carry a full formal analysis. In Economics, Mnookin and Wilson (1998) provided a model of costly pretrial discovery, a procedure that, although is not a conflict *avant la lettre*, can be used as a signaling device by the discovering party. These authors explicitly chose not to consider this possibility in their model.

[8] Several empirical studies have corroborated this point. Schnell and Gramm (1987) demonstrated the existence of a "learning by striking" phenomenon in wage negotiations, proved by the negative relation between lagged strike experience and the likelihood of further strikes. Box-Steffensmeier et al. (2003) showed that peace is more likely to break down between two states who fought a war that ended in a stalemate than when it did not and that this effect weakens over time. On the other hand, Goemans (2000) used a set of case studies from World War I to track how the estimates of several contenders about their relative strength evolved as fighting proceed. Setbacks forced them to lower their estimates whereas successes made them more optimistic and increased their demands. Interestingly enough, the author provides historical records proving that the German leadership explicitly designed their attack at Verdun not to decisively defeat the French but to influence France's estimate of its own relative strength.

ited confrontations are worth fighting. On the other hand, in the long run, the more the parties fight the sharper their estimates of the true balance of strengths, and the closer they are to a complete information scenario where agreement is immediate. These observations lead to the conclusion that the use of confrontation as a bargaining instrument is a self-limiting phenomenon. This is equivalent to the concept of positive duration dependence in the language of duration analysis.[9]

In order to investigate the possible existence of this pattern, we perform a duration analysis on a sample of 94 colonial and imperial wars that took place between 1817 and 1988. These wars were mainly caused by states aiming to expand and acquire new colonies or by dependencies trying to change their subordinate status. Hence, one can assume that the two sides were implicitly bargaining over a piece of territory or over the degree of autonomy of the non-state side. Our data come from the Extra-systemic wars dataset of the 3.0 Correlates of War (COW) project database (Sarkees, 2000). Well-known examples of these disputes are the Boer wars, the Zulu wars, the Mahdi uprising and the Algerian war of independence. A summary of the cases considered and of the changes made on the original database can be found in the Appendix B.

Without entering into too many technical details (see Appendix B), this analysis estimates the hazard rate for these conflicts by taking war duration, measured in months, as the dependent variable. A logistic functional form for this rate is assumed and estimated. This function includes several time interactions in order to investigate how the hazard rate changes over time.

We do not intend to claim that the set of Extra-systemic wars as a whole displays an increasing hazard rate. After all, duration dependence is just

[9] Note that this conclusion is reinforced if limited conflicts can themselves result in one side fully defeating the other or if they have accumulative costs.

theoretically unexplained variance. Instead, we must try to establish that any duration dependence found is due to the reasons conjectured.

If conflict was indeed used in order to change the opponents' beliefs and measures of such beliefs existed, their inclusion in the analysis would make duration dependence vanish (and the hazard rate flat). Given that such measures do not exist, we will use the termination mode of the conflict as a way to identify those cases whose hazard rate we expect to be increasing: We classify the disputes in the sample depending on whether they ended or not with a negotiated agreement. We employ the type of ending as an (imperfect) measure of the importance of the bargaining component of the conflict: Wars where confrontation was used as a bargaining tool (and therefore, for which our conjecture applies to) should be more likely to populate the agreement category. The rest of wars were mostly pure military contests where little or none bargaining took place and where incomplete information was probably irrelevant.

Because we want to analyze different termination modes, we estimate a *competing risks* model, where one hazard rate is estimated for each type of ending, Agreement vs. No agreement. We follow Bennett and Stam (1996) and Ravlo et al. (2003) when constructing the set of variables to be included as controls. For simplicity we use the same vector covariates in both risks. A positive (negative) coefficient implies that the covariate increases (decreases) the corresponding hazard rate. Again, we refer the reader to Appendix B for details.

Table 1 presents the results of the estimation of the *single risk* model (first column), that does not distinguish between the two termination modes, and of the competing risks model[10]. A quick examination of the log-likelihood

[10] In the estimation of these models we employed the 6.4 version of TDA (Transition Data Analysis), developed by Blossfled and Rohwer (1995). This software is specially designed

Table 1:

Estimates of the single and competing risks logistic hazard rate models

		Competing risks model	
Variables	Single risk model	No agreement	Agreement
Constant	-4.086 (0.360)***	-4.543 (0.512)***	-4979 (0.593)***
Average Deaths	0.264 (0.092)***	0.314 (0.117)***	0.262 (0.153)*
Stable democracy	0.158 (0.305)**	0.756 (0.431)*	-0.450 (0.475)
Military personnel	0.283 (0.397)*	-0.273 (0.642)	0.879 (0.527)*
Casualties ratio	0.888 (0.487)**	0.458 (0.689)	1.281 (0.730)*
Population	0.290 (0.345)	0.857 (0.483)*	-1.354 (1.302)
Decolonization war	-1.335 (0.299)***	-1.410 (0.443)***	-1.248 (0.429)***
Previous disputes	-0.597 (0.263)**	-0.363 (0.333)	-0.815 (0.417)**
Number of colonies	0.023 (0.011)**	0.061 (0.014)	0.047 (0.018)***
Time interaction	**0.004 (0.004)**	**-0.008 (0.006)**	**0.012 (0.005)***
Log-likelihood	-397.882	-452.329	
-2(L_{null}-L_{model})	43.249	64.431	
N	94	94	

Note: Numbers in parentheses are standard errors. One asterisk indicates p<0.10, two indicate p<0.05 and three indicate p<0.01.

shows that both models greatly improve upon the null one. The evidence however favors the competing risk approach: The data reject the hypothesis that the two cause-specific hazards are equal.[11]

We ask the reader to concentrate on the coefficient of the time interaction for the two models. As hypothesized, wars that terminated in agreement display an increasing hazard rate, captured by the positive and significant coefficient of its time interaction[12]. The wars we identified as likely sce-

for Duration analysis and it is available at http://steinhaus.stat.ruhr-uni-bochum.de/.

[11] The likelihood-ratio test statistic for this hypothesis is $2(L_{CR} - L_{SR} - N \ln \frac{1}{2})$ where L_{CR} and L_{SR} are the log-likelihood of the competing risks and single risks models respectively. The term $N \ln \frac{1}{2}$ is the adjustment factor that allows the direct comparison between the two models. This statistic equals 21.417 and and has an associated p-value< 0.02.

[12] We estimated several models with time interactions of higher order: There was no significative improvement when the quadratic and the cubic specifications were estimated.

narios for the use of confrontation in bargaining, present positive duration dependence. On the contrary, those wars that ended in the total collapse of one of the parties display a flat hazard rate. On the other hand, the single risk model finds no duration dependence at all. This result suggests that the termination modes capture differences in the aims and conduct of wars that need to be controlled for.[13]

The sharp differences in duration patterns uncovered by this analysis are consistent with the use of conflict in negotiations and support our initial hypothesis. The improvement made when moving from the single risk to the competing risks model indicates that the termination modes are supplying relevant information. On the other hand, the existence of positive duration dependence only in the case of the conflicts that ended in agreement indicates the presence of unexplained variance; a variance that is absent from the no agreement category where we did not expect conflict to be used as a bargaining instrument.[14]

3 The model

In the remainder of the paper, we explore a formal model that studies the role of conflict as a bargaining instrument. Its main ingredients are incomplete information and the coexistence of limited and final confrontations.

Consider a game, denoted by $G[\delta, \theta]$, where two risk neutral players bargain over the division of a cake worth one euro. We will assign to P1 the male gender and the female gender to P2. This game has two periods

[13] These results cannot be attributed to "Unobserved Heterogeinity" (Kiefer, 1988) since this problem cannot spuriously generate positive duration dependence.

[14] Our results contrast with the U-shaped or declining settlement rates obtained for strikes (Kennan and Wilson, 1989) and cast some doubts on the lack of duration dependence found for interstate wars by Bennett and Stam (1996), who only estimated the pooled (single risk) hazard rate for these conflicts.

$t = 1, 2$. Players are impatient and discount the future at a common factor $\delta \in (0, 1]$. There is a parameter $p \in \{p_L, p_H\}$ denoting the *relative strength* of player P1 in case of confrontation and such that $1 > p_H > p_L > 0$. P1 knows his own relative strength but it is unknown to P2, who believes at the beginning of the game that $p = p_H$ with probability $\frac{1}{2}$.

At $t = 1$, P1 chooses an action in $\{A, B, x(1)\}$, where $x(1) \in [0, 1]$ is an *offer* of the share of the cake to P2. A is the option of *Absolute Conflict* that ends the game, and B means that a *Battle* between the two players is fought, making the game proceed to $t = 2$. In that period, the only available actions are $\{A, x(2)\}$, where $x(2)$ is the share of the cake offered to P2.

P2 only moves if P1 makes an offer. In that case, her available actions are $\{$*Accept*, *Reject*$\}$. If P2 accepts, agreement is reached at that period. Rejection triggers A.

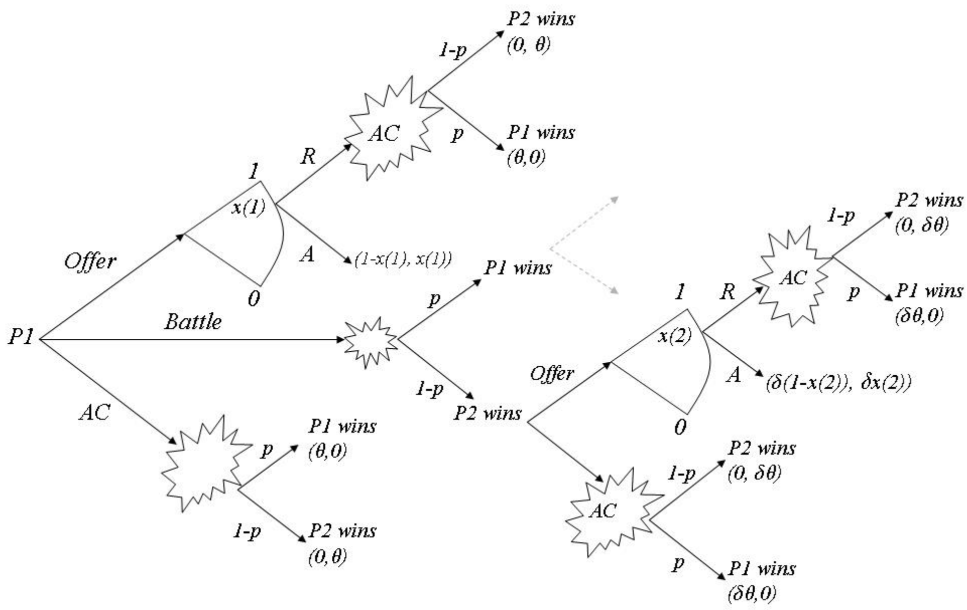
An Absolute Conflict is a "fight to the finish", a confrontation in which both parties perfectly commit to defeat their opponent.[15] Therefore, it necessarily ends the game. We model this conflict as a costly lottery whose payoffs depend on the realization of p: With such probability P1 wins and P2 is defeated. This confrontation entails a fixed loss: The value of the cake reduces to $0 < \theta \leq 1$. The payoffs from A, conditional on p, are thus

$$d = (d_1, d_2) = (\theta p, \theta(1 - p)) \qquad p = p_L, p_H.$$

On the other hand, the Battle is a conflict of limited scope that does not entail the end of the game: Nature simply announces a winner and the second period is reached. The outcome of the Battle is a function of the

[15] In these conflicts, parties aim to render the opponent defenseless, either directly or by delegating to a third party. Here we assume that this is done *directly*, like in the case of wars, so the winner is able to impose her most preferred outcome without opposition. If this were achieved *indirectly*, as in court for instance, the final outcome would only reflect the winner's maximal aspirations partially.

Figure 1: Partial tree representation of the game



relative strength p too. For simplicity, we will assume that P1's Battle winning probability is precisely p (and $1-p$ for P2).[16]

We will refer to the outcome of the Battle from P1's point of view, either *Victory* (V) or *Defeat* (D). Notice that since p is unknown to P2, *the outcome of the Battle conveys information* about the true balance of strengths.[17]

Offers constitute an additional source of information. They can be pooling, meanins that both types of P1 make them, or separating, in which case P1's true type is revealed. The key difference between these two sources of information is that whereas offers are typically used to misrepresent the own type, the outcome of the Battle is noisy but not subject to manipulation; it depends only on the parties' true relative strength.

[16]This assumption can be relaxed. It is enough to assume that the Battle winning probabilities are a function of p and that this function is known by the uninformed party.

[17]We abstract from any particular interpretation of the Battle. This comes at the price of ignoring the non-informational gains that limited confrontations can generate.

Beliefs consist of a probability distribution $\mu(\cdot \mid h(t))$ over the set of types that depends on the *history* of the game $h(t)$, that includes both the offers eventually made and the outcome of the Battle. At period t, P2's expected payoff from disagreement following history $h(t)$ is thus

$$E(d_2 \mid h(t)) = \theta(1-E(p \mid h(t))) = \theta(1-p_H \cdot \mu(p = p_H \mid h(t)) - p_L \cdot \mu(p = p_L \mid h(t))).$$

Note that if P2's beliefs after history $h(t)$ make her too optimistic about her probability of winning A, the sum of the perceived disagreement payoffs may be greater than one and this renders agreement impossible.

Definition 1 *Agreement is said to be* ***feasible*** *following history $h(t)$ whenever the sum of (expected) disagreement payoffs does not exceed the size of the cake, that is, whenever*

$$\begin{aligned} 1 &\geq E(d_2 \mid h(t)) + \theta p \\ &\geq \theta(1 - E(p \mid h(t))) + \theta p. \end{aligned} \tag{1}$$

After rearranging (1) feasibility of agreement is given by

$$Q = \frac{1-\theta}{\theta} \geq p - E(p \mid h(t)), \tag{2}$$

so the *Loss ratio* (Q) must exceed the difference between the actual and P2's expected value of p. As the Loss ratio increases even a very optimistic P2 does not expect to get much from A and agreement becomes feasible.

A strategy for P1 in this game is a function $\sigma_1(p)$ mapping the set of histories and types into the set of actions $\{A, B, x(1), x(2)\}$; similarly, a strategy for P2 is a function σ_2 mapping histories into $\{$*Accept*, *Reject*$\}$.

Now, one can apply the standard solution concept for this kind of games.

Definition 2 *A* ***Perfect Bayesian Equilibrium*** *(PBE) of the game* $G[\delta, \theta]$ *is a strategy profile* $(\sigma_1^*(p), \sigma_2^*)$ *and posterior beliefs* $\mu(\cdot \mid h(t))$ *such that* $\sigma_1^*(p)$ *maximizes P1's continuation value of the game for each* $h(t)$ *and for each type, P2 accepts* x_t *if and only if* $x_t \geq E(d_2 \mid h(t))$ *and* $\mu(\cdot \mid h(t))$ *is consistent with* $\sigma_1^*(p)$ *via Bayes' rule.*

4 Characterization of equilibria

In this Section, we first discuss the benchmark version of the game above in which P1 simply makes a take-it-or-leave-it offer to P2 and the Battle is not available. Then we characterize the PBE of the full-fledged game $G[\delta, \theta]$. In the last part of the Section, we compare these two games and discuss the role and effects of limited confrontation in bargaining.

4.1 The benchmark case

Suppose that the Battle is not available so any confrontation in the game is final. P1 can either trigger A or make a take-it-or-leave-it offer. This gives rise to two different type of equilibria, *Separating* or *Pooling.*

In a Separating equilibrium, the L-type makes a fully revealing offer. He can reveal his true type by making an offer x such that

$$1 - x \leq \theta p_H,$$

because the H-type would never make it.

In a Pooling equilibrium, both types of P1 make the same offer. In this case, given the initial beliefs, the minimal acceptable offer is simply

$$x^P = \theta(1 - \frac{p_L + p_H}{2}).$$

In the next Theorem, we characterize the Perfect Bayesian Equilibria of this game. Recall that under this solution concept we need to specify not only strategies but also P2's beliefs, including those off-the-equilibrium-path since Bayes' rule imposes no restriction on them. Throughout the paper we will support these PBE with the largest possible set of parameters by employing "optimistic" (from P2's viewpoint) beliefs when necessary.

Theorem 0 (Take-it-or-leave-it-game) *In the one-period version of the game $G[\delta, \theta]$ with no battle,*

(i) *If the Loss ratio is not too high, i.e. $Q \leq [p_H - p_L]$, there is a **Separating** PBE in which the H-type triggers A, the L-type offers $x^L = \theta(1 - p_L)$ and P2 accepts and holds beliefs $\mu(p = p_L \mid x \neq x^L) = 1$.*

(ii) *If agreement is feasible, i.e. $Q \geq \frac{1}{2}[p_H - p_L]$, then there exists a **Pooling** PBE in which both types of P1 offer x^P and P2 accepts.*

Proof. Given the previous discussion, the separating offer must be

$$x = \max\{1 - \theta p_H, \theta(1 - p_L)\},$$

because any offer to be accepted by P2 must satisfy $x \geq \theta(1 - p_L)$.

However, when $Q > [p_H - p_L]$, i.e. $1 - \theta p_H > \theta(1 - p_L)$, separation cannot be sustained because the H-type prefers to settle rather than to trigger A. He is better off by doing so even if he were to be confused with the L-type. Hence, no off-the-equilibrium path beliefs can support a Separating equilibrium in that case.

On the other hand, the necessary and sufficient condition for the pooling offer to be an equilibrium is that the H-type must prefer to make it rather than to trigger A, that is

$$1-\theta(1-\frac{p_L+p_H}{2}) \geq \theta p_H \;\Rightarrow\; Q \geq \frac{1}{2}[p_H-p_L]. \tag{3}$$

■

The main implication of this Theorem is that when no agreement is feasible, i.e. $Q<\frac{1}{2}[p_H-p_L]$, only the Separating equilibrium exists and it entails an efficiency loss: Absolute Conflict occurs half of the time because P2 is excessively optimistic when P1 is of the H-type. Full efficiency however can be recovered when agreement is feasible because an offer dominating agents' expected payoffs from Absolute Conflict exists. So when conflict is always final, confrontation occurs *only if* agreement is not feasible.

4.2 Pooling by battles

We now analyze the PBE of the game $G[\delta,\theta]$. First, we show that the equilibria characterized in Theorem 0 still exist. In order to sustain them, we will employ the following "optimistic" beliefs

$$\mu(p=p_L \mid h(1)=B)=1. \tag{4}$$

The following Corollary extends Theorem 0 to the full-fledged version of the game.

Corollary 1: *In the game $G[\delta,\theta]$ and if P2 holds the off-the-equilibrium beliefs in (4):*

*(i) If $Q\leq[p_H-p_L]$, there exists a **Separating** PBE in which at $t=1$ the L-type makes an offer and the H-type triggers A.*

(ii) If $Q \geq \frac{1}{2}[p_H - p_L]$, there exists a ***Pooling by offers*** *PBE in which both types of P1 make the same offer at $t = 1$.*

Note that the existence of these equilibria only depends on the value of Q and not on the discount rate δ.

Let us now focus our attention on the equilibria in which both types of P1 fight the Battle in order to alter P2's beliefs.

Definition 3 *A Perfect Bayesian Equilibrium of the game $G[\delta, \theta]$ is called* ***Pooling by battles*** *if both types of P1 trigger the Battle at period $t = 1$.*

The H-type is the one with more incentives to fight the Battle: It can help him to overcome the disadvantageous position he is in due to incomplete information. On the other hand, the weak type can obtain extra benefits by mimicking him, thanks to the noisy information transmitted by the Battle.

The second period of the game is final and then almost identical to the benchmark scenario; separating or pooling offers can again take place. These different equilibria will arise depending on who won the Battle. Intuitively, Victory gives more room to a pooling offer since the more pessimistic P2 is, the lower her minimal acceptable offer. Under Defeat however, P2 becomes more demanding and it is more likely that the H-type will prefer to trigger A instead. In that case, we should expect separation to prevail.

Definition 4 *A Pooling by battles PBE is called 1)* ***full*** *if in the second period both types make the same offer; and 2)* ***with partial separation*** *if both types make the same offer under V but only the L-type makes an offer under D.*

Therefore, the occurrence of pooling or separation at $t = 2$ crucially depends on P2's beliefs after the Battle. Conditional on its outcome, they are simply

$$\mu(p = p_H / \text{ Victory}) = \frac{p_H}{p_H + p_L} = q^+, \tag{5}$$

and

$$\mu(p = p_H / \text{ Defeat}) = \frac{1 - p_H}{2 - p_H - p_L} = q^-. \tag{6}$$

The importance of these beliefs will be made clear below.

In order to support the Pooling by battles profile as a PBE we will again employ "optimistic" beliefs[18]. So deviations from the equilibrium profile will convince P2 she is facing the weak opponent, that is

$$\mu(p = p_L \mid h(1) \neq B) = 1. \tag{7}$$

We are finally in the position of stating our main Theorem characterizing the Pooling by battles PBE. This characterization is made by means of the two parameters of the model, the Loss ratio, Q, and the discount factor, δ. The discount factor becomes important here because if P1 is too impatient, he may prefer to take the outside option or settle immediately.

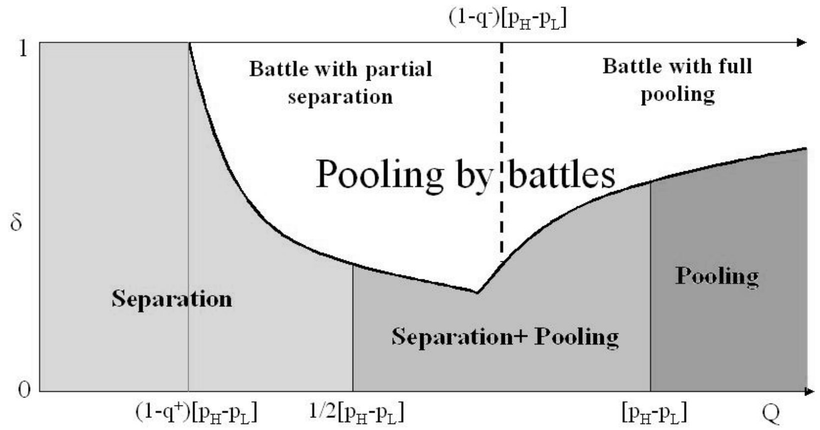
Theorem 1 (The Battle as a bargaining tool) *In the game $G[\delta, \theta]$ and if P2 holds the optimistic off-the-equilibrium beliefs in (7):*

*(i) For intermediate values of the Loss ratio ($(1 - q^+)[p_H - p_L] \leq Q \leq (1 - q^-)[p_H - p_L]$) there is a threshold discount rate $\overline{\delta}$ such that if $\delta \geq \overline{\delta}$ a **Pooling by battles** PBE **with partial separation** exists.*

*(ii) For moderately high values of the Loss ratio ($Q \geq (1 - q^-)[p_H - p_L]$) there is a threshold discount rate $\overline{\overline{\delta}}$ such that if $\delta \geq \overline{\overline{\delta}}$ a **Full pooling by battles** PBE exists.*

[18] A different set of beliefs would not change qualitatively our results.

Figure 2: Representation of the PBE characterized in Corollary 1 and Theorem 1



The proof of this Theorem and of Corollary 1 can be found in the Appendix A. Figure 2 depicts one possible configuration in the parameter space.

4.3 Discussion

Theorem 1 fully describes the taxonomy of PBE of our game. Observe that the existence of the Pooling by battles equilibrium is determined by two factors. First, the Loss ratio should be high enough; otherwise, Absolute Conflict is too attractive for the H-type. Second, the differential of strengths $[p_H - p_L]$ should not be too big, because in that case the Battle would become too informative, nor too small, because the change in beliefs induced by the Battle would become negligible.

The reader may find surprising that a *two-period separation* profile, in which the weak type settles immediately and the strong one fights the Battle, cannot be an equilibrium. The reason is straightforward: In that profile, the outcome of the Battle is totally irrelevant; whenever it takes place, P2 knows for sure she is facing the strong type. But then the weak type would deviate and fight as well unless the discount rate is very low. And this in turn would make the strong type prefer to settle immediately too. Notice that this result is quite general: it applies to versions of the game with a richer support of the type space and more than one battle. It implies that even if multiple battles were available, all types must stop fighting battles at the same time in any equilibrium.

Bur more importantly, Theorem 1 uncovers the double-edge effect of conflict in our model.

For low values of the Loss ratio ($Q < (1 - q^+)[p_H - p_L]$) the Pooling by battles profile cannot be supported under any of the two outcomes of the Battle and the H-type always triggers A. In this case, we are back in the world where the lack of feasible agreements inevitably precipitates conflict.

When the loss from A is high enough, the Battle can facilitate agreement because a defeat changes P2's beliefs enough to make agreement feasible. If a settlement was not feasible in the first place, and the discount rate is not too low, this limited confrontation can be paradoxically *efficiency enhancing:* The strong type uses the Battle to state his true strength and obtain a settlement in the second period, thus (partially) avoiding the inefficiency caused by Absolute Conflict. Meanwhile, the weak type attempts to get a concession by mimicking.

But when the value of Q is such that agreement is feasible, if P1 triggers confrontation the Battle introduces a delay that is absent from the Pooling by offers scenario. This is rational, because the Battle can grant him further advantage at the bargaining table, but it is socially inefficient.

These results offer an explanation for the pervasiveness of conflict in negotiations: The feasibility of agreement is a necessary but not a sufficient condition for a settlement to be reached. Limited or absolute confrontations will be observed not only when agreement is impossible but also whenever a settlement is feasible but the returns of resorting to conflict are higher than the returns from diplomacy.

5 Further remarks

We have presented a simple model exploring the role of conflict as part of the bargaining process, a role, we believe, that is common to many contexts. One of the main results derived from this model is the existence of a double-edged effect of confrontation in negotiations, an effect that sheds new light on some of the most puzzling aspects of real disputes.

Regarding the Uneven contenders paradox, we argued that weak agents fight much stronger ones as a way of extracting better terms from them. This happens even when these agents have little chance of victory in case of going to trial, engaging in a salvage strike or fighting an absolute war.

On the other hand, the puzzle that motivates the Hicks paradox comes from the definition of "mutually beneficial" agreements as those that dominate the outcome of an all-out conflict. This definition neglects that parties have other instruments available. An agreement may not be mutually beneficial when compared to what parties can get by fighting a skirmish that will affect their opponent's expectations. Rational agents will engage in limited confrontations whenever the returns from doing so are higher than the returns from "diplomacy".

Finally, some comments on robustness and extensions are in order. We have presented a stylized view of real-world negotiation processes that is hence potentially subject to multiple criticisms. One set of objections refers to the two-point support of the type space, the other to the particular structure of moves and information selected. Yet, we think that the simplicity of the ideas behind our model make it robust to these plausible concerns.

A richer support of the type space would of course change the exact conditions giving rise to the different PBE, but they would produce qualitatively the same results. For instance, with a continuum of types separation would entail the existence of a cut-off type such that P1 makes an offer if p is below it and triggers Absolute conflict otherwise. This threshold would vary depending on when this (partial) separation occurs and on the outcome of the Battle. But such extension would not generate new equilibria[19]. As discussed in Section 4.3, the impossibility of an equilibrium involving a two-period separation, in which weak types settle immediately and the stronger ones engage in the Battle, can be generalized well beyond our set-up.

On the other hand, as any game in extensive form, ours employs a very specific protocol that can be generalized in many possible directions. However, most of the alternatives are either intractable or do not add much to the main message of the paper. For instance, it is easy to see that increasing the number of periods, and hence the number of possible battles, has no big impact on the results, at least if p remains constant. Battles in that case would become a sort of branching process. This would in turn lead to an complex division of the parameter space in regions where different Pooling by battles profiles, contingent on the number of victories attained at each point in time, can be supported in equilibrium and coexist (let us insist that *all* types would stop fighting at once anyway). We admit that if multiple battles can make p change, results might differ substantially. However, it is not clear at all how p would vary with the events at the battlefield: Sometimes an initial defeat precipitates the collapse of the loser but others it increases her conflict effort. Still, this possibility deserves further analysis.

The reader may also argue that by assuming that every offer is final we

[19] Apart from a rather uninteresting fully revealing equilibrium in the case of a continuum of types.

avoid further signalling through rejected P1's offers. We claim that this is assumed without loss of generality: If P2 also had the option of rejecting the offer and triggering a battle, all offers would be either uninformative or accepted in equilibrium. Any informative offer would make P2 more optimistic. Therefore, P1 *cannot gain* anything from such offer.

Another modification would be to switch roles so the uninformed party is the one who makes offers. This would lead to a scenario where battles are used to screen the opponent rather than as a signaling device. This is a very interesting possibility that we intend to explore in future research. A further extension to a two-sided incomplete information framework does not seem to add enough insights to compensate the cost of increasing complexity.

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A Appendix

Theorem A *In the game* $G[\delta, \theta]$ *there exist two threshold discount rates* $\overline{\delta}$ *and* $\overline{\overline{\delta}}$ *such that*

(i) If $(1-q^{+})[p_H - p_L] \leq Q \leq (1-q^{-})[p_H - p_L]$ *and* $\delta \geq \overline{\delta}$ *then there is a* ***Pooling by battles*** *PBE* ***with partial separation*** *in which P2 accepts* $x^V(2)$ *under V and* $x^L(2)$ *under D and believes that* $\mu(p = p_L \mid h(1) \neq B) = 1$.

(ii) If $Q \geq \frac{1}{2}[p_H - p_L]$ *then there exists a* ***Pooling by offers*** *PBE in which P2 accepts* $x^P(1)$ *and her beliefs are* $\mu(p = p_L \mid h(1) = B) = 1$.

(iii) If $Q \geq (1-q^{-})[p_H - p_L]$ *and* $\delta \geq \overline{\overline{\delta}}$ *then there is a* ***Full pooling by battles*** *PBE in which P2 accepts* $x^V(2)$ *under V and* $x^D(2)$ *under D and hold beliefs* $\mu(p = p_L \mid h(1) \neq B) = 1$.

(iv) If $Q \leq [p_H - p_L]$ *a* ***Separating*** *PBE exists in which the H-type triggers A, P2 accepts* $x^L(1)$ *and holds beliefs* $\mu(p = p_L \mid h(1) \neq x(1)) = 1$.

Proof. In order to prove this Theorem, let us first consider all the possible actions that both types of P1 can take at period $t = 1$.

a) L-type triggers A: It is easy to see that for the L-type, triggering A is always a dominated action. He could instead offer $\theta(1 - p_L)$ and end up better off since P2 will accept that offer.

b) L-type makes an offer: If the H-type makes an offer too, it is easy to see that it must be the same offer (the two-type assumption precludes the construction of a fully revealing schedule of offers). Hence, we are in the Pooling by offers scenario (case (ii)). This profile can be supported as an equilibrium when condition (3) holds because the optimistic beliefs ensure that if P1 deviates from this profile he will get at most $\delta(1-\theta(1-p_L)) < 1-\theta(1-\frac{p_L+p_H}{2}) = 1-x^P(1)$.

The second option is the separating profile in which the L-type makes an offer and the H-type triggers the Battle. This one cannot be sustained as a PBE. Notice first that it would require the L-type not to mimic and battle as well, i.e. $\delta \leq \frac{Q+p_L}{Q+p_H}$. But the H-type should not prefer to offer $\theta(1-p_L)$ because it is always accepted, and this requires exactly the opposite condition! Hence, a two-period separation of types cannot be a PBE.

It only remains to consider the case where the L-type makes an offer and the H-type triggers A (case (iv)). We must check that it is not in the interest of the H-type to trigger the Battle even if P2 holds optimistic beliefs; that is, we need to check that

$$\theta p_H \geq \delta(1-\theta(1-p_L)),$$

implying the condition $\delta \leq \frac{p_H}{Q+p_L}$.

But the existence of a Separating equilibrium does not only need this condition to hold true. This profile cannot be an equilibrium when $Q \geq p_H - p_L$ since the H-type would be better of by offering $\theta(1-p_L)$ at $t=1$ than by fighting A (P2 will always accept that offer). Notice however that $\frac{p_H}{Q+p_L} \geq 1$ when $Q < p_H - p_L$, implying that the restriction on δ has no bite in this region. Therefore, only the condition $Q < p_H - p_L$ must be met in order to support a Separating PBE.

c) *L-type fights the Battle:* First we show that if the Battle is fought both types must do so. Suppose the H-type makes an offer instead. Then the weak type would be better off by mimicking him. Suppose now that the H-type triggers A but the L-type fights the Battle; for this separation to be sustainable, the H-type should not prefer to fight the Battle as well. This implies that $\theta p_H \geq \delta(1 - \theta(1 - p_L))$ is needed, or in other words

$$\delta \leq \frac{p_H}{Q + p_L}.$$

We know that this restriction has bite only when $Q > p_H - p_L$, but in that case it is not optimal for the H-type to trigger A since he would prefer to offer $\theta(1 - p_L)$. Therefore, both types must trigger the Battle. This is the Pooling by battles profile.

Now we obtain conditions that support Pooling by battles as a PBE of the game. Let us derive the pooling offers under both outcomes V and D. Given beliefs (5) and (6), one can compute the minimal acceptable offers for P2 under each outcome. Under V this offer is

$$x^V(2) = \theta[1 - (q^+ p_H + (1 - q^+)p_L)] = \theta(1 - \frac{p_H^2 + p_L^2}{p_H + p_L}),$$

whereas under D it is

$$x^D(2) = \theta(1 - p_H q^- - p_L(1 - q^-)) = \theta(1 - \frac{p_H(1 - p_H) + p_L(1 - p_L)}{2 - p_H - p_L}).$$

Note that $x^V(2) < x^D(2)$. It is immediate to see that for Pooling to be sustainable, both types must prefer to make the minimal acceptable offer $x^j(2)$ to A. The following auxiliary Lemma characterizes this necessary condition.

Lemma A1 *At the second period of the game* $G[\delta, \theta]$

(i) If $Q \geq (1-q^{-})[p_H - p_L]$, *pooling can be supported under both outcomes V and D.*

(ii) If $(1-q^{+})[p_H - p_L] \leq Q \leq (1-q^{-})[p_H - p_L]$, *pooling can be supported under V only. Under D, separation prevails.*

(iii) If $Q < (1-q^{+})[p_H - p_L]$ *pooling cannot be supported and separation occurs under both V and D.*

Proof. Let us consider the two possible outcomes of the Battle. Under V, both types will prefer to make the offer $x^V(2)$ if and only if

$$1 - \theta(1 - \frac{p_H^2 + p_L^2}{p_H + p_L}) \geq \theta p_H,$$

that can be rewritten into

$$(1 - q^{+})[p_H - p_L] \leq \frac{1-\theta}{\theta} = Q.$$

This condition is equivalent to (2) under this outcome. Similarly, under outcome D we need

$$\begin{aligned} 1 - \theta(1 - \frac{p_H(1-p_H) + p_L(1-p_L)}{2 - p_H - p_L}) &\geq \theta p_H \Leftrightarrow \\ \frac{1 - p_L}{2 - p_H - p_L}[p_H - p_L] &\leq \frac{1-\theta}{\theta} = Q, \end{aligned}$$

that note that again coincides with the condition on the feasibility of agreement under D. ∎

We also need P1 not to be so impatient he prefers to trigger A. Formally,

$$\begin{aligned} \theta p_i &\leq \delta E[v_i]; \\ \delta &\geq \frac{\theta p_i}{E[v_i]} \qquad i = L, H, \end{aligned} \tag{8}$$

where $E[v_i]$ is the expected continuation value of the game for type i. The next Lemma characterizes the set of parameters that satisfy these conditions.

Lemma A2 *There exist two threshold discount rates $\delta_1 \leq 1$ and $\delta_3 \leq 1$ such that*

(i) If pooling is only sustainable under V, condition (8) holds if and only if $\delta \geq \delta_1$.

(ii) If pooling is sustainable under both V and D condition (8) holds if and only if $\delta \geq \delta_3$.

Proof. We saw above that when $Q < (1 - q^+)[p_H - p_L]$ there is separation under both outcomes of the Battle because the H-type prefers A to the pooling offer. Given this, H-type's optimal action is to trigger A at $t = 1$. Hence, the first necessary condition for Pooling by battles to prevail is $Q \geq (1 - q^+)[p_H - p_L]$.

Once in this region, if $Q \leq (1 - q^-)[p_H - p_L]$, condition (8) reduces to

$$\delta \geq \frac{\theta p_H}{p_H(1 - x^V(2)) + (1 - p_H)\theta p_H} = \frac{1}{1 + Q - (1 - q^+)[p_H - p_L]} = \delta_1,$$

because straightforward algebra shows that if condition (8) holds for type H so it does for the type L. Note that $\delta_1 \leq 1$ whenever $Q \geq (1 - q^+)[p_H - p_L]$. This threshold is decreasing and convex in Q.

When there is pooling at both states ($Q \geq (1-q^-)[p_H - p_L]$) condition (8) boils down to

$$\delta \geq \frac{\theta p_H}{1 - p_H x^V(2) - (1-p_H)x^D(2)} = \frac{p_H}{Q + p_H - \frac{p_H(1-p_H)+p_L(1-p_L)}{(p_H+p_L)(2-p_H-p_L)}[p_H - p_L]} = \delta_3,$$

because again, only the condition for the H-type needs to be checked. Note that $\delta_3 < 1$ in this area. This threshold is also decreasing and convex in Q. Simple computations show that $\delta_1 = \delta_3$ when $Q = (1-q^-)[p_H - p_L]$. ■

There are two deviations from the Pooling by battles profile: (i) P1 triggers A in the first period; we already dealt with this possibility in Lemma A1. (ii) P1 makes an offer at that period. The following Lemma shows that if one uses optimistic out-of-equilibrium beliefs, a sufficiently high discount rate can avoid the latter deviation.

Lemma A3 *There exist two threshold discount rates* $\delta_2 \leq 1$ *and* $\delta_4 \leq 1$ *such that if P2's beliefs are* $\mu(p = p_L \mid h(1) \neq B) = 1$ *then Pooling with partial separation and Full pooling by battles constitute a PBE if and only if* $\delta \geq \delta_2$ *and* $\delta \geq \delta_4$*, respectively.*

Proof. When optimistic beliefs are used, the type with the most incentives to deviate is the L-type since the condition

$$\begin{aligned} 1 - \theta(1-p_L) &\leq \delta E[v_i]; \\ \delta &\geq \frac{1-\theta(1-p_L)}{E[v_i]}, \qquad i = L, H, \end{aligned}$$

is required and $E[v_H] \geq E[v_L]$. Hence, new thresholds on the discount rate are needed. When there is separation under D the new condition is

$$\delta \geq \frac{1-\theta(1-p_L)}{1 - p_L x^V(2) - (1-p_L)x^L(2)} = \frac{Q + p_L}{Q + p_L + q^+ p_L[p_H - p_L]} = \delta_2,$$

and

$$\delta \geq \frac{1-\theta(1-p_L)}{p_L(1-x^V(2))+(1-p_L)(1-x^D(2))} = \frac{Q+p_L}{Q+p_L+\frac{p_H(1-p_H)+p_L(1-p_L)}{(p_H+p_L)(2-p_H-p_L)}[p_H-p_L]} = \delta_4,$$

when there is pooling under both outcomes. Both thresholds are increasing and concave in Q. Easy algebra shows that $\delta_2 > \delta_4$ for any Q. ■

These conditions are summarized as follows:

$$\delta \geq \begin{cases} \overline{\delta} = \max\{\delta_1, \delta_2\} & \text{if } (1-q^+)[p_H-p_L] \leq Q \leq (1-q^-)[p_H-p_L]; \\ \overline{\overline{\delta}} = \max\{\delta_3, \delta_4\} & \text{if } (1-q^-)[p_H-p_L] \leq Q, \end{cases}$$

so if the discount rate is high enough and P2's beliefs are optimistic, neither of the two possible deviations, either A or an offer, can beat the Pooling by battles profile. ■

B Appendix

B.1 Methodology

The duration of events can be seen as a random variable T with its own distribution function[20]

$$F(t) = \Pr(T \leq t),$$

specifying the probability that an event lasts less or equal than t. Symmetrically, the survivor function

$$S(t) = 1 - F(t) = \Pr(T > t),$$

is the probability that the duration will exceed t.

[20] This subsection builds on Allison (1982) and Kiefer (1988).

The main object of interest when studying duration dependence is the **hazard rate**

$$\lambda(t) = \Pr[T = t \mid T \geq t] = \frac{f(t)}{S(t)},$$

where $f(t)$ is the density function of T. The hazard rate is thus a conditional density function. An event is said to exhibit positive (negative) duration dependence when its hazard rate increases (decreases) with duration.

We employ a *competing risks* model in order to investigate multiple termination modes. We consider two risks depending on whether contenders reached a settlement, coded as s, or one of the sides was totally defeated, coded as ns. Two risk-specific hazard rates

$$\lambda_r(t) = \Pr[T = t,\ R = r \mid T \geq t] \qquad r = s, ns,$$

are estimated, where observations whose termination mode is different from r are treated as censored at the point of termination.

Assuming that risks are independent, the overall hazard becomes

$$\lambda(t) = \sum_{r=s,ns} \lambda_r(t). \tag{9}$$

The parametric estimation procedure assumes either a functional form on $f(t)$ or a particular specification of the hazard rate directly, and then estimates $\lambda(t)$ by maximum likelihood. The latter is the common practice in discrete-time analysis like the one we perform in this paper[21]. In particular,

[21] We have some reservations against continuous-time specifications: (*i*) they often impose strong distributional assumptions on the hazard rate; and, more importantly, (*ii*) the data on wars are typically discrete. On the other hand, the Cox semiparametric specification imposes fewer restrictions than ours on the shape of the hazard rate because it is not directly estimated. But this feature makes this model less valuable when duration dependence is the main object of interest.

we assume that the hazard rate takes the logistic functional form

$$\lambda_r(t) = \frac{1}{1 + \exp -(\alpha_r X_r + \beta_r t)} \qquad r = s, ns, \tag{10}$$

where X_r is a vector of cause-specific covariates and α_r is the vector of associated coefficients. Duration dependence is captured by cause-specific coefficient β_r. This model is thus quite flexible: Contrary to other specifications (like Weibull) it does not restrict the hazard to be monotonic.

B.2 The data

The 3.0 COW Extra-systemic dataset contains 109 military disputes[22]. We dropped 16 cases due to the lack of information about some covariates. There is an ongoing debate regarding the inclusion of several conflicts (and the exclusion of others) in the database. We wanted to remain neutral in this issue so the only change we made in the composition of the sample, following Clodfelter (1992), Dupuy and Dupuy (1993) and Goldstein (1992), was to split the Franco-Dahomeyan war into two conflicts. Table 3 below contains all the cases included in the analysis.

We take one observation per war, measured at the start of the conflict. We believe that this does not seriously limit our analysis. If time-varying covariates were employed, they would not change much over time because most of them are annual measures. Moreover, as Bennett and Stam (1996) argue, the present approach allows us to predict the duration and termination mode of a conflict in a similar way to the involved parties since this was the information available to them when the war began.

[22] This data set is publicly available at http://cow2.la.psu.edu/. An Extra-systemic war is a military conflict that led to more than 1000 battle casualties and that was fought between a state and an entity that did not qualify as such (e.g. a colony, a protectorate, a tribe). A state is defined as a member of the United Nations or the League of Nations or an entity with a population greater than 500,000 and recognized by two major powers.

This dataset makes the construction of dyadic variables difficult. Measures of relative strengths or the contenders' regime-type match are not available due to the lack of information about the non-state sides. When needed, we solve this problem by assuming that all non-states were identical in a certain characteristic. While this is a strong assumption in some dimensions, it is not that implausible in others: Although not all the non-states had the same regime-type, they were mostly perceived as non-democratic by the democratic states fighting them (see Ravlo et al., 2003).

The variables employed in the analysis are:

Duration: The data from the COW dataset was cross-checked with Clodfelter (1992) and Dupuy and Dupuy (1993). When divergences appeared, we gave priority to these sources since they are more accurate[23]. When the start or end date where not precise, we took the average of the maximum and minimum possible durations.

Agreement: The sources are Clodfelter (1992), Dupuy and Dupuy (1993) and Goldstein (1992). Following the criteria employed[24], 45 out of the 94 cases considered ended in a settlement.

Average deaths: We proxy the cost of continuing conflict with the non-state's monthly average of thousands of battle casualties. The data come from the COW database, Clodfelter (1992) and Lacina and Gleditsch (2005).[25]

Stable democracy: There is evidence showing that democracies and autocracies wage war differently. Democracies are less likely to support long wars because the costs to their leaders increase over time (due to the exis-

[23] The original COW records were quite inaccurate probably because the interest of scholars has been almost exclusively centered in the Interstate wars database.

[24] We consider that a war did not end in agreement when the state completely withdrew due to a military defeat, when it stormed the capital of the opponent, or the latter totally lost its autonomy or its population was annihilated. Even very unfavorable settlements for the losers, like the acceptance of a protectorate status, are coded as agreements. Results do not change if these less clear-cut cases were coded as ending in no agreement.

[25] The inclusion instead of the state's average deaths yields almost identical results.

Table 2: Descriptive statistics of the variables considered

Variables	Minimum	Maximum	Mean	Std. deviation
Duration				
Agreement	1	165	42.47	38.11
No agreement	1	114	23.14	38.20
Independent variables				
Average Deaths	0.013	11.47	0.809	1.574
Stable democracy	0	1	0.702	0.460
Military personnel	0.005	4	0.448	0.558
Casualties ratio	0.001	0.95	0.251	0.237
Population	0.013	5.72	0.424	0.591
Decolonization war	0	1	0.277	0.450
Previous disputes	0	2	0.213	0.461
Number of colonies	0	50	19.49	15.03

tence of a public opinion and free press), so they tend to fight shorter wars than autocracies. The state's regime type can thus proxy the state's cost of war. We considered several measures of democracy proposed by Bennett and Stam (1996) and Ravlo et al. (2003). Finally, we employed a dichotomous variable coding a state as a stable democracy if at least ten years passed since it became democratic.[26]

Relative strength: Under the assumption of equal-strength across the non-state entities, measures of the state' strength can be considered as proxies for the dyadic concept of relative power. We follow Bennett and Stam (1996) and include:

(i) Population: Measures the state's population in hundred of millions.[27]

(ii) Military personnel: Measures the state's total military personnel in millions of soldiers.

[26] The basis of this measure is the widely used Polity IV Democracy score running from 0 to 10 (Marshall and Jaggers, 2000). We are aware of the potential flaws of any measure of Democracy. The Polity score focuses only on the "institutional" characteristics of a democracy and does not record other important elements like the extent of the suffrage. Within this limits, it is nevertheless a consistent measure, available for most countries since 1800. We used +3 as the cut-off to describe a state as democratic.

[27] A sharper indicator woud have been military-age population. However, such data was not available. The inclusion of urban population instead had no impact in the results.

Finally, we consider a third, truly dyadic variable:

(iii) State's casualties ratio: We divide the state's battle deaths by the total of battle deaths as a measure of the non-state's strength. Again, the data come from The COW database, Clodfelter (1992) and Lacina and Gleditsch (2005).

Decolonization war: Conflicts in the sample are too heterogeneous; they can be structurally different. Following Ravlo et al. (2003), we propose three categories: Colonial if the war was fought in the period 1816-1870; Imperial if it was fought in the period 1871-1918; and of Decolonization otherwise. Preliminary results showed that the first two categories were not statistically different. Therefore, we only included a dummy taking value 1 if the war belongs to the Decolonization period and 0 otherwise.

Previous disputes: Counts the number of disputes between the two sides in the 25 years before the war. We conjecture that more disputes make further conflicts shorter because part of the "learning" process is already done. Hence, we expect more disputes to be associated with shorter durations.

Number of colonies: When confronting a non-state entity, states may have reputational concerns with respect to other non-states they may encounter in the future or they may fear that the loss of one colony can trigger independence attempts by other possessions. This can affect their willingness to settle or to fight a protracted conflict. We follow the criteria of Ravlo et al. (2003) when calculating the number of colonies owned by each state.

Table 3:

Extra-systemic wars in the sample, 1817-1988

War name	Participants	Start year	End year	Duration (months)
British-Mahrattan	United Kingdom vs. Mahrattas	1817	1818	7
British-Kandyan	United Kingdom vs. Kandyan rebels	1817	1818	13
Turko-Persian	Ottoman Empire vs. Persia	1821	1823	23
British-Burmese of 1824	United Kingdom vs. Burma	1824	1826	24
British-Ashanti of 1824	United Kingdom vs. Ashanti tribe	1824	1826	31
Dutch-Javanese	Netherlands vs. Java kingdom	1825	1830	57
British-Bharatpuran	United Kingdom vs. Bharatpur	1825	1826	1
Russo-Persian	Russia vs. Persia	1826	1828	20
British-Zulu of 1838	United Kingdom vs. Zulu tribe	1838	1840	25
British-Afghan of 1839	United Kingdom vs. Afghan tribes	1839	1842	42
First Opium	United Kingdom vs. China	1839	1842	36
Franco-Algerian of 1839	France vs. Algerian tribes	1839	1847	99
Peruvian-Bollivian	Peru vs. Bolivia	1841	1841	1
British-Baluchi	United Kingdom vs. Sind Army	1843	1843	6
Uruguyan Dispute	France & United Kingdom vs. Uruguay	1845	1852	86
Franco-Moroccan	France vs. Moroccan resistance	1844	1844	1
British-Sikh of 1845	United Kingdom vs. Sikhs	1845	1846	3
Cracow Revolt	Austria-Hungary vs. Polish rebels	1846	1846	1
British-Sikh of 1848	United Kingdom vs. Sikhs	1848	1849	5
British-Kaffir of 1850	United Kingdom vs. Kaffirs	1850	1853	37
British-Burmese of 1852	United Kingdom vs. Burma	1852	1853	10
British-Santal	United Kingdom vs. Santals	1855	1856	12
Second Opium	France & United Kingdom vs. China	1856	1860	49
Indian Mutiny	United Kingdom vs. Indian sepoys	1857	1859	23
Argentine-Buenos Aires	Argentina vs. Buenos Aires secessionists	1859	1859	5
British-Maorin	United Kingdom vs. Maori	1860	1870	122
Spanish-Santo Dominican	Spain vs. Santo Domingo	1863	1865	15
British-Bhutanese	United Kingdom vs. Bhutan	1865	1865	10
British-Ethiopian	United Kingdom vs. Ethiopia	1867	1868	4
Spanish-Cuban of 1868	Spain vs. Cuba	1868	1878	114
British-Ashanti of 1873	United Kingdom vs. Ashanti tribe	1873	1874	14
Franco-Tonkin	France vs. Vietnam	1873	1874	3
Dutch-Achinese	Netherlands vs. Aceh sultanate	1873	1878	66
Egypto-Ethiopian	Egypt vs. Ethiopia	1875	1876	5
British-Afghan of 1878	United Kingdom vs. Afghan tribes	1878	1880	22
Bosnian	Austria-Hungary vs. Bosnia	1878	1878	2
Russo-Turkoman	Russia vs. Turkomans	1879	1881	19
British-Zulu of 1879	United Kingdom vs. Zulu tribe	1879	1879	6
Gun War	United Kingdom vs. Basuto	1880	1881	8
Boer War of 1880	United Kingdom vs. Transvaal	1880	1881	3
Franco-Tunisian of 1881	France vs. Tunisia	1881	1882	14
Franco-Indochinese of 1882	France vs. Annam	1882	1883	16
British-Mahdi	United Kingdom vs. Mahdist	1882	1885	31
Franco-Madagascan of 1883	France vs. Madagascar	1883	1885	31
British-Burmese of 1885	United Kingdom vs. Burma	1885	1886	2
Mandigo	France vs. Mandinga	1885	1886	12
Serbo-Bulgarian	Serbia vs. Bulgaria	1885	1886	4
Italo-Ethiopian of 1887	Italy vs. Ethiopia	1887	1887	1
First Franco-Dahomeyan	France vs. Dahomey kingdom	1890	1890	8

Table 3 (cont.)

War name	Participants	Start year	End year	Duration (months)
Second Franco-Dahomeyan	France vs. Dahomey kingdom	1892	1892	5
Belgian-Congolese	Belgium vs. Congo	1892	1894	16
British-Ashanti of 1893	United Kingdom vs. Ashanti	1893	1894	12
Dutch-Balian	Netherlands vs. Bali-Lombok	1894	1894	3
Franco-Madagascan of 1894	France vs. Madagascar	1894	1895	10
Spanish-Cuban of 1895	Spain vs. Cuba	1895	1898	38
Japano-Taiwanese	Japan vs. Taiwan	1895	1895	5
Italo-Ethiopian of 1895	Italy vs. Ethiopia	1895	1896	11
Spanish-Philippino of 1896	Spain vs. Philippines	1896	1898	23
Mahdi Uprising	France & United Kingdom vs. Mahdist	1896	1899	42
British-Nigerian	United Kingdom vs. Nigeria	1897	1897	1
Indian Muslim	United Kingdom vs. Indian-Muslims	1897	1898	9
American-Philippino	United States vs. Philippines	1899	1902	42
Somali Rebellion	United Kingdom vs. Mad Mullah army	1899	1905	67
Boer War of 1899	United Kingdom vs. Boer	1899	1902	32
Conquest of Kano & Sokoto	United Kingdom vs. Kano & Sokoto sultanates	1903	1903	6
South West African Revolt	Germany vs. Herero & Nama tribes	1904	1905	22
Maji-Maji Revolt	Germany vs. Tanganyka	1905	1906	11
British-Zulu of 1906	United Kingdom vs. Zulu tribe	1906	1906	4
Moroccan of 1911	France & Spain vs. Morocco	1911	1912	13
Caco Revolt	United States vs. Haiti	1918	1920	19
British-Afghan of 1919	United Kingdom vs. afghan tribes	1919	1919	2
Iraqi-British	United Kingdom vs. Iraqi Arabs	1920	1921	14
Moplah Rebellion	United Kingdom vs. Moplah	1921	1922	4
Riff Rebellion	France & Spain vs. Morocco	1921	1926	64
Italo-Libyan	Italy vs. Libya	1923	1932	107
Franco-Druze	France vs. Druze	1925	1927	23
Saya San's Rebellion	United Kingdom vs. Burmese rebels	1930	1932	18
British-Palestinian	United Kingdom vs. Palestina	1936	1939	37
Indonesian	Netherlands & United Kingdom vs. Indonesia	1945	1949	49
Franco-Indochinese of 1945	France vs. Vietminh	1946	1954	93
Franco-Madagascan of 1947	France vs. Madagascar	1947	1948	20
Malayan Rebellion	United Kingdom vs. Malaysia	1948	1957	112
Sino-Tibetan of 1950	China vs. Tibet	1950	1951	8
Franco-Tunisian of 1952	France vs. Tunisia	1952	1955	39
British-Mau Mau	United Kingdom vs. Kenya	1952	1956	39
Moroccan Independence	France & Spain vs. Morocco	1953	1956	31
Franco-Algerian of 1954	France vs. Algeria	1954	1962	90
Cameroon	France & United Kingodm vs. Cameroon	1955	1960	55
Angolan-Portugese	Portugal vs. Angola	1961	1974	165
Guinean-Portugese	Portugal vs. Guinea-Bissau	1963	1974	140
Mozambique-Portugese	Portugal vs. Mozambique	1964	1974	121
East Timorese	Indonesia vs. Timor	1975	1977	19
Namibian	South Africa vs. Namibia	1975	1988	156
Western Saharan	Mauritania & Morocco vs. Polisario	1975	1983	98