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**Title**

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**Permalink**

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**Journal**

American Journal of Political Science, 48(4)

**ISSN**

0092-5853

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**Publication Date**

2004-10-01

Peer reviewed

# How Initiators End Their Wars: The Duration of Warfare and the Terms of Peace

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*The new theories of endogenous war termination generally predict that initiators would tend to do badly the longer the war, that information acquired during the war would outweigh information available prior to its outbreak, that stronger initiators would be slower to update their estimates about the outcome, and that uncertainty would increase the expected duration of conflict. This article subjects these hypotheses to statistical testing by estimating time-accelerated log-logistic hazard models of duration and bootstrapped ordered probit models of outcome with a new data set of 104 interstate wars from 1816 to 1991. The Monte Carlo simulation results support the hypotheses and the substantive findings provide ample reason for continuing with this research agenda.*

Why do wars last as long as they do? What can an initiator expect when it starts a war? Theories of endogenous war termination show that duration and outcome are closely related to the willingness to make concessions on war aims, and that this willingness is itself determined by warfare. Leaders can, and often do, modify their demands as they update their beliefs about the strength of the adversary, its resolve, and the costs of compelling it to make concessions. They revise war aims as the expectations about the military outcome rise and fall with battlefield developments (Goemans 2000). However, in the standard empirical specification of the problem, it is assumed that war aims are exogenous to fighting (Bennett and Stam 1996; Werner 1998).

The goal of this article is to derive several hypotheses from the theories of endogenous war termination, test them with statistical techniques that account for the relationship between duration and outcome, and assess the usefulness of the theories by comparing the findings with known results. Substantively, we want to know if it is possible to form coherent predictions about the duration and outcome of wars. Because expectations about termination of war influence the desire to initiate it, explaining these

expectations would also help explain causes of wars, possibly leading to theories of prevention.

We now have theoretical studies that enable us to hypothesize about factors that determine, at least in part, how wars are fought and how they end. However, because extant empirical studies have not taken into account these theories, the analyses have methodological shortcomings that I address. Deriving hypotheses directly from formal theories of endogenous war termination has two advantages. First, we have more confidence in the observed correlations because the causal mechanism is logically sound and internally consistent. Second, we can judge the promise of these theories empirically before committing to (expensive) data collection efforts that would be necessary to probe the insights deeper. The main substantive new findings are:

- Long wars are expected to end badly for the initiator. This finding is quite robust even when tested against alternative econometric specifications and provides support for the *principle of convergence* that has emerged from the theoretical studies.
- Information acquired while fighting outweighs information available prior to the war. This lends further

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I thank Neil Beck, Ian Bellany, Kristian Gleditsch, John Freeman, Curt Signorino, Randy Stone, Robert Walker, and Christopher Zorn for valuable comments on previous drafts. I am grateful to Dan Reiter, Allan Stam, Paul Huth, and Jacob Berkovitch for sending me their data. I have also benefitted from the comments of the participants of the 2003 Geography, Conflict, and Cooperation Workshop of the European Consortium for Political Research, Edinburgh, Scotland, UK. Previous versions of this paper were presented at the 2003 annual meetings of the American Political Science Association, Midwest Political Science Association, and the Peace Science Society.

*American Journal of Political Science*, Vol. 48, No. 4, October 2004, Pp. 813–829

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ISSN 0092-5853

support to the principle and implies that prewar military indicators may be poor predictors of outcomes.

Overall, the empirical results correspond quite well to existing ones, and the new findings provide ample justification for continuing the research on endogenous war termination.

This article is organized as follows. The first section reviews some of the existing empirical literature on war duration and outcomes and identifies an unresolved puzzle. The second section outlines the theories of endogenous war termination, some of their principal predictions, and shows how they link duration to outcome. The third then presents the six hypotheses of this study, and the fourth describes the data set, the operationalization of the variables, and the research design. The fifth and sixth sections discuss the results of the statistical analysis of duration and outcomes. The seventh provides several historical examples and presents simulations of outcomes for six real wars, and finally, the last section concludes.

## The Empirical Study of Duration and Outcome

Bennett and Stam (1996) provide the first rigorous empirical investigation of the determinants of war duration by taking into account both political and military variables. They find that imbalances in military forces lead to shorter wars, as do permissive terrain and democracy. All of these findings find support in the present study, which also uses their analysis as a benchmark for the duration model.

It was recognized, however, that duration and outcome should not be treated separately from each other. Bennett and Stam (1998) provide a combined multinomial logit model where they incorporate continuation of war as one of the per-period outcomes. They find that democracies tend to get into wars they can win quickly, and if they cannot do so, they fight to a draw.

But why are democracies more likely to win? Reiter and Stam (2002) offer two possible explanations: democracies are either better at war-fighting or they select themselves into conflicts they can win. They find support for both explanations. In particular, they find that democratic initiators are more likely to win than non democratic ones, but initiators are more likely to win regardless of regime type in general. The robustness of these findings is confirmed by Clark and Reed (2003) who specify a censored probit model to account for the selection effects.

Combining duration and outcome in the econometric models could only be partially successful in the ab-

sence of theoretical foundations that would specify the precise causal mechanism linking them. To cope with this shortcoming, Werner (1998) provides an early bargaining model of war termination, which she then tests with ordered logit models. War aims, although now partially endogenized by the theory, are still treated as exogenous in the statistical specification.<sup>1</sup> She finds that regime type has no effect on the terms of the settlement, seemingly contradicting the previous findings on democracy.

The need for better models of endogenous war termination became evident, and the studies described in the next section are the theoretical foundation for this analysis. The specification offered here helps reconcile the contradictory results on initiators, duration, outcomes, and regime type. Democratic initiators do obtain better outcomes in wars but only because they start wars that tend to be short, and initiators of short wars tend to do better in general. Once the impact of regime type on duration is accounted for, there seems to be no residual impact on outcome.

## Theories of Endogenous War Termination

Leaders form expectations about what they can gain from war and weigh these benefits against the costs of obtaining them through fighting. Only leaders who are optimistic about their chances in a war will tend to initiate it. This is a well-known claim that encompasses optimism about the outcome (victory), duration (short), and costs (low) of war (Blainey 1988). However, because at least two states are required to start a war, at least one (the loser) must have been wrong in its estimates.

Within the rationalist framework, both sides may be optimistic at the same time if they possess private information about their ability to wage war. These divergent beliefs cannot be reconciled without some risk of war if there are incentives to conceal this information. A genuine risk of war always exists in crisis bargaining models that assume war is a costly lottery over outcomes (Fearon 1995; Powell 1996).

But bargaining does not end with the outbreak of war. Keckskemeti (1958), Schelling (1966), and Pillar (1983) provide early informal takes on war as a bargaining process. Building on the ideas of Clausewitz (1832) and Fuller (1961), they argue that war is a costly way to influence the expectations of the opponent. Because learning continues

<sup>1</sup> It is partially endogenized because the theoretical model is solved with complete information, and the equilibrium involves no bargaining at all—the first offer is immediately accepted.

during war, the question arises whether the costly lottery assumption is misleading, especially for information-based explanations (Wagner 2000).

It turns out that the answer depends on what assumptions are made about the process of fighting itself. Powell (2002) argues that the insights of the costly lottery model extend to intrawar bargaining if we assume one-sided asymmetric information, a protocol that allows only the uninformed player to make offers and a static distribution of power. Of course, the probability of military victory does not remain constant throughout the war. Recent models allow for a changing distribution of power by incorporating either resource constraints (Filson and Werner 2002) or military objectives (Smith and Stam 2003), with probability of ultimate victory in both cases depending on success in individual battles. From these models, which also assume one-sided bargaining, it is possible to derive the *principle of convergence*.

The principle posits that wars end when expectations about military victory converge sufficiently. It specifies the mechanism through which this convergence occurs and shows that mutual optimism is not a necessary condition to fight a war, which may explain the many cases of losing initiators. Can the principle be recovered under the alternating-offers protocol and a changing distribution of power? The answer is yes, at least for the case of finite number of types (Slantchev 2003). The following summary is based on this model, which is the most recently published one, and which compares the alternative specifications and discusses the generality of the implications.

According to the theory of endogenous war termination, states possess private information about their ability to wage war, and this information is gradually revealed through fighting. Every battlefield outcome, every rejected offer, and every unreasonable demand cause a state to update its beliefs about the strength of its adversary by inferring what types of opponents are likely to behave this way. The situation is enormously complicated by the fact that states are well aware of this process and therefore seek to manipulate these beliefs strategically.

At any point in time players balance their demands (war aims) between the gains to be had from settling on some terms and the risk of continued fighting. The terms are jointly determined by the current military position which reflects how well the state has done in the war thus far, and its evaluation of the future which reflects its beliefs about the strength of its opponent. These beliefs are continuously updated throughout the war based both on diplomatic behavior of the opponent and the outcomes on the battlefield. Thus, when players formulate proposals for peace, they engage in the well-known risk-return trade-off (Powell 1999). That is, they balance the proba-

bility of having the offer rejected at a cost of more fighting against the gains of demanding slightly more.

The current offer made by a player then is a function of its beliefs about how strong its adversary is and the current military situation. The offer is designed in such a way that weaker opponents would accept it (thus yielding a larger benefit) while stronger ones would reject it (thus risking more fighting). With time, the facts that its opponent has rejected previous offers and has yet to collapse military combine to cause the state to become more pessimistic about its chances of success. The offers begin favoring the opponent because now the state knows that it has to satisfy a stronger adversary. Further, this new evidence acquired the hard way gradually displaces the priors the state had before the war. The following section derives several testable propositions from this logic.

## **General Implications of the Theory Uncertainty and Duration**

In equilibrium, players will only delay agreement if they expect to gain from doing so. From the perspective of the uninformed player, a weak opponent (defined as one who cannot secure a favorable military outcome or impose sufficient costs) should give up more than a strong one, and the difference in the two bargains must be sufficiently large to justify screening out the opponent's type instead of simply settling with it as if it were strong. In other words, if the difference between an agreement with a weak opponent and one with a strong opponent is not large, there is no gain in delaying. This expected difference is driven by the amount of uncertainty in the uninformed player's beliefs, which is reflected in their variance (Huth, Bennett, and Gelpi 1992).

However, these beliefs are unobservable. Indeed, it is not clear that they can be operationalized at all. Given that uncertainty is unobservable, how can we construct empirical models to test a theory that relies on it? We can do this by assessing the statistical validity of certain observable implications of the model. If we receive confirmatory evidence, then it is possible to conclude that the model predicts behavior correctly, which should increase our confidence in its theoretical causal mechanism. Thus, in principle we do not even need a variable that measures uncertainty. Still, some way of getting at the amount of uncertainty would be most useful (Morrow 1989).

The asymmetric information about strength can arise from unobserved factors, such as military capabilities, effectiveness, and trustworthiness of allies. In an informationally poor environment, beliefs are critical in determining state actions. Since it is not possible to measure

beliefs, scholars have tried to infer the extent of informational problems by positing hypotheses about effects of different domestic institutions (Reiter and Stam 2002) or observable capabilities (Clark and Nordstrom 2001).

Parity in observable capabilities makes informational problems more severe by reducing the ability of states to infer their chances in war correctly because states cannot use variation in observed capabilities to infer anything about unobserved ones. Thus, informational asymmetries are great (Reed 2003), and unobserved factors can shift the balance of beliefs (Bueno de Mesquita, Morrow, and Zorick 1997). This operationalization is especially convenient for testing the effect of uncertainty predicted by the model. When there is not enough variation in capabilities, strong types can benefit from delay that reveals information about their strength, and so wars will tend to be longer:

**HYPOTHESIS 1 (UNCERTAINTY AND DURATION).** *When observable capabilities are close to parity, the incentives to delay agreement are strongest, and wars will tend to be longer.*

In the model, uncertainty is positively related to fighting, the more informationally sparse the environment, the longer the duration of conflict provided both sides want to screen their opponents and signal their types. This is different from the other common argument that posits that observable capabilities should be unrelated to the likelihood of some state backing down because states self-select into crises (war), and therefore if we observe fighting, then these factors have already been taken into account (Fearon 1994a). Thus, if Hypothesis 1 receives empirical support, it will cast doubt on the argument that selection effects render these capabilities informationally irrelevant once conflict begins.

On the other hand, using parity in military capabilities as a proxy for uncertainty, although common in the literature, raises an important question of alternative causal mechanism. It could be the case that when forces are evenly matched, the fighting is prolonged simply because neither side can defeat the other. Because both arguments predict longer wars, one must find additional implications of these mechanisms and assess their validity.

Consider the impact of new information acquired during war. The estimation of the outcome equation, which does specify prewar military balance of capabilities, shows evidence of learning through fighting. The informational perspective allows us to derive hypotheses that run counter to the straightforward reliance on military capabilities. In particular, with evenly matched states, developments on the battlefield will tend to be less informative because the probability of intermediate success in battle roughly equals the probability of failure. Thus, in-

dividual engagements will convey less information, and so war would tend to last longer. This is in keeping with the balance of capabilities argument as well.

However, evidence from low-probability events should have significant impact on the outcomes. That is, an unexpected victory (or series of victories) by a country considered weak should make the opponent more pessimistic very quickly, leading to a quick settlement. This gives a direct prediction that wars in which both sides are evenly matched in terms of military capabilities but where one side is considered weaker, would tend to end quickly if the side thought to be weak manages to achieve surprising victories on the battlefield. My data do not allow a fine test of this argument, but I give several examples in the seventh section of this mechanism in effect.

This argument, while not conclusive, should at least raise our confidence in using the parity variable as a proxy for uncertainty instead of a measurement of how able opponents are to reach a military solution.

## Information and Outcomes

The theoretical model assumes that the initiator is the uninformed party without justifying it except on tractability grounds. As discussed above, player 1 must be sufficiently uncertain about the strength of its opponent to make fighting pay off. Otherwise, it will simply settle immediately by making a generous offer to the informed player. Thus, the model requires that the initiator have optimistic beliefs if fighting is to occur in equilibrium. In other words, war will not occur unless the uninformed party makes an unreasonable demand. Players “select themselves” into conflict (Fearon 1994b). It is from this rationale that empirical initiators are identified with the uninformed player in the model.

In the bargaining equilibrium, duration of war is interpreted as a combination of screening and signaling; that is, rejected offers. The settlement (war outcome) then reflects the relative strength of opponents: An early settlement means that a weak (informed) player has accepted an offer made by the strong opponent; a late settlement means that a strong (informed) player has extracted a good offer from a weak (previously uninformed) one.

Thus, the “screening effect” in the model predicts that weak states settle sooner than strong ones. Because the initiator continually lowers its demands in an effort to balance the benefits from settling and the risk of continued fighting, the longer the war lasts, the lower the terms that it will eventually accept:

**HYPOTHESIS 2 (STRATEGIC DELAY).** *The probability of a favorable settlement for the initiator declines as the duration of war increases.*



The expectations of a player are determined by its prior beliefs and the new information that accrues during the fighting. The model specifically accounts for battlefield performance, but testing this directly requires data that are not available. Alternatively, we can use a measure that crudely captures the performance of the player relative to that of its opponent.

While absolute levels of losses of military personnel may not be a good indicator of how well one is doing in war, suffering losses at higher rates than the opponent sends the initiator a credible signal about the type of adversary it is facing. In other words, the initiator should update its beliefs that its opponent is strong much faster in these cases (Gartner 1997). Thus, for any given duration, the initiator will have become more pessimistic compared to a case where the rate of loss was more favorable and will be willing to settle for much less:

**HYPOTHESIS 3 (WARTIME INFORMATION).** *Initiators that suffer losses at rates greater than their opponents will accept worse settlements at any given time.*

Conversely, the ability to mobilize additional resources for fighting implies that some setbacks will be discounted as the state gears up for war. States that are resource-rich, and thus have high prior beliefs about their chances of success, will require more evidence before they are convinced that their prospects are poor. This effect will be strongest when the initiator enjoys a comparative advantage with respect to its adversary:

**HYPOTHESIS 4 (PRIOR BELIEFS).** *Initiators with more reserves than targets will be slower to update their beliefs in the strength of their opponents and will demand better settlements at any given time.*

In the model, both sides learn through the dual processes of fighting and bargaining. Since initial beliefs reflect the information that states have prior to starting a war, and because war ends only when the beliefs of the uninformed party converge sufficiently close to the true type of its opponent (excluding completely military solutions), it follows that information revealed through the fighting phase will precede in importance the priors.

To illustrate this idea, consider the effect of unexpected events in war. Under conditions of high uncertainty (evenly matched military capabilities), beliefs should be especially sensitive to surprise developments on the battlefield. For example, if a state generally thought to be weak wins contrary to expectations, the opponent will drastically revise its beliefs and a war that should have been long according to the balance of capabilities would not only tend to be short, but its outcome will also tend

to favor the side managing to effect the surprise. The argument is summarized in the following:

**HYPOTHESIS 5 (BELIEF UPDATES).** *Information acquired during fighting will be more important than information available prior to fighting.*

All wars are not equal. Some are isolated affairs, such as the many punitive expeditions Britain undertook against various “extrasystemic” states (e.g., the British-Abyssinian War). For at least one of the sides, such wars are low-level, low-cost efforts. There are also wars where both sides fight over territory or state integrity. These conflicts involve a somewhat more salient issue. Finally, there are those wars where national existence is at stake, such as World War II and the Wars of Italian Unification.

Conditional on having been engaged in a conflict, the side with the lower stakes also has incentives to end it sooner, and may therefore expect a worse settlement compared to a determined opponent. Thus, the expected payoff from starting such a conflict is low given some probability of winning. Conversely, when the issue is more salient, then the player can expect to be able to fight longer, even under worse circumstances.

Thus, players would initiate nonsalient conflicts only when the probability of winning is rather high. If initiators calculate their chances correctly on the average, this would imply that such conflicts would tend to end in their favor. If, on the other hand, they are compelled to fight over a more salient issue, then (because the payoff is greater), the probability of winning does not have to be that high. On the average, we should expect that initiators will settle for a bit less in these cases. This reasoning, combined in part with Hypothesis 2 above, yields the following:

**HYPOTHESIS 6 (SELF-SELECTION).** *When the contestable issue is more salient for the initiator, the outcome will tend to favor the initiator less.*

Some of these hypotheses (e.g., 4) will not be surprising, and others (e.g., 3 and 5) seem intuitive even without the model, although this article innovates in the test of the latter. However, hypotheses 2 and 6 are novel. They are also counterintuitive to the extent that few would accept them without the logic provided by the theory.

## Data and Methods

The data set consists of 104 interstate wars that have occurred between 1816 and 1991.<sup>2</sup> I follow the Correlates of

<sup>2</sup>The following general sources were used in addition to works specific to particular conflicts: Randle (1973), Dupuy and Dupuy (1985), Holmes (2001), Clodfelter (1992), and Langer (1975).

War (COW) Project's criteria but also include several wars excluded from COW due to restrictive requirements for system membership, and disaggregate several multilateral wars into a series of smaller ones (Dupuy and Dupuy 1985; Bennett and Stam 1996).<sup>3</sup>

**Duration of War.** The outbreak of war is timed either by its formal declaration, or, when this is not available, by the beginning of intentional sustained fighting (a deliberately hostile act designed to provoke war or an invasion). The ending is timed by an effected armistice, an implemented cease-fire, a preliminary treaty that ends active campaigning, a decisive battle that eliminates the opponent, or a formal capitulation. The mean war duration is 13.94 months, and the median only 5.62 months, reflecting a highly skewed distribution. Given the sparsity of observations in the upper tail of the distribution, we should expect the statistical estimates to have wider variance for longer wars because of increased uncertainty.

**Outcome of War** is an ordered categorical variable that takes one of four values: (1) *defeat*, if the initiator was exterminated or capitulated unconditionally because of inability to continue fighting; (2) *concessions*, if the initiator agreed to an armistice and concluded an agreement that was disadvantageous with respect to its war aims or the prewar status quo; (3) *gains*, if the initiator achieved most of its war aims and the post-war arrangements are more beneficial compared to the prewar status quo; (4) *victory*, if the initiator succeeded in eliminating its opponent completely or it was able to force its capitulation or unconditional surrender. There is no category for draws because even if the military contest was inconclusive, one can still determine how close the initiator came to its war aims. In keeping with the standard rational choice argument, the majority of war endings favor the initiator: 63, or 61%, compared to 41, or 39%. However, the difference is not overwhelming.

## Principal Explanatory Variables

**Military Parity** measures the absolute value of difference in the army sizes, scaled between 0 and 1. The result is subtracted from 1 so that lower values represent severe power asymmetries and thus least uncertainty, and higher values power distributions approaching parity, and thus most uncertainty. This variable has a mean (and median) of .51, with a standard deviation of .29.

<sup>3</sup>I account for the extent of a country's involvement in a particular war by recording actual committed military personnel, and, if a country is simultaneously involved in more than one war, the approximate share of resources dedicated to each war.

**Reserve Parity** is measured analogously, with total population substituting for army size. It has a mean of .48, a median of .50, and a standard deviation of .29. The two measures are not highly correlated.

Predicted Duration of War (in months) comes from the duration models. Because the theory makes predictions about factors that should affect duration, it is possible to construct a model that does just that. On the other hand, there might be concerns about endogeneity if we test the hypotheses about outcomes using observed duration as an explanatory variable. To deal with this, I use the duration model to generate predictions about the length of each war and then use these predicted values in the models of war outcomes. As I explain later, this necessitates bootstrapping the second estimation to account for the uncertainty in the predicted durations.

**Prewar Balance of Reserves.** While the number of mobilized troops is important, state capacity to sustain the war effort by fielding even more is also instrumental in determining outcomes. I proxy potentially available resources by the relative size of populations of the warring sides by computing the ratio of the initiator's total population to the sum of its population and that of its opponent.<sup>4</sup> This variable has a mean of .57 (median .60) and a standard deviation of .29.

**Prewar Military Balance.** I use the size of the army as a proxy for ability to project military power. Using the pre-war numbers is appropriate when we want to predict the outcome based on prior information only. Instead of discounting for distance, I use the number of troops involved at the outbreak of hostilities, not the total size of the national army, unless there was no other conflict that the state was involved in at the time and the war was close to its home territory. This variable is defined as the ratio of initiator's army size to the total number of military personnel involved. It has a mean of .60 (median .64) and a standard deviation of .27.

**Rate of Loss.** To measure the relative rate of loss for the initiator, I compute the ratio of its military dead to its total military personnel and divide the result by the total rate of losses for both sides. This variable has a mean of .35 (median .27) and a standard deviation of .30. Lower values of this variable mean that the initiator's relative losses are much lower than its opponent's.<sup>5</sup>

<sup>4</sup>The conventional measure uses the National Composite Capabilities index developed by Singer, Bremer and Stuckey (1972). However, for many of the wars in this sample, most of the necessary data are missing.

<sup>5</sup>Because the rate of loss is partly derived from military forces, we might expect a strong correlation between them that may cause instability in the regression coefficients and inflated standard errors. Despite a correlation of .75, it is not excessively high because

**Issue Salience.** Using the classification in Holsti (1991), I identify the most important stakes over which states went to war and categorize them according to the following scheme: If the issue was regime/state survival, national liberation, or autonomy, I assign it the highest salience; if it involved territory, integrity of state, or honor/ideology, I assign it medium salience; finally, if it involved maintaining an empire, commercial disputes, or policy, I assign it no salience. This variable has three categories and equals 2 if the issue was more salient for the initiator than it was for the target, 1 if the issue was equally salient for both, and 0 if it was not salient.

### Control Variables

**Total Military Personnel** measures the total size of the armies (in thousands of personnel) involved in a war using the immediate pre-war numbers. **Total Population Reserves** measures the total size of the populations (in billions) of the warring sides using the immediate pre war numbers. **Terrain** measures the difficulty of terrain over which a war is fought using the procedures in Stam (1999). Higher values represent more difficult terrains, which should be associated with longer wars. **Contiguity** uses the COW contiguity score that ranges from 1 (land contiguity) to 6 (not contiguous by up to 400 miles of water) to measure the difficulty of supplying the war over long distances. **Number of States** measures the total number of states involved in each war following Blainey's (1988) argument that more actors imply longer wars. **Pre-armistice Negotiations** is an indicator variable and is set to 1 if there were either direct pre-armistice negotiations, or a third-party intervention to impose a solution, or a cease-fire arranged by an international organization. **Democratic Initiator** uses the Gurr, Jagers, and Moore (1989) "institutionalized democracy" score to identify democracies. It ranges from 0 (noncompetitive participation, closed executive recruitment, and minimal constraints on the executive) to 10 (full political participation, elective executive, and substantial constraints on the executive). This dummy variable equals 1 if the POLITY democracy score was at least 6 and 0 otherwise. There are 22 cases of democratic initiators. **Losses by Democratic Initiator.** Studies suggest that public opinion is sensitive to absolute levels of casualties and that support for war

declines as the war continues (Mueller 1973; Gartner and Segura 1998). Since public opinion plays such an important role in the literature on the impact of absolute losses, and because democracies are arguably less able to contain the effect of bad news, I include an interaction term that captures the interplay of regime type of the initiator and its losses (measured as the total number of military dead).

### Research Design

To analyze war duration, I use a data set that consists of one observation per war, for a total of  $N = 104$  observations. The dependent variable measures the duration of war in months. I use a time-accelerated log-logistic hazard model with robust standard errors. This is a parametric model that assumes that individual durations have the same distribution up to a transformation of the time scale.<sup>6</sup> Because the empirical hazard rate is decreasing, we can use the Weibull, gamma, or log-logistic distributions for the unknown baseline hazard. The Akaike Information criterion for the log-logistic has the smallest value which means that this functional form is superior to the others.

To analyze the determinants of war outcomes, I use the same data set as for the duration models but with the added variable *predicted duration*, which measures predicted war duration for each observation. The predictions are not data because they have their own standard errors. This uncertainty can be incorporated in the second model by bootstrapping techniques. First, I draw a sample (with replacement) from the original data set. The number of observations in that sample is the same as the number in the original data set. I then estimate the duration model and generate predicted values for each observation in the sample. Next, I estimate the outcome model using the predicted values from the previous step as one of the explanatory variables. I save the estimated coefficients and then repeat the whole process  $K = 1000$  times. This generates  $K$  estimates for each coefficient from which we can compute expected values and confidence intervals.

The dependent variable in the outcome model is categorical, but also ordered. Theoretically, the observable outcome represents an unobserved underlying continuous variable, which is the true outcome. Assuming

precision of estimates is halved at around .9. To determine whether multicollinearity will be a problem for estimation, I calculated the variance inflation factors (VIF). Chatterjee, Price, and Hadi (1999) recommend two rules of thumb for detection of multicollinearity: (1) the largest VIF must be greater than 10; and (2) the mean VIF must be considerably larger than 1. The largest VIF was 3.66, while the mean was only 1.84.

<sup>6</sup>To check if the proportional hazards assumption is violated (Box-Steffensmeier and Zorn 1998), I performed a test on the Schoenfeld residuals from a Cox regression. Because two of the control variables reveal some evidence of nonproportionality, I use the parametric specification instead. However, using the Cox model does not alter the substantive findings. All variables retain their statistical significance and direction.



that this latent variable is distributed normally, the appropriate modeling technique is ordered probit (Maddala 1983). Thus, for the analysis of outcomes, I use an ordered probit model with robust (Huber-White) standard errors for each of the bootstrap estimations.

In ordered probit, the marginal effects of the regressors do not equal the coefficients, and even their directional effect generally depends on the location of the cut-points. The change in regressors in effect shifts the entire distribution over the cut-points and thus whether this leads to an increase or decrease in the probability for each category depends on where the cut-points are (except for the first and last categories). To interpret the substantive significance of the findings, I use Monte Carlo simulations. This approach allows the computation of point estimates and standard errors while taking into account both estimation and fundamental uncertainty (King, Tomz, and Wittenberg 2000).

### Analysis of War Duration

Table 1 presents the results from three models of duration. The baseline model includes only the two measures of uncertainty: military and reserve parity. While obviously misspecified (note the failure to clear the traditional threshold of significance for the  $\chi^2$  test), the model serves as a baseline to track the changes in significance of these two variables. Although military parity is both strongly statistically significant and has the impact predicted by the theory, reserve parity is in the “wrong” direction. However, its statistical significance is only marginal and disappears completely in the full specification.

The second model adds the two territory variables. Both are statistically significant and have the expected effects. For example, the conditional probability of continuing a war after a year jumps from 15% for land contiguous states to 55% for noncontiguous states.

**TABLE 1 Analysis of War Duration. Accelerated-Time Failure Log-Logistic Duration Models. Robust Standard Errors in Parentheses**

	Baseline	Territory	Full
Military parity	1.8939*** (.6435)	1.4408*** (.5443)	1.1677** (.5372)
Reserve parity	-1.2975* (.6638)	-.6289 (.5717)	-.6821 (.5315)
Terrain		3.2125*** (.6914)	3.3729*** (.7150)
Contiguity		.2489*** (.0705)	.2571*** (.0717)
Number of states			.1357** (.0674)
Total population reserves			-.5976 (.6685)
Total military personnel			.0000 (.0001)
Democratic initiator			-.7547** (.3163)
Constant	1.2572*** (.3924)	-1.6570** (.6698)	-1.7626** (.7087)
Gamma	.9440 (.0629)	.8029 (.0500)	.7560 (.0512)
N	104	104	104
$\chi^2$	9.12	43.62	94.11
DF	2	4	8
Prob. > $\chi^2$	.0105	<.0001	<.0001
Log likelihood	-199.8374	-182.4247	-176.7221

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .10$ .

Terrain difficulty has a very strong substantive effect on the expected duration of war. The probability that a war will last longer than a year when fought over a very permissive terrain is about 5% and then quickly goes to zero. In contrast, the analogous probability for wars fought over difficult terrain is over 70%, and the decline is gradual and very slow, remaining over 10% for even the longest war in the data set. This finding confirms the effect of terrain that Bennett and Stam (1996) found in their duration model with time-varying covariates.

Adding the variables for number of participants, democratic initiators, total reserves, and total military personnel improves the fit of the model substantially, and the first two variables are statistically significant. Increasing the number of participants results in longer wars. For example, the probability that war will continue after one year when there are only two states fighting is 25%. This number doubles when there are six states involved. This supports Blainey (1988) and contradicts the results in Bennett and Stam (1996).

Democratic initiators tend to fight shorter wars, which confirms analogous findings in previous studies (Bennett and Stam 1998; Clark and Reed 2003). The probability of a war continuing over a year when initiated by a democracy is less than 10% while the corresponding probability for a war initiated by a nondemocracy is close to 25%. Although it is beyond the scope of this article to investigate this, it is encouraging that the results concur with robust empirical regularities in the literature (Reiter and Stam 2002).

The findings for the other two variables only partially concur with those of Bennett and Stam (1996), which accord strong significance to the total military forces and none to total population. Still, it is noteworthy that even in the presence of these variables, military parity retains its strong statistically discernible impact, while reserve parity fails to achieve any.

Aside from looking at the log-likelihoods, there is no commonly accepted way of measuring the goodness of fit of duration models. Bennett and Stam (1996) suggest several measures that might improve our sense of how well the model explains variations in our data. Table 2 presents some goodness of fit measures for the duration model.

The model appears to be doing relatively well. The predicted average duration is 8.55 months, as opposed to the empirically observed 13.94. The medians, on the other hand, are quite close, showing that the model is accounting for the skewed distribution of observed durations. The model is capable of predicting both short and long wars although it is decidedly better at predicting the short ones.

**TABLE 2** Goodness-of-Fit of the Duration Model

Variable	Mean	Median	Std. Dev	Min	Max
Observed	13.94	5.62	20.94	.03	103.27
Predicted	8.55	4.79	10.22	.40	52.38
Error	-5.39	-.41	18.99	-93.78	36.08
Absolute Error	10.34	3.78	16.79	.03	93.78

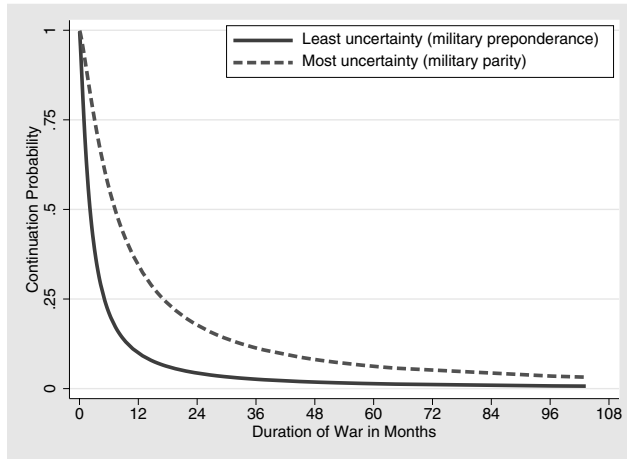
A closer look of the fit is provided by the error, which is simply the difference between the predicted and actual durations. We see that in general the model tends to underestimate duration by a median of less than a month. Bennett and Stam (1996) prefer to measure the absolute value of the error, which I report in the last row of Table 2. The best model in their article predicts with a mean absolute error of 13 months, which is a little worse than the 10 months of this model. The median absolute error, which they treat as an even better measure, is 5.1 months in their model against 3.78 months in the present one. There are only eight covariates in the model used to generate these statistics, while there are 17 covariates in their specification. These numbers should not be treated as critique of Bennett and Stam's (1996) work, but rather as a basis on which to form an idea about the fit of the present model in comparison to the best model of duration currently available.<sup>7</sup>

To analyze the implications for Hypothesis 1, refer to Table 1. Reserve parity loses its marginal statistical impact in the fully specified model, and thus its "wrong" sign is of no consequence for the analysis. Military parity retains its statistical significance, suggesting that military uncertainty has a strong effect on the expected duration of war. Figure 1 demonstrates the effect of varying military uncertainty from its minimum value of .016 (military preponderance) to its maximum of 1 (military parity).

As the theory predicts, higher levels of uncertainty result in longer wars. For example, the conditional probability that a war continues after a year is less than 10% when there is least uncertainty and over 40% when there is most uncertainty. This supports Hypothesis 1 and provides the basis for the analysis of war outcomes based on the predicted duration of war from this model.

<sup>7</sup>It is not possible to estimate their model on the full sample of 104 wars in the present data set because of missing data. The improved fit may be due to more observations and more precise data. We can markedly improve the fit without change in substantive conclusions if we include the interaction terms of some explanatory variables with the natural log of time, a technique suggested by Box-Steffensmeier and Zorn (1998). Not surprisingly, when we include a transformation of the dependent variable in the list of covariates, the statistical fit of the model improves dramatically.

**FIGURE 1 Effect of Uncertainty on Duration**



**Analysis of War Outcomes**

The estimates and confidence intervals reported in this section are from a two-stage estimation. The first stage is the estimation of the duration model for a random sample from the original data. The second stage is the estimation of the outcome model using the predicted duration from the first stage. Bootstrapping produces larger standard errors that reflect the uncertainty from the first stage of the estimation. Table 3 shows that all five principal explanatory variables are statistically significant at the 95% confidence level: The confidence intervals do not include zero. Even with the large additional uncertainty from the

**TABLE 3 Analysis of War Outcomes. Ordered Probit Models with Bootstrapped 95% Confidence Intervals**

	Estimate	Confidence Interval
Predicted duration of war	-0.0387	(-0.0777, -0.0091)
Prewar balance of reserves	2.0776	(1.0560, 3.2214)
Prewar military balance	-2.3228	(-4.0052, -0.8020)
Rate of loss	-2.5839	(-3.8620, -1.3479)
Issue salience	-0.4862	(-0.9317, -0.1029)
Pre-armistice negotiations	-0.3678	(-0.8698, 0.0706)
Democratic initiator	-0.0463	(-0.5486, 0.5000)
Losses by democratic initiator	-0.0086	(-0.0866, 0.0228)
cut point 1	-3.9254	(-5.3935, -2.6098)
cut point 2	-2.3533	(-3.6291, -1.2134)
cut point 3	-0.8152	(-2.0336, 0.3183)

**TABLE 4 Observed and Expected Predicted War Outcomes**

Observed	Predicted				Total
	Defeat	Conc.	Gains	Victory	
Defeat	4	5	2	0	11
Concessions	3	17	9	1	30
Gains	0	7	24	6	37
Victory	0	0	9	17	26
Total	7	29	44	24	104
Correct	63 (61%)				
Modal	37 (36%)				
Error reduction	39%				

bootstrapping, predicted duration retains its significance as well.

Although low predictive ability does not necessarily indicate a bad fit of the model (Greene 2000), we still want to know how much we can improve upon guessing the outcome randomly or choosing the modal category in the sample. Table 4 presents the predictive capabilities of the fully specified model. The predictions are the expected values of the bootstrapped estimation.

Overall, the model performs quite well given the imprecise data, the many outcomes it has to account for, and the fact that one of the principle explanatory variables is itself generated from another statistical model with additional uncertainty. The model always outperforms random selection (which would pick the correct outcome 25% of the time because there are four outcomes) and modal selection, which is the best we can do without our multivariate model. The modal category is *gains* with 37 observations, yielding an expected correct prediction 36% of the time. The model predicts correctly 63 observations, or 61%, with a confidence interval between 53 and 73 correct predictions. The proportional reduction in error is quite significant: 39%.<sup>8</sup> Another strength of the model is that its predictions are not too far off. It never predicts victory when the realization is defeat. Similarly, the model never predicts defeat or concessions when the realization is victory. The model predicts 36 outcomes unfavorable to the initiator when the true number is 41, and 68 favorable ones, when the true number is 63.

<sup>8</sup>The proportional reduction in error is one common way to determine whether a less restricted model adds explanatory power compared to some restricted null model. The PRE of using the full model *F* over the restricted model *R* is computed with the formula  $PRE = 1 - (ERROR_F / ERROR_R)$ . It is the ratio of wrong predictions by the full model to wrong prediction by the restricted one.

One surprise that emerged from these models is the direction of the effect of prewar military balance. An advantage in raw numbers does not translate directly into better outcomes for the initiator. As we shall see, the population ratio seems to be a much better predictor that is statistically significant, and substantively very strong. The puzzling effect of the military balance can be explained by taking the rate of loss into account. These two variables are highly correlated, and a large army often implies a large number of casualties. The rate of loss has the expected dampening effect, and it swamps the advantage of having a large army.

Engaging in pre-armistice talks has no statistically discernible impact on the outcome. This finding should be treated with caution because most wars in the data set ended without such talks. However, given the last half-century trend of using such negotiations, newer data sets might uncover its impact yet.

Democracy fails to achieve statistical significance by itself or jointly with the interaction term with losses. Democracy does not have an impact on the outcome separate from its significant effect on duration. Thus, democracies seem to wage shorter wars, which is why they end up appearing more successful overall.

### Prewar Capabilities and New Information

Figure 2 presents four panels of Monte Carlo simulation results for varying model parameters, as explained below. The other variables are held at their median values for a war between nondemocracies over an equally salient issue without pre-armistice talks. The horizontal axis plots the duration of war for up to nine years. The vertical axis represents the probabilities associated with the four different outcomes. For each simulated war duration, the four probabilities sum to one.<sup>9</sup>

I present four scenarios with different balances of reserves and loss rates for the initiator. To simulate advantage (disadvantage) in reserves, I hold the variable at the 75th (25th) percentile of the sample data. To simulate a favorable (unfavorable) loss rate, I hold the variable at the 25th (75th) percentile.

<sup>9</sup>The figures show only the expected values of the probabilities without confidence intervals to reduce clutter. Generally, the confidence intervals for defeat widen, especially after the third year, while those for victory become narrower. This reflects the substantial uncertainty in estimating longer wars due to the dearth of such observations in the data. In most cases the confidence intervals for these two outcomes do not overlap too much, and we can therefore be relatively confident in the estimates of the associated probabilities.

All four panels show strong support for Hypothesis 2. Long wars tend to end badly for the initiator regardless of the rate of loss and the prewar balance of reserves. The speed with which its fortunes are expected to decline varies depending on the initiator's capabilities and its performance during the fighting. The decline always occurs nonetheless, sometimes dramatically fast. For example, under most favorable conditions for the initiator (top right panel), the probability of a favorable outcome (victory or gains) drops from over 95% to about 75% within two years. Under least favorable conditions (bottom left panel), it plummets from close to 30% initially to a little over 5% within the same time period. Conversely, the probability of defeat begins rising almost immediately after the beginning of war in all cases.

### Rate of Loss

The rate of loss exhibits a very strong impact on the expected outcome of war. States that obtain a favorable outcome in war will have generally suffered casualties at rates much lower than their opponents. This contrasts sharply with the inconclusive findings in previous empirical studies of the relationship between casualties and outcome.

To examine the predictions of Hypothesis 3, compare any of the two top panels in Figure 2 with its corresponding bottom panel. Consider, for example, the case where the initiator fights under a reserve disadvantage (left panels). When the rate of loss favors the initiator, the probability of a favorable outcome is over 50% for the first two years of the war. Initiators can prolong low-casualty conflicts for quite a while before outcomes are affected adversely.

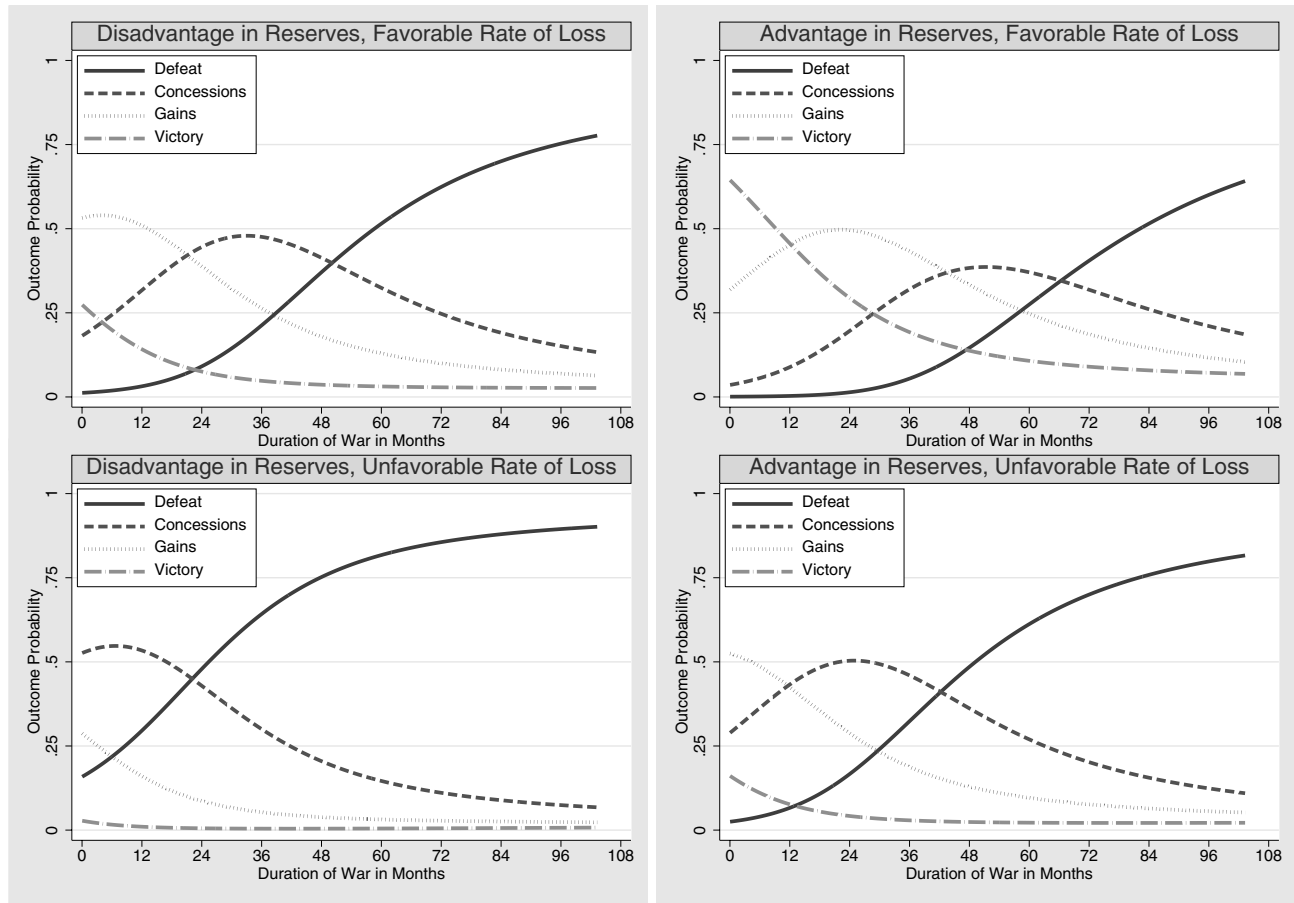
Contrast this with a conflict in which the initiator suffers casualties at rates much higher than its opponent. From the very outset, the probability of a favorable outcome is about 30% and declines precipitously within one year. The probability that the initiator would have to settle for an unfavorable outcome always exceeds the probability of a favorable outcome from the very beginning of the war.

This supports Hypothesis 3: when the initiator suffers losses at rates that exceed that of its opponent by a wide margin, it realizes that it is facing a strong adversary much sooner, and thus it is prepared to accept worse terms for any given duration.

### Balance of Reserves

To assess the impact of the prewar balance of reserves, compare any of the two left panels in Figure 2 with the corresponding right panel. This shows the effect of

**FIGURE 2** Effect of Reserves and Rate of Loss



reserves while holding the other variables (the rate of loss in particular) constant. Consider, for example, the case where the initiator has a favorable rate of loss (top panels). When it fights with a prewar disadvantage in reserves, the probability of a favorable outcome starts at about 80% and is overtaken by the probability of an unfavorable outcome in two years.

Contrast this with a similar conflict in which the initiator begins with a favorable balance of reserves. The starting probability of a favorable outcome is over 95% and the corresponding shift to a higher probability of an unfavorable outcome does not occur until after the fourth year. Most tellingly, the probability of victory remains over 50% for an entire year, while it never exceeds 30% in the other case.

This supports Hypothesis 4. The effect of having a favorable balance of reserves is enormous: It allows the initiator to fight twice as long before its expected fortunes decline sufficiently. Having a prewar advantage in reserves makes the initiator less accommodating. For any given duration, the probability that the initiator will de-

mand and receive better terms is higher when it enjoys a favorable balance of reserves than when the balance favors its opponent.

### Impact of New Information

While the balance of reserves captures the prior beliefs, the rate of loss reflects information learned through fighting. I expect that while the prewar balance of reserves has a positive impact on the terms of the settlement, as predicted by Hypothesis 4, its effect will be outweighed significantly by an adverse rate of loss, as predicted by Hypothesis 5.

To examine this prediction, compare any of the two pairs of diagonal panels in Figure 2. Consider, for example, the case in the top-left panel where the initiator begins relatively pessimistic (disadvantage in reserves) but the new information is optimistic (favorable rate of loss). The probability of a favorable outcome starts at about 80% and is overtaken by the probability of an unfavorable outcome in two years.



Contrast this with the case in the bottom right panel where the initiator begins relatively optimistic (advantage in reserves) but the new information is pessimistic (unfavorable rate of loss). The probability of a favorable outcome starts a bit lower at about 70% but it is overtaken by the probability of an unfavorable outcome twice as fast (within a year).

This supports Hypothesis 5: the information acquired during the conflict outweighs the information available prior to it. This is reflected in the different speed with which initiators update their beliefs. When they begin with an optimistic assessment, the unfavorable new information doubles the rate at which they offer concessions compared to the case when they begin with a pessimistic assessment and the favorable new information makes them less willing to yield.

### Issue Salience

To gauge the relative impact of the salience variable for Hypothesis 6, I held all other variables at their median values for a nondemocracy and a war with no pre-armistice negotiations. I then simulated outcome probabilities for a war over a nonsalient issue for the initiator and compared the results with a simulation of a war over an issue that is more salient to the initiator than its opponent.

The substantive impact of salience is quite large. When the initiator starts a war over a nonsalient issue, the probability of a favorable outcome exceeds the probability of concessions or defeat for the first three years of the war. In contrast, when the initiator starts a war over an issue more salient to itself, the corresponding period is less than two years. When a war over a nonsalient issue lasts a year, the probability of victory drops from 45% to 25%, compared to a drop from 25% to less than 10% when the war is over a salient issue. Similarly, the probability of defeat rises above 25% after four years of fighting over a nonsalient issue compared to three years of fighting over a salient issue.

This supports Hypothesis 6: When the the issue is more salient to the initiator, the likelihood of an outcome that will favor it is lower regardless of the duration of fighting.

For example, consider the British experience in the Sudan following the conquest of Egypt in 1883. Much to British surprise and consternation, the Dervishes proved capable opponents. Their repeated defeats of imperial forces culminated with the fall of Khartoum in January 1885 and the failure of the relief expedition. Having decided that the conflict was not worth it, politicians quickly manufactured an excuse to withdraw all the troops

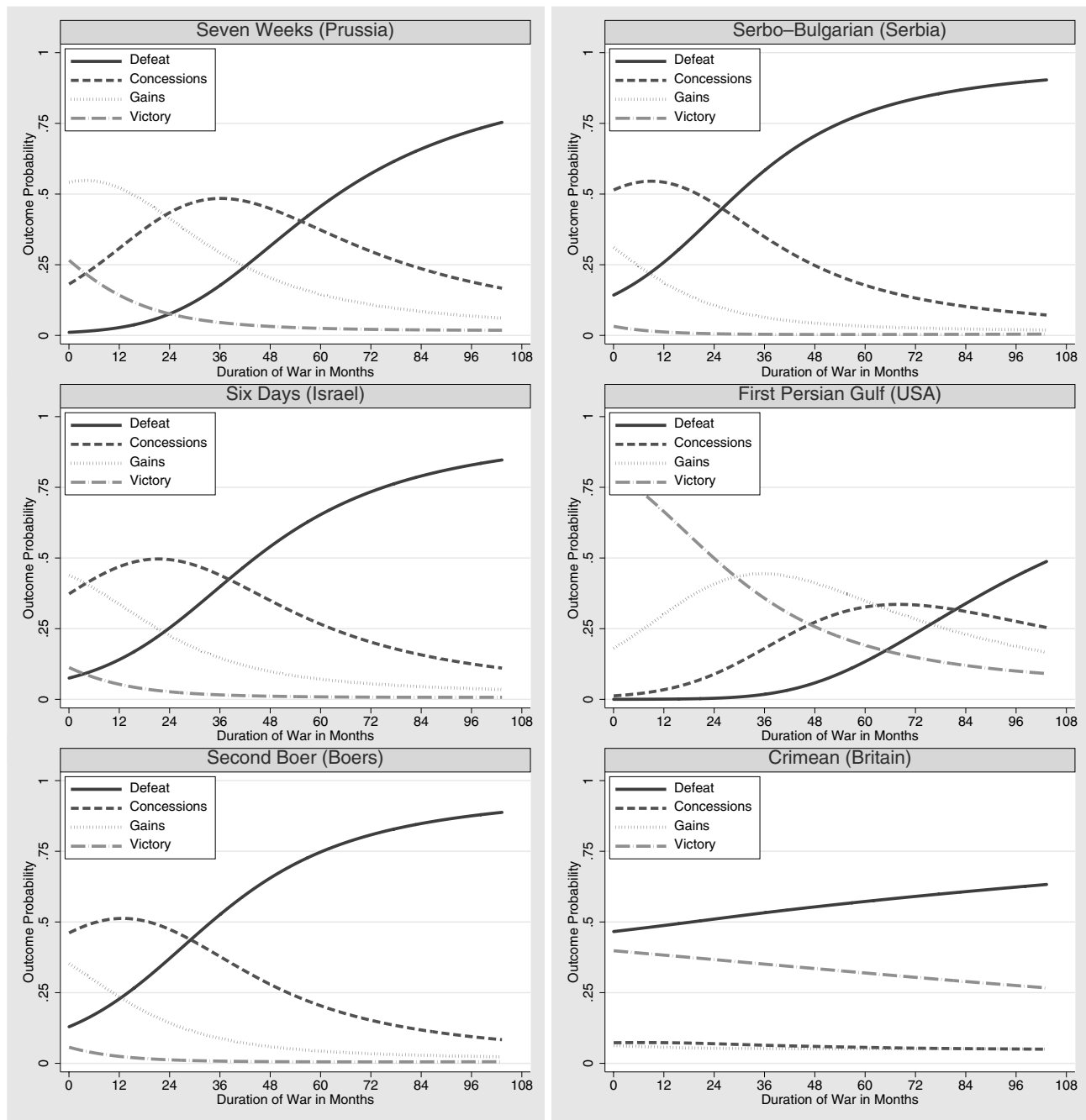
from the area, abandoning the upper Nile to the Mahdi (Farwell 1972). This is a case where the British inherited governance problems from their Egyptian acquisition and decided not to pursue them because the probability of victory was not sufficiently high to justify the expected costs and benefits.

However, this changed with the arrival of Marchand at Fashoda in 1898. The issue now became more salient because of the French threat to British interests in the region. Even though the probability of victory declined (at least because of the French presence), the British policy toughened, and Kitchener was sent to subdue the Mahdi, which he did with the victory of Omdurman on September 2 before racing to Fashoda (Porch 2000). In this case, the higher salience forced the British into a conflict over Sudan despite the lower probability of success. Even though in this they were successful, in many other instances this would not necessarily be the case. For example, when the Boers desperately fought in the Second Boer War over an issue of extreme importance to them, they had to face the might of the British Empire and were soundly defeated (Kruger 1990). Similarly, in the Austro-Sardinian War of 1848, the Italians who initiated it over an issue very salient to them, ended up having to make concessions.

### Some Real Wars

In the third section, I argued that the distribution of pre-war military capabilities is not a good predictor of war outcomes absent the causal mechanism specified by the endogenous war termination theory. Because the data do not allow a fine-grained test, I supplement the strong empirical findings of the previous section with several historical examples. I briefly discuss two wars where military capabilities were very close to parity and where one side believed the other to be weaker. In one case it was the defender and in the other it was the initiator who had exaggerated optimism about its chances. In both cases, dramatic unexpected events caused them to revise these estimates very quickly, leading to short wars. In both cases, the statistical model does predict the outcomes correctly (Figure 3).

Prior to the Seven Weeks War, Prussia and Austria appear to be quite evenly matched in terms of raw numbers (parity is .99). However, it was generally believed that Prussia was the weaker side and that it would be unable to defeat the Austrian Empire. This belief was shared by the French and the Russians, with the former actually helping the Austrians promote the war (Taylor 1971, 165).

**FIGURE 3 Predicted Outcomes for Six Real Wars (Initiator in Parentheses)**


The Austrians were also thought to be in a good defensive position to repel both the Prussians and the Italians (Buchholz 2001; Wawro 1996).

Austria did defeat Italy. However, the Battle of Königgrätz on July 3, 1866 was a stunning surprise. The Prussians routed the Austrians at one-fifth of their losses, a “breath-taking accomplishment that utterly destroyed Austrian morale” (Wawro 1996, 274). The unexpected

victory, which the French called the *surprise de Sadova*, compelled Austria to seek peace, and the war ended after less than a month and a half, with Prussia, the initiator, enjoying significant gains and Austria embarking on its quick decline as a major power.

Another war in which military parity was coupled with optimistic estimates is the Serbo-Bulgarian War of 1885. King Milan of Serbia was concerned with the

alteration of the balance on the Balkans that would result from Bulgaria's unification with Eastern Rumelia in violation of the Berlin Decree. Serbia, goaded by Austria, rejected half-hearted offers of territorial compensation and adopted a hardline course, further emboldened by the Russian recall of all its officers from the Bulgarian army in protest of the independent policies of the young prince Alexander.

When Bulgaria proceeded with the unification, it was a state less than seven years old, with an army denuded of officers, and with no experience. Almost all of its 30,000 troops were concentrated in Eastern Rumelia expecting an Ottoman attack. The border with Serbia was undefended. Under these propitious circumstances, King Milan invaded the country with all currently mobilized forces, or about 35,000 troops (parity of .86). No one thought Bulgaria would last long and the government was expected to sue for peace.

However, in a stunning maneuver utilizing the limited resources of the single railway, and making heavy use of horses, the bulk of the Bulgarian army marched across the country, returning to face the invaders at Slivnitsa, 30 kilometers west of the capital. In the ensuing battle on November 17-19, the Bulgarian army, with contingents going into combat immediately upon arrival, routed the Serbs and pursued them back across the border. This battle, a "remarkable achievement for an untested army shorn of its senior officers" (Crampton 1997, 102), came as a "surprise to most observers" (Jelavich 1983, 371).

The unexpected defeat of the Serbian army stirred the Austrians into defense of their protege, and the Bulgarians were forced to settle under the threat of invasion from the Austro-Hungarian Empire, ending the war after less than a month of fighting. Serbia, the initiator, was compelled to make concessions and accept the enlarged Bulgarian state.

Consider now the Six Day War. Israel was quite disadvantaged in terms of military capability (parity of .31). Yet, its surprise aerial strike secured control of the skies. This provided cover for the land force and ensured the success in the Sinai (Oren 2002). Israel emerged with a stunning victory, contrary to the expectations of its opponents, and contrary to what the raw military power measure would suggest. According to the model, which predicts gains by Israel, the window of opportunity it so skillfully exploited was very small, perhaps less than three months.

These examples demonstrate why it is not straightforward to use military capabilities to predict duration of war. This is not to suggest, of course, that military capabilities do not matter. As the plot in Figure 3 for the First Persian Gulf War demonstrates, Saddam Hussein's hopes of drawing the U.S.-led Coalition in a long war of attrition

hoping for a better outcome were wild fantasies at best: any chance of concessions would appear only after over five years of fighting.

In the previous example, the issue was less salient for the initiator who did rather well. The Second Boer War, on the other hand, is an instance where the initiator, the Orange Free State, had an enormously important stake in the outcome, its very existence as an independent entity. However, as the predictions show, the Boers never really had much of a chance, and at the actual duration (32 months) they could only expect outright defeat, which is what they got.

Finally, consider a case where the model does not predict the correct outcome, the admittedly tricky case of the Crimean War. Here, the army sizes were roughly at parity (0.98), and the population slightly favored Russia (0.83). The model suggests that the Russians should have done better, but not overwhelmingly so. At the actual duration of this conflict (28 months), the model predicts roughly 50% chances of defeat for the combined Anglo-French forces and close to 40% chances of their victory.

Given the strong intuition provided by the theory, the plausibility provided by the historical examples and the simulations of real wars, the results from the statistical model lend credibility to the causal mechanism specified by the theory of endogenous war termination.

## Conclusion

The theories of endogenous war termination have progressed sufficiently to generate testable hypotheses. Although it is still impossible to probe the micropredictions because the necessary event-level data are not available, I constructed a data set to test some of the more general implications of these models. Despite the limitations of the data and the uncertainty in the two-stage estimation, the empirical results provide some preliminary strong support for these theories.

The longer the war, the worse the expected outcome for the state that started it. This is a novel finding that helps reconcile some seemingly contradictory results that find that on one hand, democracies tend to win their wars but on the other, regime type has no bearing on the terms of the settlement. It seems that democracies tend to select wars they correctly predict to be short (presumably because of the declining public support for fighting), but that initiators do better in short wars generally.

The results also corroborate many earlier ones about the impact of resource base asymmetries, although the finding that information conveyed during fighting (by the relative rate of loss) outweighs information available

prior to the war (resources, army size) casts some doubt on the use of these common prewar figures to predict the outcome of war. A small but determined enemy capable of inflicting damage can compensate for some of the disadvantages of size. Larger states may settle for much less, and weak states may gain more, depending on their performance in war.

Because initiators will tend to start nonsalient conflicts only when the probability of winning is quite high (e.g., wars of empire), the finding that initiators may do worse in conflicts that are very salient to them may not appear surprising, although it is a novel selection effect insight.

Overall, these results suggest that the endogenous war termination theory is a worthwhile research agenda that deserves further scrutiny. Useful directions for future research include creating low-level event data sets that would allow us to test micropredictions, as well as refining the theories to account for resource constraints, new uncertainty in long conflicts introduced by technological innovation, the ability to forge credible peace settlements, and the role of fighting in overcoming prewar commitment problems.

## References

- Bennett, D. Scott, and Allan C. Stam. 1996. "The Duration of Interstate Wars, 1816–1985." *American Political Science Review* 90(June):239–57.
- Bennett, D. Scott, and Allan C. Stam. 1998. "The Declining Advantages of Democracy: A Combined Model of War Outcomes and Duration." *The Journal of Conflict Resolution* 42(June):344–66.
- Blainey, Geoffrey. 1988. *The Causes of War*. 3rd ed. New York: The Free Press.
- Box-Steffensmeier, Janet M., and Christopher J. W. Zorn. 1998. "Duration Models and Proportional Hazards in Political Science." Presented at the 1998 Annual Meeting of the Midwest Political Science Association.
- Bucholz, Arden. 2001. *Moltke and the German Wars, 1864–1871*. Hampshire: Palgrave.
- Bueno de Mesquita, Bruce, James D. Morrow, and Ethan Zorick. 1997. "Capabilities, Perception, and Escalation." *American Political Science Review* 91(March):15–27.
- Chatterjee, Samprit, Bertram Price, and Ali S. Hadi. 1999. *Regression Analysis by Example*. Wiley Series in Probability and Statistics. 3rd ed. New York: John Wiley, and Sons.
- Clark, David H., and Timothy Nordstrom. 2001. "Modeling Uncertainty: Resolving Misspecification and Selection Bias in International Conflict Research." Presented at the Annual Meeting of the American Political Science Association, San Francisco.
- Clark, David H., and William Reed. 2003. "A Unified Model of War Onset and Outcome." *The Journal of Politics* 65(February):69–91.
- Clodfelter, Micheal. 1992. *Warfare and Armed Conflicts: A Statistical Reference to Casualty and Other Figures, 1618–1991*. 2 Volumes. Jefferson: McFarland and Company.
- Crampton, R. J. 1997. *A Concise History of Bulgaria*. Cambridge: Cambridge University Press.
- Dupuy, R. Ernest, and Trevor N. Dupuy. 1985. *The Encyclopedia of Military History from 3500 B.C. to the Present*. 2nd rev. ed. New York: Harper, and Row Publishers.
- Farwell, Byron. 1972. *Queen Victoria's Little Wars*. New York: Norton.
- Fearon, James D. 1994a. "Domestic Political Audiences and the Escalation of International Disputes." *American Political Science Review* 88(September):577–92.
- Fearon, James D. 1994b. "Signaling versus the Balance of Power and Interests: An Empirical Test of a Crisis Bargaining Model." *Journal of Conflict Resolution* 38(June):236–69.
- Fearon, James D. 1995. "Rationalist Explanations for War." *International Organization* 49(Summer):379–414.
- Filson, Darren, and Suzanne Werner. 2002. "A Bargaining Model of War and Peace: Anticipating the Onset, Duration, and Outcome of War." *American Journal of Political Science* 46(October):819–38.
- Fuller, J. F. C. 1961. *The Conduct of War, 1789–1961*. New Brunswick: Rutgers University Press.
- Gartner, Scott Sigmund. 1997. *Strategic Assessment in War*. New Haven: Yale University Press.
- Gartner, Scott Sigmund, and Gary M. Segura. 1998. "War, Casualties, and Public Opinion." *The Journal of Conflict Resolution* 42(June):278–300.
- Goemans, Hein E. 2000. *War and Punishment: The Causes of War Termination and the First World War*. Princeton: Princeton University Press.
- Greene, William H. 2000. *Econometric Analysis*. 4th ed. Upper Saddle River: Prentice Hall.
- Gurr, Ted Robert, Keith Jagers, and Will H. Moore. 1989. "Polity II: Political Structures and Regime Change, 1800–1986." Photocopy, University of Colorado. ICPSR 9263, updated through 1991.
- Holmes, Richard, ed. 2001. *The Oxford Companion to Military History*. Oxford: Oxford University Press.
- Holsti, Kalevi J. 1991. *Peace and War: Armed Conflicts and International Order 1648–1989*. Cambridge: Cambridge University Press.
- Huth, Paul, D. Scott Bennett, and Christopher Gelpi. 1992. "System Uncertainty, Risk Propensity, and International Conflict Among the Great Powers." *Journal of Conflict Resolution* 36(September):478–517.
- Jelavich, Barbara. 1983. *History of the Balkans: Eighteenth and Nineteenth Centuries, Volume 1*. Cambridge: Cambridge University Press.
- Keckskemeti, Paul. 1958. *Strategic Surrender: The Politics of Victory and Defeat*. Stanford: Stanford University Press.
- King, Gary, Michael Tomz, and Jason Wittenberg. 2000. "Making the Most of Statistical Analyses: Improving Interpretation and Presentation." *American Journal of Political Science* 44(April):341–55.
- Kruger, Rayne. 1990. *Goodbye Dolly Gray: The Story of the Boer War*. Random House.

- Langer, William L., ed. 1975. *The New Illustrated Encyclopedia of World History*. Vol. 1 and 2. New York: Harry N. Abrams, Inc.
- Maddala, G. 1983. *Limited Dependent and Qualitative Variables in Econometrics*. New York: Cambridge University Press.
- Morrow, James D. 1989. "Capabilities, Uncertainty, and Resolve: A Limited Information Model of Crisis Bargaining." *American Journal of Political Science* 33(November):941–72.
- Mueller, John E. 1973. *War, Presidents, and Public Opinion*. New York: John Wiley.
- Oren, Michael B. 2002. *Six Days of War*. Oxford: Oxford University Press.
- Pillar, Paul R. 1983. *Negotiating Peace: War Termination as a Bargaining Process*. Princeton: Princeton University Press.
- Porch, Douglas. 2000. *Wars of Empire*. London: Cassell.
- Powell, Robert. 1996. "Bargaining in the Shadow of Power." *Games and Economic Behavior* 15(August):255–89.
- Powell, Robert. 1999. *In the Shadow of Power*. Princeton: Princeton University Press.
- Powell, Robert. 2002. "Bargaining Theory and International Conflict." *Annual Review of Political Science* 5:1–30.
- Randle, Robert F. 1973. *The Origins of Peace: A Study of Peacemaking and the Structure of Peace Settlements*. New York: The Free Press.
- Reed, William. 2003. "Information, Power, and War." *American Political Science Review* 47(December):633–41.
- Reiter, Dan, and Allan C. Stam. 2002. *Democracies at War*. Princeton: Princeton University Press.
- Schelling, Thomas C. 1966. *Arms and Influence*. New Haven: Yale University Press.
- Singer, J. David, Stuart Bremer, and John Stuckey. 1972. Capability Distribution, Uncertainty, and Major Power War, 1820–1965. In *Peace, War, and Numbers*, ed. Bruce M. Russett. Beverly Hills: Sage Publications, pp. 19–48.
- Slantchev, Branislav L. 2003. "The Principle of Convergence in Wartime Negotiations." *American Political Science Review* 47(December):621–32.
- Smith, Alastair, and Allan C. Stam. 2003. "Bargaining and the Nature of War." Presented at the annual meeting of the Midwest Political Science Association.
- Stam, Allan C. 1999. *Win, Lose, or Draw: Domestic Politics and the Crucible of War*. Ann Arbor: The University of Michigan Press.
- Taylor, A. J. P. 1971. *The Struggle for Mastery in Europe, 1848–1918*. Oxford: Oxford University Press.
- von Clausewitz, Carl. 1832. *On War*. Ed. transl. Michael Howard and Peter Paret, 1984. Princeton: Princeton University Press.
- Wagner, R. Harrison. 2000. "Bargaining and War." *American Journal of Political Science* 44(July):469–84.
- Wawro, Geoffrey. 1996. *The Austro-Prussian War: Austria's War with Prussia and Italy in 1866*. Cambridge: Cambridge University Press.
- Werner, Suzanne. 1998. "Negotiating the Terms of the Settlement: War Aims and Bargaining Leverage." *The Journal of Conflict Resolution* 42(June):321–43.