# Review Article: Wagner's *Bargaining and War*

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## Summary

Wagner argues that existing models interpret war as the result of choices made prior to war onset, treating the costly lottery of war as an alternative to a negotiated settlement. He instead follows Clausewitz in seeing war as a continuation of the bargaining process. Noting that wars are not typically contests for total disarmament, he argues that the fact that fighting is expected to lead to a negotiated settlement changes how states fight. Rather than modeling negotiation and war as distinct phases, Wagner's model introduces intrawar bargaining. He argues that we should see war as a competitive struggle to determine the agreement outcome in a bargaining game where states use force (and the threat of force) to influence each other. The disagreement outcome in such a game is a military contest in which each side tries to disarm the other absolutely. Viewed this way, Wagner draws the intriguing conclusion that wars need not be fought for the purpose of disarmament and may instead be initiated for the purposes of altering the other side's estimates regarding the future course of the war, leading to a favorable negotiated settlement.

### Recommendation

Publication Recommendation: **Revise and Resubmit**.

## Evaluation

Recent literature exhibits a measure of satisfaction with the existing set of crisis-bargaining models. In this paper, Wagner gives us several reasons to question our satisfaction. Most notably, he convincingly shows that war outcomes depend crucially on choices made during intrawar bargaining, and that our standard models rule out these influences by construction. More generally, the article demonstrates the need for additional theoretical work on the causes of war, and the desirability of incorporating clear thinking on war by those outside the profession.

Wagner's idiosyncratic style of reasoning leads him to important conclusions that other analysts have overlooked. However, this idiosyncratic style also leads him to articulate his models in notation and terminology that are likely to confuse other scholars.[1] His inconsistent use of labels and variables, as well as the absence of a technical appendix, make the argument difficult to appraise and impossible to extend.[2] However, his ability to clearly think his way through the causes of war is astonishing. Unlike many formal theorists, Wagner begins by thinking through the problem verbally, and adds notation in a somewhat ad-hoc manner as needed. This approach contrasts starkly with the alternative method of developing or adapting a piece of modeling technology and only then casting about for applications. Wagner's problem-driven approach goes some way towards explaining both his insightful discoveries and the idiosyncrasies that make these discoveries so opaque to other scholars.

Wagner argues that prior models that depend on conceptualizing war as a costly lottery distort our understanding of the bargaining process, because take-it-or-leave-it offers are an abstraction from the complexities of bargaining, and it is precisely these complexities in which we should be interested. He thinks that a state might be willing to "fight for a while in hopes of getting a better deal," (470), but that this option is artificially ruled out by modeling negotiation as a take-it-or-leave-it offer.

This line of reasoning leads Wagner to criticize models presented in, *inter alia*, Morrow 1985, Powell 1996, Fearon 1992 and Fearon 1995 for failing to explain why negotiated settlement is possible *after* fighting occurs but not before (471). He claims that these models make a sharp distinction between "negotiation" and "war," assuming that bargaining ends when war begins. On the assumptions made in these models, argues Wagner, states will never fight to get a better deal at the negotiating table if they have no reason to believe that fighting will improve their military situation.[3] Wagner argues that states *do* in fact fight purely to improve their bargaining position, leading him to conclude that prior models are deficient.[4]

Wagner sees his contribution as presenting a model encompassing both war initiation and

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[1] I am not the first reader to criticize Wagner's work in these terms. "The second set of reasons I have for worrying that *War and the State* will be underappreciated concerns not the field, but Wagner's own arguments and his presentation of them" (Fearon 2010).

[2] To this extent, he would benefit from the advice set out in Thomson 2001.

[3] "...formal models that focus on a prewar choice between war and a negotiated settlement either fail to distinguish between the outcome of fighting and the outcome of bargaining (Morrow 1985), or assume implicitly (Powell 1996) or explicitly (Fearon 1992, 1995a) that bargaining ends when war begins. They are therefore at best either irrelevant to historical wars (since they ignore the possibility of negotiated settlements once war has begun) or contain no information (since they do not tell us what is the basis for the expectations represented by the costly lottery). At worst they are examples of fallacious reasoning in which a costly lottery is defined in one way in the premises of an argument (an all-out war fought to the finish) and another way in the conclusion (a bargaining process which is preceded or accompanied by fighting)" (471).

[4] This point could be more fully substantiated by reference to historical examples. Wagner instances the US war in Vietnam (note 5), but this case is complicated by the vast disparity in power between the contending parties. This portion of the paper could be expanded to great effect. One thinks naturally of such cases as the German General Staff's decision to continue the war in 1917 despite the low probability of a breakthrough on the western front, or the Confederacy's strategically questionable invasion of Maryland in 1862 in a desperate attempt to secure British recognition and improve the terms of a prospective settlement.

war termination that allows us to examine the relationship between fighting and bargaining (471). He builds on prior work by Wittman (1979) and Stam (1996). In particular, he seeks to evaluate two of Wittman's claims. First, Wittman argued that because pessimism and optimism regarding capabilities sum to zero, changes in the relative military power of the contending parties will have no effect on their ability to reach a negotiated settlement. Second, Wittman argued that the existence of a bargaining range prior to war is no guarantee of a peaceful settlement, because one of the contending parties might "hope by fighting to improve the terms it can extract from the other" (470). Viewed this way, the mere existence of a bargaining range is not a sufficient condition for reaching a peaceful settlement.

Wagner's crucial insight is that although most wars are not wars for total disarmament, states engaged in negotiations will look down the game tree to the disagreement outcome – the outcome that will obtain in the absence of a negotiated settlement. Following Clausewitz, Wagner argues for the existence of two fundamental types of war: "absolute war" and "real war". Absolute war, which Clausewitz also called "war in theory," can be understood as a contest to totally disarm the adversary. However, Clausewitz famously argued that absolute wars are vanishingly rare in practice, because the possibility of a negotiated settlement allows the parties to use the information produced by war to harmonize their impressions of the future course of events. These "real wars" can thus be waged purely in order to reveal information, without entailing the "costs and risks" associated with an absolute war (472).

While he proposes to represent absolute war with a variant of the standard Rubinstein bargaining game, Wagner reflects usefully on the differences between the contexts of negotiation and war. He observes that immediate agreement is prevented in negotiation by private information as to preferences, but in war by conflicting expectations concerning success in battle. While in bargaining games the only cause of delayed agreement must be private information regarding preferences, Wagner argues that war itself provides a means of revealing information and resolving conflicting expectations.[5] Other scholars have similarly noted the distinctions between the regulated context of economic bargaining and the anarchic context of crisis bargaining, arguing that the dissimilarity between "voluntary and non-coercive" contexts and crisis bargaining is "staggering" (Slantchev and Tarar 2011).[6] According to

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[5] One is reminded here of Orwell's observation that "...we are all capable of believing things which we know to be untrue, and then, when we are finally proved wrong, impudently twisting the facts so as to show that we were right. Intellectually, it is possible to carry on this process for an indefinite time: the only check on it is that sooner or later a false belief bumps up against solid reality, *usually on a battlefield*" (Orwell 1946, my emphasis).

[6] "The gap between this environment [peaceful trade] and crisis bargaining is staggering. If one player extends his hand, the other can politely turn him down, and he cannot whack her on the head until she agrees to terms...It does not matter how beneficial these expected terms might be relative to the status quo payoff he obtains when she walks away. If whacking is allowed, extending one's hand is no longer unambiguously related to his private information because it is now a threat: "give me what I ask for or else I will whack you." What now matters is whether he means it because it would determine the terms she would have to offer to prevent him from whacking her. His declaration of willingness can no longer be taken at face value because he now has incentives to pretend to want to whack her if she fails to meet his terms. This necessitates actions designed to dispel such illusions, and so on...it is a whole other ball game" (Slantchev and Tarar 2011). See also Lerner 1972: "the solution is essentially the transformation of the conflict from a political problem to an economic transaction. An economic transaction is a solved political problem. Economics has

Wagner's analysis, war provides a means of revealing information not available in the standard models. He further points out that this understanding of war's role better explains the non-random distribution of negotiating offers during conflict, specifically their periodic nature (476).

# Model Mechanics

Drawing these points together, Wagner proposes a two-stage model where "real wars" are assumed to occur prior to the bargaining game that models "absolute war". Understood this way, one of the functions of real wars is to influence the terms of any agreement that will be accepted in lieu of fighting an absolute war by "revealing information about the parameters associated with it [the absolute war]" (472). Crucially, bargaining will not occur until states no longer have an incentive to reveal information by fighting. Understood this way, observed wars have the same relationship to absolute war that crises are usually assumed to have to war, and what we call peace negotiations are analogous to crisis bargaining.[7] Although absolute wars are rare, their possibility explains the wars that do occur. On this understanding, military operations have two distinct effects: to *reveal* information about relative capabilities, and to *influence* relative capabilities by damaging the enemy's military or by capturing territory (473).

## Absolute War

Because states anticipate the possibility of absolute war, the expected course of such a war partly determines behavior in crisis bargaining and in real wars. Wagner thus begins his analysis with absolute war. Consider two states, $i$ and $j$. Let $W_i$ represent the expected utility to state $i$ of the bargaining game that results from disarming state $j$, and let $L_i$ represent the utility to state $i$ of the bargaining game that results from being disarmed by state $j$. Represent the cost of war with a constant per-period cost of $c$, and the duration of war as the probability $q$ that one of the combatants will be disarmed by time $t$, represented as $1 - q^t$ (Wagner is assuming here that per-period costs and continuation probabilities are constant). In the event that a state is disarmed, the probability that the outcome will be $W_i$ is $p$, and the probability that it will be $L_i$ is $1 - p$. Putting these terms together, Wagner derives the expected cost of a war that ends no later than time $t$:

$$c\Big(\frac{1 - q^t}{1 - q} - tq^t\Big) \equiv C(t) \tag{1}$$

We can therefore state the total cost of war as:

$$\lim_{t \to \infty} C(t) = \frac{c}{1 - q} \equiv C \tag{2}$$

Wagner asserts that although this formulation replicates the more common representation of war as a costly lottery according to the form $pW + (1-p)L - C$, his formulation allows for

(1) conceptualizing absolute war as a limit rather than a likely eventuality; (2) modeling an 'intrawar' period during which war can be interrupted, and (3) modeling military stalemate.

## Intrawar Bargaining

Now consider intrawar negotiation. Call $\Lambda$ the lottery representing the expected outcome of the military contest, excluding costs, assume that all offers take the form of $y \equiv (y_i, y_j)$, and say that a state $i$ has two options when receiving an offer: accept it with payoff $y_i$ or reject it and propose some offer $x \equiv (x_i, x_j)$ instead. If state $i$ accepts $y$, war ends, but if it instead demands $x$, then the best it can expect is $qx_i + (1-q)\Lambda_i - c$ (this is the payoff if $x$ is accepted). As we have seen, this is a Rubinstein bargaining game with alternating offers and risk of breakdown (compare Osborne and Rubinstein 1990:71-6).[8]

In any subgame-perfect equilibrium of this game, offers that are made must be accepted, and players with an opportunity to make an acceptable offer must at least weakly prefer to do so. This implies indifference between accepting offer $y$ at time $t$ and making offer $x$ at time $t + 1$.[9] Call these equilibrium offers $y^*$ and $x^*$.

Confusingly, Wagner deviates here from his prior use of $i$ and $j$ as labels for the states involved, here calling them Player 1 and Player 2. It is also difficult to understand what an equilibrium offer of $x^*$ would mean, as $y^*$ will be accepted in equilibrium and an offer of $x^*$ will never occur. By assigning a value of 0 to the breakdown outcome $\Lambda$, Wagner is able to derive the following symmetric properties of the equilibrium offers: $x_2^* = qy_2^* - c$ and $y_1^* = qx_1^* - c$.[10] A player's equilibrium offer will be that state's preferred division indexed to the probability that war will continue, less the costs of war.

Wagner further distinguishes his model from a standard Rubinstein bargaining model by making the disagreement outcome a point on the bargaining frontier, rather than the status quo. This frees either side from the need to make concessions unless they expect war (and has the additional virtue of obviating the need for modeling assumptions about "satisfied" and "dissatisfied" states independent of their willingness to engage in war). He calls the points on the bargaining range that line up with the equilibrium offers $w^*$ and $z^*$, where $w^* < z^*$.[11] Finally, Wagner models the status quo as $s$, where $(0 > s < 1)$.

As we have just seen, a state must be willing to attack in order to make demands. The most State 1 (Wagner has switched labels once again) can expect to gain by attacking State 2 is $qU_1(z^*) + (1-q)U_1(\Lambda) - U_1(c) = U_1(w^*)$, where $U(\cdot)$ is a Von Neumann-Morgenstern utility

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[8]Note that the "breakdown" outcome is actually the *end* of the ongoing war, which is the only situation where the combatants are exposed to the risk of defeat.

[9]These points follow from the subgame-perfect solution concept and from backwards induction, though Wagner does not substantiate them.

[10]Wagner is careful to note that the risk of breakdown incorporates the discount factor $\delta$ (note 12), freeing him from the obligation to include it explicitly, but more discussion on this point in the main text would be helpful.

[11]This discussion (475) is unnecessarily opaque.

function defined on the unit interval such that $W_i = U_i(1)$ and $L_i = U_i(0)$. Similarly, the most State 2 can expect to gain by attacking State 1 is $qU_2(w^*) + (1-q)U_2(\Lambda) - U_2(c) = U_2(z^*)$. If $w^* \leq s \geq z^*$, neither state will expect to gain from war, but if $s < w^*$ or $s > z^*$ then one state can expect to gain from war but, knowing this, the other will be able to prevent an attack by accepting the other side's equilibrium offer in place of the status quo.

Because $w^*$ and $z^*$ increase with $c$ and decrease with $q$, we can see that costly wars that are likely to end quickly will have wider ranges of status quo distributions that satisfy both states (and vice versa). Wagner sees this mechanism as an independent justification for the claim in Fearon 1995 that increasing the probability of stalemate makes war more attractive, but instead of Fearon's explanation (that the bargaining range is reduced), Wagner asserts plausibly that this phenomenon is instead caused by a reduction in the range of renegotiation-proof status-quo distributions.[12] In a sense, there are two different bargaining ranges depending on which state attacks first (476).

Much hangs on the order of moves. Although he does not provide an extensive-form representation, Wagner notes that the state against whom war is initiated moves first in the bargaining game associated with the war. To determine the responding state's best response, Wagner reasons that in some cases, an incentive to strike first can also prevent a negotiated settlement without war (476). This will occur when the benefits of striking first (notated as $w^{**}$ and $z^{**}$) outweigh the costs of moving second in the intrawar bargaining game, or when the expression $qU_2(w^{**}) + (1-q)U_2(\Lambda) - U_2(c) = U_2(z^{**}) > U_2(w^*)$ is true.

## Real War

With a model of absolute war established, Wagner now turns to modeling real war. Recall that he sees real war as occurring in the shadow of a potential absolute war if the parties are unable to come to an agreement. He argues convincingly that a proper model of real war should incorporate subjective information by replacing $p$, $q$ and $c$ with corresponding subjectively-estimated values $p_i$, $q_i$ and $c_i$. Because these parameters will depend on battlefield developments, battles will be engaged in partly with an eye to changing the other side's parameter estimates, allowing us to see conflict from a very different perspective.[13] Wagner is at pains to point out that this is precisely Clausewitz's explanation for the rarity of absolute war, and that because states can agree to a negotiated settlement short of total war, "a weak state can hope to gain concessions from a strong state even though it would be unable" to prevail in absolute war (477). This is because military operations, far from aiming explicitly at victory, aim at changing the other side's estimates of the relevant parameters.[14]

If we imagine that both states can influence the other side's expectations in this way, we must also imagine that this strategic manipulation will be mutually anticipated. However, Wagner argues that this will not obviate the need for military operations because the

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[12] A more thorough discussion of this relationship would be helpful.

[13] Wagner traces this perspective to Clausewitz, Blainey and Wittman.

[14] One is reminded here of the arguments for strategic bombing offered by RAF Bomber Command's Arthur Harris in 1943.

sides may well have inconsistent expectations (477). Assume for the moment that $q$ and $c$ are common knowledge, but that the parties disagree about $p$. Specifically, State 1 believes it has a military advantage, while State 2 believes this is correct with the probability $r < 1 - r$. Call $p^+$ the true probability that State 1 will prevail in an absolute war if its leaders are correct, and $p^- < p^+$ the probability that State 1 will prevail if its leaders are incorrect about their putative military advantage. In this example, then, $p_1 = p^+$ and $p_2 = r(1 - p^+) + (1 - r)(1 - p^-) > 1 - p_1$.

Now suppose a battle occurs prior to negotiation. If the result of the battle changes the sides' parameter estimates ($p_2$ and $1 - p_1$ get closer or farther apart), states will engage in Bayesian updating. Call $r^*$ State 2's updated estimate of the probability that State 1 is correct (Wagner has already defined this quantity as $p_i$). States will update according to the following formula:

$$r^* = \frac{rp^+}{rp^+ + (1 - r)p^-} \tag{3}$$

We can see that if State 1 wins the battle, the difference between $p_2$ and $1 - p_1$ will diminish and State 2 will need to increase the size of its offer to State 1 in order to reach a negotiated settlement and avoid the absolute war outcome. Note that crucially, although State 1 is choosing between a costly lottery (absolute war) and a negotiated settlement, all of the possible outcomes are agreements expected in the bargaining game just analyzed, *not* outcomes in the absolute war that is that bargaining game's disagreement outcome. As a result, total victory or defeat are not on the table, and the status quo need not be either. Wagner takes this to explain why post-war territorial settlements often force states to return territory that they have conquered (note 20).

Consider the expected value of fighting to State 1. Wagner argues that it will be based not on the expected value of a fight to disarmament, but rather by the magnitude of the negotiating concessions that State 2 can be induced to make as a result of fighting (478). While a fight to disarmament looms on the horizon, it can be avoided by making a deal during negotiations, so its consequences need not impinge on a state's decision-making except to the extent that disagreement in negotiations is likely.

## Results

Wagner draws a major distinction from the analysis in Fearon 1995. Recall that Fearon sees war as a means to induce adversaries to reveal credible private information regarding capabilities, but only where the disagreement regarding capabilities is so profound that "no negotiated outcome is mutually preferable to war" (1995:400). Wagner argues that any disagreement need not be so great; even if there exist agreements that both sides prefer to fighting, they may ultimately fight anyway to determine *which* of the mutually acceptable agreements they will ultimately accept (478). This means that private information plays

a very different role in war than it does in economic bargaining.[15] Fighting is a genuinely objective way to obtain credible private information, but it is costly. Wagner points out, however, that it need not be *existentially* costly because states can fight for some period of time and then reach a negotiated settlement without engaging in absolute war (though the possibility of such a war colors their behavior in negotiation).

Wagner is now in a position to evaluate Wittman's (1979) claim that if war can lead to a negotiated settlement then the distribution of power cannot affect the likelihood of war. Wagner is able to dispute this claim using his model by showing (1) that the range of status-quo distributions immune to renegotiation will be influenced by the distribution of power, and (2) that the more nearly equal two states are the more likely they are to have inconsistent parameter estimates. He argues that both of these factors, *contra* Wittman, affect the likelihood of war.[16]

A major contribution of this paper is that it forces us to question the common assumption that war can be modeled as a costly lottery. As Wagner puts it, "War is indeed a costly lottery, but so are commercial airline flights, horse races, strikes, and economic sanctions" (481). Wagner argues that if we understand war as a costly lottery with two outcomes, victory and defeat, we are precluding by construction any outcome-relevant bargaining after war onset. He demonstrates to my satisfaction that intrawar bargaining can indeed affect outcomes. Wagner's adoption of Clausewitz's distinction between real and absolute war is plausible, and the idea that intrawar negotiation occurs with absolute war as the disagreement outcome is a tremendously important contribution to our understanding of war onset and war termination. The further implication that strategic players will sometimes fight wars not to disarm the other side but to alter its estimates of the relevant parameters is strikingly original and seems likely to radically change our understanding of why states fight.[17] The counterintuitive notion that a state can improve its bargaining position even by losing battles as long as it changes the other side's parameter estimates explains, among other things, our notion of a Pyrrhic victory.[18]

# Exposition

This paper should be re-drafted to improve clarity and flow. Wagner's writing is admirably clear in places, but the general thrust of the paper is currently unclear at the outset, and it seems that Wagner's thinking on this subject deepened during peer review but that the theoretical exposition was not enlarged or revised to match. At the moment, the exposition tracks Wagner's own process of discovery. This is normal in early drafts, but typically papers

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[15]See note 6 above.

[16]As in many other places, discussion in greater depth would be desirable here.

[17]A reassuring implication of this analysis is that it vindicates authors whose informal work is persuasive and plausible: Clausewitz, Blainey, Pillar (1983) and Wittman.

[18]Consider the eponymous case. Pyrrhus of Epirus fought three battles against Rome and won them all (280-279 BCE). Then he entered into negotiations and gave up all the territory he had won. Wars like this one seem difficult for the Fearon-inspired class of models to explain.

are re-written to make their principal contributions more salient and clear. Wagner's contributions emerge by the way, and a great deal of patience is required to connect the different threads of the argument. In particular, the abstract does a very poor job of summarizing the paper's argument, highlighting the way that present models make war purely a function of pre-war bargaining at the expense of Wagner's own contribution. A full rewrite could greatly improve the paper by making sure that each point is connected to the main thrust of the argument.

## Structure

Wagner's decision to begin with the model of absolute war and only then work up to real war and bargaining is a logical application of backwards induction. His decision to treat Wittman's conjecture as the central theme of the paper is less well-founded. Although claims about the effect of the distribution of power on the likelihood of war (if settlement is possible) relate to Wagner's subject, they are not central. I would frame this paper as a direct reply to Fearon 1995. After all, it shows that Fearon is in a sense right for the wrong reasons, which (given that article's subsequent influence) would be a tremendously important contribution. There is also a philosophy of science contribution in this paper regarding the application of off-the-shelf models from other disciplines. Although the differences between war and economic exchange are obvious and salient, few scholars have questioned the wholesale importation of frameworks like the Rubinstein alternating-offers model from economics and other disciplines. Wagner's habitually robust theoretical reflections have led him to a methodological caution that should be more widely shared by other scholars.

## Secondary Aspects

Wagner's creative and inconsistent use of notation will give many readers whiplash. While some sections of the paper (*e.g.* "real war") express his model using relatively standard variables and labels, other sections veer off into uncharted territory, with lambdas, double asterisks, superscript operators and other innovations. In his acknowledgments, Wagner credits fruitful conversations with Fearon, and it may be the case that this influence caused Wagner to change part (but not all) of his notation, to great confusion. We are thus left comparing quantities like $p_i$ and $1 - p_j$ in one paragraph and $p_1$ and $p_2$ in the next, with $p^+$ and $p^-$ thrown in for good measure. The contending states are sometimes $i$ and $j$, sometimes States 1 and 2, and sometimes Players 1 and 2. Even Clausewitz's absolute war is relabeled "total war" in several places. As a result, it is difficult for a reader to extract the substance of Wagner's argument from the notation. This shortcoming is palliated to some extent by Wagner's dexterous prose, but reliance on that prose introduces imprecision that a properly-specified model would dispel.

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