External Subsidies and Lasting Peace*

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Abstract

Third parties are thought to face a tradeoff in that those actions most likely to bring peace in the short run appear least likely to ensure its long run stability. Yet the tradeoff between conflict management and conflict resolution may be overstated. Analyzing an iterated three player bargaining model with both information and commitment problems, we first demonstrate two conditions under which third parties may produce lasting peace through conditional subsidies, even without addressing underlying informational or commitment problems. Second, we illustrate this possibility by analyzing the impact of US foreign aid on patterns of conflict and peace between Israel and her neighbors. Our analysis indicates that the termination of the rivalry between Israel and Egypt was most likely not brought about by the Camp David accords or peacekeeping operations, but by sustained foreign aid provision. We discuss the implications for both this conflict and conflict management more broadly.

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Can third parties bring lasting peace?

Recent work suggests a depressing answer, telling us that the conditions under which conflict resolution can be achieved are limited, while mere conflict management only delays the inevitable (Beardsley 2008, 2011, Werner and Yuen 2005). In contrast, we argue that third parties can sometimes bring lasting peace even without addressing the underlying information and commitment problems that might otherwise lead to war. Under certain conditions, genuine conflict resolution is not necessary to prevent war indefinitely.

To develop our argument, we analyze a bargaining model that allows for both information and commitment problems. We first discuss an equilibrium that illustrates extant claims about the counterproductive nature of conflict management. We then discuss two equilibria in which third parties can produce lasting peace. When the primary obstacle to negotiation is a commitment problem induced by a rapid shift in power, subsidies in the short term bring lasting peace. When the primary obstacle stems from information problems, sustained third party commitments can bring peace in both the short and long term.

We then illustrate the plausibility and applicability of these results with a quantitative case study of the Arab-Israeli conflict. We demonstrate that, from 1948 to 2001, conflict between Israel and her Arab neighbors occurred more frequently in the presence of conditions that exacerbate information and commitment problems, but only when the US did not provide foreign aid. Moreover, since 1973, the US has provided more economic aid to Israel and Egypt when observable indicators suggested that armed conflict would otherwise be particularly likely. Taken together, these results indicate that the primary reason Israel and Egypt have been at peace for forty years is external subsidies.

Recent events, we think, lend credence to this view. While briefly in power, the Muslim Brotherhood's political arm threatened to "revisit" the 1979 treaty with Israel if the US were to cut off aid, (New York Times, 3/16/2012). According to the New York Times, "Egyptians have long considered American aid as a kind of payment for preserving the peace despite the popular resentment of Israel."

After discussing the Arab-Israeli conflict, we briefly consider other cases where third parties have either fostered or reinforced peace through the selective provision of tangible economic benefits. We focus specifically on Greek and Turkish trade with the US following the Turco-Cypriot War, the EU's insistence on normalized relations between Serbia and Kosovo as a condition for Serbian accession, and the role of democracy aid in preventing civil conflict in democratizing states.

We conclude by discussing the implications of our work for the study and practice of conflict management.

Managing and Resolving Conflicts

A consensus has recently emerged around three findings in the study of third party influence on the stability of postwar peace.[1] First, the recurrence of war is less likely when the belligerents are allowed to "fight it out" than when they are interrupted by third parties.[2] Second,consent-based peacekeeping discourages the recurrence of conflict.[3] Finally, the prospects for genuine conflict resolution are bleak. While some have articulated conditions under which mediation resolves information problems that might otherwise give rise to conflict,[4] a critical assumption of such arguments is that third parties possess information the belligerents have already been assumed to have an incentive to keep private;[5] without such an assumption, there is little reason to expect mediation as information revelation to resolve conflicts, and no systematic evidence that it does so (Fey and Ramsay 2010).

[1] In contrast, there is little consensus regarding the effect of third party intervention in an ongoing war. See, inter alia, Balch-Lindsay, Enterline, and Joyce (2008), Regan and Aydin (2006), Regan (2002).

[2] See especially Werner and Yuen (2005) and Beardsley (2008, 2011). On the value of decisive outcomes, see also Senese and Quackenbush (2003) and Quackenbush and Venteicher (2008).

[3] See Doyle and Sambanis (2000), Fortna (2004), and Gilligan and Sergenti (2008). However, see also Lo, Hashimoto, and Reiter (2008).

[4] See especially Kydd (2003).

[5] Note that Smith and Stam (2003) similarly conclude there is little prospect for mediation to reveal information in practice. They argue that the theoretical possibility of information revelation via mediation exists, but in practice mediators are often too biased for their efforts to be credible. Of course, Kydd (2003) argues that it precisely because of their bias that mediators are sometimes able to credibly convey information. But Kydd has little to say about how mediators come to posses such information.

In short, recent work indicates that third parties are unable to produce genuine conflict resolution for the very reasons that states find it difficult to reach negotiated settlements on their own. This suggests that mere conflict management, which is thought to only bring peace in the short term, is the only option open to would-be peacemakers.

The bargaining literature tells us that wars are likely to end only once a convergence of expectations about each side's capabilities and/or resolve has been reached, unless of course one side is defeated outright.[6] Once this convergence occurs, neither side can reasonably expect to profit from continuing to fight, and peace becomes self-enforcing. Thus, Werner and Yuen (2005) and Beardsley (2008, 2011) argue that when third parties press for peace *before* belief convergence, they sow the seeds of future conflict. Since the third party's interest will inevitably wane, such intervention does little more than kick the can down the road.

We add an important caveat: while the third party's attention might often wane, we need not assume that it *always* does—and *if* the third party is willing to provide subsidies in perpetuity, then war may forever loom beyond the horizon. This is important because the exceptions—such as the extended commitment on behalf of the United States to maintaining peace between Egypt and Israel, or managing relations between Greece and Turkey—concern conflicts of great interest to the international system.

Further, we demonstrate below that one-time transfers are sufficient when third parties seek to prevent conflicts arising from commitment problems induced by rapid shifts in power. The intuition here, simply enough, is that future shifts in power create temporary problems. Thus, temporary fixes are sufficient.[7] An unappreciated implication of the logic linking rapid shifts in power to war is that once the shift occurs, the problem goes away.[8] It is not the shift itself that causes war, but the anticipation thereof, and the incentive this creates for preventive war. Third parties thus need only raise the cost of war to until the shift transpires.

We turn now to the formal model we use to develop the logic of our argument.

[6] See especially Wagner (2000), Powell (2004*a*) and Slantchev (2003*b*). Slantchev and Leventoğlu (2007) and Powell (2012) demonstrate that limited wars can also resolve commitment problems.

[7] We thank an anonymous reviewer for pointing this out.

[8] However, see Reed, Wolford, and Arena (N.d.).

The Model

Two actors, A and B, dispute the division of a good or bundle of goods whose value is normalized to 1.[9] Some third party, C, is primarily interested in ensuring a peaceful outcome.[10]

Each period $t \in [1, \infty)$ begins with C proposing some bundle of subsidies, consisting of $\sigma_{At} \in [0, \infty)$ and $\sigma_{Bt} \in [0, \infty)$, where σ_{At} is the amount to be allocated to A in the event that an agreement is reached, and σ_{Bt} is the amount that will be allocated to B. For ease of exposition, let $\sigma_t = \sigma_{At} + \sigma_{Bt}$ denote the total subsidies that C offers.

Though C announces the size of σ_{At} and σ_{Bt} at the start of the period, and thus A and B are aware of what they stand to lose if they fight, C only delivers σ_t if war is averted.

After observing C's choice of σ_{tA} and σ_{tB}, A decides whether to attack B immediately or enter negotiations,[11] which we model using the ultimatum bargaining protocol. That is, A proposes some division of the good, such that $x_t \in [0, 1]$ is allocated to A and $1 - x_t$ to B in the event of an agreement. Should B accept this proposal, it is implemented, and A and B's flow payoffs reflect their shares of the good as well as σ_{tA} and σ_{tB}.

We abstract away from the very real possibility that belligerents fail to uphold their agreements in order to focus on situations where obstacles to peace exist despite common knowledge that enforceable agreements are available.[12]

If B rejects A's proposal, a battle occurs. This may represent either the onset or continuation of war, depending upon the decisions made in $t - 1$. Regardless of whether an agreement is struck or a battle fought, play then proceeds to period $t + 1$. Neither peace nor war is treated as a terminal outcome here, the way one or the other is in most models.[13]

[9] Note that we need not assume that A and B represent internationally recognized sovereign states, though negotiations between governments a non-state actors may differ from those between states in ways we do not explore here.

[10] We'll generally assume the third party is a state, but we could easily envision C as an international governmental organization (IGO) or non-governmental organization (NGO) instead.

[11] Naturally, there is no reason that B could not also attack immediately. But since we will assume that the passage of time strictly advantages B, it is only A that would ever have a clear incentive to do so.

[12] This assumption is standard in the literature. However, see Schultz (2010), who demonstrates that when actors have incentives to defect from agreements, and cannot monitor compliance, war may be unavoidable.

[13] See, inter alia, Filson and Werner (2002), Powell (2004*b*), Slantchev (2003*a*,*b*), Slantchev and Leventoğlu (2007), Smith and Stam (2004) and Wagner (2000) for examples of models where negotiations end the

We allow for both informational and commitment problems. Specifically, we assume that if A attacks in t, A wins the resulting battle with probability $p_{tI} = \frac{m_{tA}}{m_{tA} + m_{tB}}$, whereas A wins battles that occur after failed attempts at negotiation with probability $p_{tN} = \frac{m_{tA}}{m_{tA} + m_{tB} + \alpha_t}$, where $\alpha_t > 0$ ensures that $p_{tI} > p_{tN}$. Let $m_{ti} > 0$ denote the material capabilities of $i \in \{A, B\}$ in period t, and let α_t denote the advantage accruing to B if A does not attack immediately. Further, let the value of m_{tA} and α_t be common knowledge while only B knows the value of m_{tB}. We assume that A and C only know that $m_{tB} = \underline{m}_{tB}$ with probability ω and $m_{tB} = \overline{m}_{tB}$ with probability $1 - \omega$, where $\underline{m}_{tB} < \overline{m}_{tB}$. Thus, A and C both know the probability with which B will be relatively weak or relatively strong, and also know that, regardless of B's initial capabilities, B will be more difficult to defeat if A does not attack immediately.[14] We also assume $p_{tI} > p_{t+1I}$ and $p_{tN} > p_{t+1B}$, which ensures that A will not attack immediately in $t' > t$ if A does not do so in t.

Should a battle take place, both A and B suffer a loss of utility due to the costs of war, denoted $c \in (0, 1]$. Without loss of generality, we do not allow c to vary by i (i.e., by actor), t (i.e., period), or the circumstances under which fighting occurred (pre- or post-negotiations).

We model battles as partially decisive. Let $q_t \in (0, 1)$ denote the share of the good in dispute possessed by A at the start of period t, with $1 - q_t$ held by B, where q_t reflects some initial value, q_0, as well as all previous battle outcomes. Should A prevail in period t, A's share of the good becomes $\overline{q}_t \equiv \frac{q_t + \beta_t}{1 + \beta_t}$, where $\beta_t \in (0, 1)$ indexes the stakes of the battle fought in period t.[15] Should B prevail in period t, then A's share of the good shifts to $\underline{q}_t \equiv \frac{q_t}{1 + \beta_t}$. Since $\overline{q}_t > q_t > \underline{q}_t$, A's share of the good in dispute strictly increases after battlefield victories and decreases after defeats.[16]

game. See Fearon (1995), Fey and Ramsay (2010), Powell (1996, 2006) and Tarar and Leventoğlu (2008) for examples of models where war ends the game. However, see Powell (2012) for an example of a model that, like ours, allows the game to continue in either case.

[14] While the actual capabilities each side possesses may change over time, we assume that B's type is fixed. That is, while $\underline{m}_{tB}$ need not equal $\underline{m}_{t+xB}$, if $m_{tB} = \underline{m}_{tB}$, then m_{t+xB} will equal $\underline{m}_{t+xB}$.

[15] Note, $\overline{q}_t$ becomes q_{t+1}, provided a battle occurs in t and A is victorious.

[16] Naturally, B controls however much of the good is not possessed by A. For example, if a battle occurs in period t and A prevails, then B's share of the good in dispute for period t is $1 - \frac{q_t + \beta_t}{1 + \beta_t}$.

C receives 0 in any period in which fighting occurs and $\iota_t - \sigma_t$ if A and B reach an agreement, where $\iota_t > 0$ reflects the degree of C's interest in seeing a peaceful outcome in period t. In practice, it is unlikely that C truly has no preference whatsoever in the outcome of a war between A and B, but we abstract away from such concerns to focus attention on situations where C's prevailing concern is stability.[17]

While we allow most of the parameters to vary with t, we do not focus on the implications of changes over time in most of them. One exception is ι_t, which we assume is subject to exogenous shocks between periods. This allows us to analyze cases where C's interest wanes, as it is typically assumed to, as well as cases where it is relatively stable.

Baseline Analysis

We begin by establishing a set of baseline expectations when C does not provide subsidies, which largely mirror results that are well-established in the literature. We will refer back to these when discussing our expectations for Arab-Israeli relations absent US intervention.

There are many pure strategy Markov perfect equilibria (MPEs) to our model.[18] To ease exposition, we focus on a few key results that yield clear empirical implications with respect to the likelihood of conflict and the distribution of material capabilities.[19]

Proposition 1. *War is more likely when the distribution of capabilities is shifting rapidly.*

Proposition 2. *War is more likely if the two sides are near parity.*

[17] Assigning C a payoff of 0 in the event of war also overlooks the possibility that domestic or international audiences might punish C for failing to do everything in their power to prevent conflict. While we believe such dynamics might well be at work in some real world situations, perhaps including US management of the Israeli-Palestinian conflict, we leave this possibility for future analysis.

[18] MPEs require actors to play Markov strategies, or those that maximize their expected utilities as of period t, treating each period as a distinct sub-game. The actors thus do not condition on the history of play, except insofar as this history pertains to their per-period payoffs.

[19] Our model provides novel implications about the technology of war that we do not explore here. For example, as β_t decreases, we see increases in the threshold that determines whether A attacks B immediately and as well as the threshold that determines whether A selects a value of x_t that risks war if A chooses to attempt negotiations at all. This suggests that peace is more stable when a single battlefield victory will produce little advantage. Second, our model indicates that war need not be inefficient, provided the implications of victory on the battlefield for future payoffs are large enough. However, we leave fuller exploration of these results for future analysis.

Proposition 3. *Rapid shifts that bring the distribution of capabilities closer to parity are more likely to cause war than are shifts away from parity.*

Neither of the first two results is particularly novel.[20] However, we believe ours is the first bargaining model to point to both results simultaneously, and to further indicate that the conditions under which A chooses to forgo negotiations, attacking outright, are more readily satisfied when the looming shift in power would bring the two sides closer to parity.[21][22]

Should A forgo the opportunity to attack B immediately, there are only two proposals A offers in equilibrium. One, denoted $\underline{x}_t$, ensures that B will accept regardless of type. The other, $\overline{x}_t$, allocates a larger share to A but is only accepted if B is relatively weak. A proposes $\overline{x}$ if and only if $\omega > \hat{\omega}_{tx}$, or only when sufficiently optimistic such terms will be accepted.

When $\omega > \hat{\omega}_{tx}$, A prefers to attack B immediately provided $\omega > \hat{\omega}_{tb}$. When $\omega \leq \hat{\omega}_{tx}$, A attacks immediately provided $\omega > \hat{\omega}_{tm}$. Using these three thresholds, which are defined in the appendix, we can fully characterize A's strategy.

Delaying the Inevitable

We begin our consideration of the impact of subsidies by returning to the argument made by Werner and Yuen (2005) and Beardsley (2008, 2011). In particular, we consider the possibility that even if attempts to end fighting are successful in the short term, they only delay the inevitable. In fact, we present a slightly stronger version of the argument—our model indicates that third parties can not only sow the seeds of future conflicts by ending wars prematurely, but also when they *prevent* wars. This suggests that we might find further empirical support for their argument if we look beyond cases where third party intervention ended an ongoing war to cases where subsidies were offered during times of peace.

We are now prepared to state our first key result regarding external subsidies.

[20] See, inter alia, Fearon (1995) and Powell (2004*b*, 2006) on rapid shifts in power. On the relationship between parity and uncertainty, see Slantchev (2004) and Reed (2003).

[21] Consult the appendix for formal proofs of these and all propositions.

[22] Taken together, these results echo the primary arguments of Power Transition Theory. See, inter alia, Organski (1958), Organski and Kugler (1980) and Lemke (2002).

Proposition 4. *If C's interests are insufficiently stable over time, subsides shift the risk of war due to informational problems from the present into the future.*

While a more formal proof can be found in the appendix, the intuition behind this result is straightforward. Suppose $\hat{\omega}_{tx} < \omega \leq \hat{\omega}_{tb}$ would hold should C set $\sigma_t = 0$.[23] This would indicate that, if C does not provide any subsidies, A would forgo the opportunity to attack outright, but would risk war with the terms it proposes to B. Thus, if C does not act, there is a chance that war will break out. Under such conditions, there exist equilibria in which C provides sufficiently large subsidies in period t to ensure that A no longer finds it optimal to risk war. By increasing the opportunity cost of war, C reduces A's incentive to respond to uncertainty by risking war in hopes of attaining a better deal.

However, when C does so, this does not address the fundamental source of the problem. Should an exogenous shock in $t+1$ yield $\iota_{t+1} < \iota_t$, C may not provide sufficient subsidies to dissuade A from risking war in $t+1$. That is, we can readily identify equilibria in which C prevents A from risking war in period t but sets $\sigma = 0$ in period $t+1$. Since A learns nothing about B's private information in t, the information problem remains at $t+1$, and once C's subsidies go away, A will then propose terms that B might reject.

Put differently, C can temporarily mitigate the consequences of A's information problem by subsidizing peaceful outcomes. A's uncertainty over B's military capabilities remains, but A has less incentive to risk war in hopes of getting a better deal when rejection not only means incurring c but forgoing σ_A. Yet if C's interest suddenly decreases, prompting C to cease providing subsidies, then A will risk war by setting $x_{t+1} = \overline{x}_{t+1}$.

This largely confirms the claim that when third parties manipulate material incentives rather than resolving the underlying causes of war, they only delay the inevitable. Whether third parties seek to manipulate the decision of the belligerents by offering subsidies that reward peace, by attempting to raise the costs of fighting (Werner and Yuen 2005), or some mix thereof, they do nothing to prevent A from risking war once the external force is removed.

[23] Which, to be more precise, implies that C has set $\sigma_{At} = \sigma_{Bt} = 0$.

Getting Through Tough Times

Let us now turn to cases where C provides subsidies ahead of a large shift in power but does not do so once the shift has transpired. We focus here on cases where the primary obstacle to negotiated agreements is one of credible commitment.[24]

The anticipation of a future shift in power can lead to war, but the commitment problem stemming therefrom disappears once the shift occurs. Shifts in power are not themselves destabilizing, at least according to the standard logic of commitment problems. Understanding that helps one to appreciate our next result.

Proposition 5. *Temporary subsidies from C may promote peace in both the short and long term, provided the primary obstacle to negotiated agreements is a commitment problem induced by a looming rapid shift in power.*

Suppose $\hat{\omega}_{tm} < \omega \leq \hat{\omega}_{tx}$ would hold provided $\sigma_t = 0$. This indicates that, absent any influence from C, A would attack B, though were A to attempt negotiations, A would issue a proposal that B would accept regardless of type. Should C select a sufficiently large value of σ_t, that will compensate A (either directly, in the form of σ_{tA}, or indirectly, in the form of σ_{tB}, which allows A to demand more from B) for the loss in bargaining power that A is about to suffer. Yet C need not provide any subsidies in $t+1$, since the incentive for A attack outright rather than attempt negotiations will be gone by then.

Always a Day Away

Even when the primary obstacle to a negotiated settlement is an information problem that won't fade away when the current period ends, there is room for hope. While we do not dispute that, on average, peace will be less stable following wars that end without the players' beliefs converging, this masks variation that is potentially quite relevant to both scholars and

[24] If both problems are present, C can still eliminate the risk of war, though this potentially requires even greater subsidies. Moreover, if C only provides sufficient subsidies to offset the commitment problem, the *ex ante* probability of war still drops from 1 to $1 - \omega$.

policy makers. That is, if C fails to resolve the underlying problem, but maintains interest in the dispute, war *indefinitely* hovers just over horizon, without ever actually occurring.

Proposition 6. *If C is willing to provide arbitrarily large subsidies in each of an indefinite number of periods, C can indefinitely prevent wars that would otherwise occur without resolving the underlying informational problem.*

Suppose that $\hat{\omega}_{tx} < \omega \leq \hat{\omega}_{tb}$ would hold if $\sigma_t = 0$. This indicates that unless C provides sufficiently large subsidies, A will propose terms that B will accept only if relatively weak. However, provided ι_t is sufficiently large, and any exogenous shocks in the future are expected to be relatively small, C offers arbitrarily large subsidies in each of an indefinite number of periods, and peace is ensured in each.[25] C's behavior is causally responsible for the peace that obtains in equilibrium, as the probability of war would be positive if C did not provide subsidies. But A remains uncertain about B's capabilities.

Informally, if C is likely to remain committed to preventing war tomorrow, and the day after that, it doesn't much matter that C only engages in conflict management rather than resolution. Either way, the probability of war will be negligible for the foreseeable future.

Of course, we do not dispute that resolving the underlying cause of the conflict would be preferable to raising the effective costs thereof, if at all possible. As discussed above, however, recent work suggests that it generally is not. We have growing reason to believe that states benefit from actions that create uncertainty (Meirowitz and Sartori 2008) and that there are significant challenges facing third parties who attempt to facilitate the credible revelation of information that the belligerents do not wish to have revealed (Fey and Ramsay 2010).[26] It therefore may not be fruitful to focus on the credible revelation of private information as a path to peace, even if we believe that the primary cause of war in most cases is the incentive states have to misrepresent their private information.

[25] The minimum shock sufficient to cause C to cease providing subsidies depends on ι_t. Thus, the result is more likely to hold *either* as C's interests increase, *or* as they grow less prone to fluctuation over time.

[26] Moreover, the *partial* revelation of private information may also make war more likely rather than less (Arena and Wolford 2012).

Subsidized Peace between Israel and Her Neighbors

Taken together, our propositions lead us to expect that subsidies from a third party may do more than simply shift the risk of war into the near future. To illustrate this possibility, we use a quantitative case study of United States' involvement in the Arab-Israeli conflict.

Our basic argument is as follows. The Arab-Israeli War of 1948–1949 marked the onset of a territorial rivalry between various Arab states and Israel, who captured vast swaths of territory—territory that, under the UN Partition Plan, was to be allocated to the Palestinians. In the subsequent years, several wars occurred, but a fear of Soviet involvement typically led the US to intervene, pressuring the belligerents into ending the conflict prematurely. However, the US did not initially seek to shore up the peace it created by providing conditional subsidies in the form of foreign aid, as it later would. Unsurprisingly, then, each new spell of peace proved no more stable than the last.[27]

All of that changed in the fall of 1973. The Yom Kippur War sparked a chain of events that collectively constituted an exogenous shock to the level of US interest in maintaining stability in the region and thus a change in strategy. Specifically, while the October war did not directly cause a shortfall in the production of oil, it played an important role in motivating the Arab Oil Embargo that in turn led to the 1973 Oil Crisis that sent the United States into a deep recession that kicked off an unprecedented period of stagflation.[28] Thus, the US had a greater incentive to focus on the Arab-Israeli conflict than ever before.

[27] This is, of course, a stylized account. There were a great many other factors involved in the terminations and origins of each of these wars. The behavior of the US is by no means the only, or even the primary, factor accounting for the ebb and flow of tensions. Nonetheless, we believe the above description captures *one* of the important aspects of this complex conflict.

[28] On the macroeconomic importance of oil price shocks, see Hamilton (1983). However, it is worth noting that the relationship between political events, supply shocks, price shocks, and macroeconomic performance is not straightforward. Hamilton (2003) argues that the relationship is non-linear, with spikes in the price of oil having a greater impact than sudden drops, while Kilian (2008) and Barsky and Kilian (2004) argue that the relationship is partly endogenous, with macroeconomic performance predicting price increases. They argue that the impact of political events, such as conflicts in the Middle East, has been overstated. However, they also stress the variance in the impact of different conflicts, arguing that there is a stronger case for the 1973 Yom Kippur War, and the embargoes that followed, causing a US recession than there is for 1979–1980 Iranian Revolution or the 1990–1991 Persian Gulf War. While we do not wish to overstate the role of this conflict, we note that even critics of simplistic narratives linking Middle East turmoil to recessions acknowledge that the oil embargoes of 1973 are, if nothing else, the exception that proves the rule.

While traditional explanations of the remarkable transformation of Israeli-Egyptian relations in the years that followed emphasize the Camp David accords and/or peacekeeping operations, we argue that the dramatic increase in the provision of US foreign aid to both Israel and Egypt is the best explanation for the absence of war between Israel and Egypt since 1973. While there is every reason to believe that information and commitment problems have remained/returned, as we'll discuss below, the United States' sustained commitment to subsidizing peace continues to discourage conflict to this day.[29]

That is, we do not argue that the United States managed to *resolve* the conflict between Israel and Egypt. Rather, we argue that the US realized in 1973 that the price of continued conflict was greater than it had once believed, and so began devoting substantial resources towards managing the conflict. The success of such a strategy over a period of 40 years stands in contrast to the expectations of Werner and Yuen (2005) and Beardsley (2011), but we nonetheless stress that our argument implies the potential for a return to conflict between Israel and Egypt should the US ever cease providing subsidies.

To support this argument, we turn now to analysis both of patterns of conflict between Israel and her Arab neighbors and variation in the provision of foreign aid by the US. We demonstrate that, in the absence of subsidies from the US in the form of foreign aid, parity and anticipated future shifts in power are associated with an increase in the incidence of the most hostile militarized interstate disputes, as anticipated by Propositions 1, 2 and Corollary 3. Yet as the total amount of economic aid provided by the US increases, this effect shrinks, eventually disappearing altogether, as Propositions 5 and 6 would lead us to expect. Finally, we demonstrate that since the Yom Kippur War, one of the key determinants of the amount of economic aid received by Israel and Egypt in any given year is the presence of observable factors that indicate an elevated risk of conflict. This suggests that aid not only facilitates peace, but is provided, at least in part, *because* it facilitates peace.

[29]In fairness, the United States has many reasons for providing foreign aid to Israel. One might argue that any US threat to withdraw aid to Israel in the event of a war with Egypt might not be credible. It is not clear to us that this is the case, but either way, the relationship between aid to Egypt and peaceful relations with Israel seems quite clear—not only to us, but to the Egyptians as well, as discussed above.

Data and Operationalization

Our unit of analysis is the dyad-year. We have data for four dyads each from 1948 to 2001, one for each of Israel's contiguous neighbors: Egypt, Jordan, Lebanon and Syria.[30] This yields an average of 45 yearly observations per dyad, after exclusions due to missing data.

Our dependent variable is $Violent\ MIDs_{d,t}$, which records the number of new militarized interstate disputes (MIDs) in dyad d in year t involving the use of force.[31] Data for this measure come from version 3.1 of the Militarized Interstate Disputes data set (Ghosn, Palmer, and Bremer 2004). The minimum of $Violent\ MIDs_{d,t}$ is 0, and the maximum is 3.

To capture the effect of external subsidies, we include the total amount of economic aid given by the US to dyad d in year t, denoted $Econ\ Aid_{d,t}$, measured in millions of constant 2005 US dollars.[32] The variable ranges from 0 to over 5,500 (i.e., \$5.5 billion).[33]

We measure parity as $Parity_{d,t} = 1 - \left(\frac{lnCINC_{Hi,t}}{lnCINC_{Hi,t} + lnCINC_{Lo,t}} \right)$, where $lnCINC_{Hi,t}$ denotes the log of the higher Composite Index of National Capability (CINC) score in year

[30] That is, our sample begins with Israel's proclamation of independence and ends in the last year for which the data on militarized interstate disputes are available.

[31] Focusing on MIDs that at least involve the use of force, as opposed to including all MIDs, decreases the risk of confirming our expectations about the incidence of violent conflict with actions states undertake in an effort to prevent such an outcome. That is, the two categories below the use of force, threats to use force and shows of force, might well represent attempts to signal resolve (Fearon 1997, Slantchev 2005). By excluding threats to use force and displays of force, we narrow the dependent variable from 61 non-zero observations to 52, of which 19 violent MIDs involved Egypt, 8 Jordan, 6 Lebanon and 19 Syria. We do not further restrict our focus to the highest category of disputes, those labeled wars according to an arbitrary fatality threshold, because our game-theoretic model only concerns whether states resort to an inefficient use of violence, irrespective of whether that violence meets a certain criterion of intensity. That is, while we used the term "war" above to refer to outcomes in which the actors did not reach a peaceful agreement, we did so using a broader conceptualization thereof than is embodied in the MID project's coding rules.

[32] Data available from the United States Agency for International Development website (US Agency for International Development 2011). The subsidies are measured as total amounts allocated per dyad because the model indicates that subsidies provided to B have the same effect, if for a different reason, as those provided to A. That is, conditional subsidies to A directly increase the effective cost of war for A, discouraging it from either attack or risking war with its choice of terms. Subsidies provided to B allow A to extract greater concessions without provoking resistance, and so also reduce this incentive, albeit indirectly. Note that we did not include provision of military aid, as it is likely that this form of aid is given for different reasons, and, moreover, influences the distribution of military capabilities. In our theoretical model, we assumed that the subsidies provided by C were simply of intrinsic value to A and B. Consideration of third party subsidies that alter capabilities, both theoretically and empirically, lies outside the scope of this paper.

[33] Note that the USAID website does not report disbursements under \$50,000. The lowest nonzero value in our dataset is .7, or \$700,000.

t and $lnCINC_{Lo,t}$ denotes the log of the lower CINC score in that year.[34][35] This variable ranges from 0.4, extreme preponderance, to 0.5, perfect parity.

Recall that it is the *anticipation* of a future shift in power, one that will *not* occur in equilibrium if A attacks, that is expected to promote conflict. Thus, we construct $Future\ Decline_{d,t} = \left(\frac{ln(\hat{CINC}_{Hi,t+1})}{ln(\hat{CINC}_{Hi,t+1}) + ln(\hat{CINC}_{Lo,t+1})}\right) - \left(\frac{ln(CINC_{Hi,t})}{ln(CINC_{Hi,t}) + ln(CINC_{Lo,t})}\right)$, which records the extent to which the stronger state's share of capabilities is predicted to decrease from year t to year $t+1$.[36] This variable ranges from -.003 to 0.003. Note that positive values of $Future\ Decline_{d,t}$ indicate that the stronger state anticipates a future decline in its standing relative to the weaker state, whereas negative values indicate that they anticipate increased dominance.[37] In accordance with Corollary 3, we expect anticipated shifts that bring the two sides nearer to parity (i.e., those in which the dominant state is expecting to lose its advantage over the weaker state) to be especially likely to promote conflict.

Recall that we have not argued that the US resolved the conflict—in which case, there would be little risk of conflict no matter what the US did—but that the provision of conditional subsidies in the form of foreign aid severs the link between information and commitment problems, on the one hand, and conflict, on the other. This implies an interactive relationship. Thus, we interact $Econ\ Aid_{d,t}$ both with $Parity_{d,t}$ and $Future\ Decline_{d,t}$.

We control for the presence of peacekeeping missions in each dyad-year with $PKO_{d,t}$, a trichotomous variable, where 0 indicates the absence of any peacekeeping operation, 1 indicates monitoring (unarmed military observers), and 2 indicates armed peacekeeping forces.[38]

[34]The data on the CINC scores come from the Correlates of War data set on National Material Capabilities (version 4.0), updated to cover the years of 1816-2007 from the original publication in Singer, Bremer, and Stucky (1972). CINC scores record a state's share of the world's total material capabilities, as measured by demographic, military, and industrial factors.

[35]We log each side's CINC score because the distribution of CINC scores exhibits a right skew, and we have little reason to believe that a given increase in capabilities has the same effect for states that are already powerful as for those who are relatively weak.

[36]The predicted values, $\hat{CINC}_{Hi,t+1}$ and $\hat{CINC}_{Lo,t+1}$ are generated, separately, by regressing CINC scores for each state in year t on CINC scores in year $t-1$ and the military aid provided by the US to each state in year $t-1$. The predicted values from these regressions give us predicted values in year t. We use the values for year $t+1$ to obtain $\hat{CINC}_{Hi,t+1}$ and $\hat{CINC}_{Lo,t+1}$.

[37]Naturally, values close to 0 then indicate that the dyadic distribution of material capabilities could be expected to remain more or less constant from year t to year $t+1$.

[38]Taken from the data in Lo, Hashimoto, and Reiter (2008), who expanded the data from Fortna (2003) to

We do not account for the Camp David accords for two reasons. First, our results are substantively similar if we include a binary variable equal to one for Israeli-Egyptian dyads starting in 1979. Second, this variable itself is not statistically significant. It only exhibits a negative association with *Violent MIDs*$_{d,t}$ when we exclude the measures used to capture our argument (i.e., *Econ Aid*$_{d,t}$ and its interactions with *Parity*$_{d,t}$ and *Future Decline*$_{d,t}$).[39]

Finally, to correct for temporal dependence, we also include *Violent MIDs*$_{d,t-1}$.[40]

Absent any evidence that foreign aid allocations increase when conflict would otherwise be likely, our claim that the US brought peace between Israel and Egypt through external subsidies might be regarded as suspect. Therefore, we assess not only the impact, but also the *determinants*, of US economic assistance. For our analysis of *Econ Aid*$_{d,t}$, our primary explanatory variable reflects the number of MIDs involving the use of force that might be expected to occur *absent* any attempts at conflict management, *Expected MIDs*$_{d,t}$, which is the predicted value of *Violent MIDs*$_{d,t}$ generated from a baseline model. This model is similar to the model we employ to test our expectations about conflict management, save for two important differences. First, it does not include any of the measures of third party attempts at conflict management.[41] Second, we include the CINC scores for each state in the dyad, $CINC_{1,t}$ and $CINC_{2,t}$ in order to improve the predictive power of the model.[42]

Since we argue that the US only became interested in subsidizing peace after 1973, we also include *Post Yom Kippur*$_t$. This variable takes on a value of 1 in all years after 1973 and 0 in all years up to and including 1973. More importantly, we interact this variable with *Expected MIDs*$_{d,t}$. This will allow us to determine whether there is a positive association between *Expected MIDs*$_{d,t}$ after 1973, yet no relationship prior to 1973, as per our argument.

We also include *Econ Aid*$_{d,t-1}$, *Econ Aid*$_{d,t-2}$, and *Econ Aid*$_{d,t-3}$, as well as a binary variable equal to 1 for that dyad and 0 otherwise.

1914-2001. We note that our results are the virtually identical regardless of whether we try alternate model specifications to test the for effect of monitoring missions separately from the armed peacekeeping missions.

[39]Results available upon request.

[40]The inclusion of additional lags did not improve model fit, nor were lags beyond the first significant.

[41]That is, we omit *Econ Aid*$_{d,t}$, the interaction terms involving *Econ Aid*$_{d,t}$, and *PKO*$_{d,t}$ from this model.

[42]The results of this baseline model are available from the authors upon request.

Analysis

Table 1 reports the results of our analysis of *Violent MIDs*$_{d,t}$, which uses a Poisson model.[43]

[Table 1 About Here]

Due to the presence of multiplicative interaction terms, interpretation is not straightforward. The interaction terms are negative, indicating that the impacts of *Parity*$_{d,t}$ and *Future Decline*$_{d,t}$ are decreasing in *Econ Aid*$_{d,t}$, as expected.[44]

To facilitate fuller interpretation, below we present graphs of the predicted values of *Violent MIDs*$_{d,t}$ for theoretically interesting values of the independent variables.[45] Consider Figures 1 and 2. The graphs in these figures plot the predicted value of *Violent MIDs*$_{d,t}$ as a function of *Parity*$_{d,t}$ and *Future Decline*$_{d,t}$ when *Econ Aid*$_{d,t}$ takes on its mean value for the Israel-Egypt dyad and when *Econ Aid*$_{d,t}$ takes on a value of 0. All other variables are set to their mean values for Israel and Egypt following the Camp David accords.[46]

[Figures 1 and 2 About Here]

When *Econ Aid*$_{d,t}$ takes on a value of 0, the predicted number of MIDs involving the use of force increases as either *Parity*$_{d,t}$ or *Future Decline*$_{d,t}$ increases, as indicated by the red lines. Yet the blue lines indicate that when *Econ Aid*$_{d,t}$ takes on its mean value for Israel and Egypt following the Camp David accords, these effects disappear. At this level of aid, the relationship between the predicted number of violent militarized interstate disputes and parity on the one hand, or rapid shifts in power on the other, is essentially flat.

[43] A Pearson χ^2 goodness-of-fit test fails to reject the null hypothesis that the data are Poisson distributed in the specification shown in Table 1. A negative binomial model shows no overdispersion in the data.

[44] The coefficient estimates on *Parity*$_{d,t}$ and *Future Decline*$_{d,t}$ are positive, indicating that, in the absence of subsidies, these factors are positively associated with conflict, which is also expected. However, these effects are not distinguishable from zero, in contrast to the expectations of Proposition 1 and 2 and Corollary 3. We hesitate to read too much into this, however, given the small number of observations and the large number of studies that have reported the expected patterns regarding parity and shifts in power.

[45] As recommended by Brambor, Clark, and Golder (2006).

[46] That is, in both graphs, *Violent MIDs*$_{d,t-1}$ is set equal to 0 and *PKO*$_{d,t}$ is set equal to 2. In Figure 1, where *Parity*$_{d,t}$ varies, *Future Decline*$_{d,t}$ is held constant at its mean of $-.0006$. In Figure 2, *Parity*$_{d,t}$ is held constant at its mean of 0.46.

Our results indicate that the number of violent militarized disputes that would have occurred between Israel and Egypt after the Camp David accords would have been substantially higher if not for the foreign aid provided by the United States. This suggests that it was not President Carter's mediation at Camp David, or the peace treaty resulting from that meeting, that reduced the likelihood of conflict between Israel and Egypt, but the increase in foreign aid that, while reaching particularly high levels in 1978 and 1979, began to rise dramatically in the immediate aftermath of the Yom Kippur War.[47]

According to our estimates, had the US provided one-tenth as much economic assistance as it actually did between 1974 and 1983—which would be roughly the amount of aid given between 1964 and 1973—Israel and Egypt would have experienced 6 violent MIDs in the decade following the Yom Kippur War. While the absence of any violent disputes in this period is not anticipated by our statistical results—which would expect roughly 1.5 violent MIDs to have occurred[48]—our analysis nonetheless indicates that US foreign aid substantially reduced the likelihood of conflict between Israel and Egypt at a crucial time.

Table 2 reports the results of an OLS regression analysis of $Econ\ Aid_{d,t}$.

[Table 2 About Here]

The first thing to note is that our results suggest that, prior to the Yom Kippur war, the US did not condition the amount of aid it gave to Israel and Egypt on expectations of conflict. This is evident from the coefficient estimate on $Expected\ MIDs_{d,t}$, which tells us the effect of this variable when $Post\ Yom\ Kippur_t$ is equal to 0 due to the multiplicative interaction. While this coefficient estimate is negative, seeming to imply that the expectation of conflict discouraged aid, it is statistically indistinguishable from 0.

[47] From 1948 to 1973, the average amount of economic assistance provided by the US to Israel and Egypt in any given year was approximately $410 million. From 1974 to 1977, the average was approximately $3.2 billion. In both 1978 and 1979, the total amount of economic aid provided was approximately $4.6 billion.

[48] This figure is merely the sum of the average number of violent militarized interstate disputes predicted in each year from 1974 to 1983.

In contrast, after the Yom Kippur War, not only did the US provide more aid even in the absence of expectations of conflict,[49] but, more importantly, the amount of aid provided by the US increased when observable indicators (such as parity and shifts in power) pointed towards a greater expectation of conflict. Figure 3 illustrates this.

[Figure 3 About Here]

Here, we plot the predicted level of economic assistance as a function of *Expected MIDs*$_{d,t}$, both before the Yom Kippur War (in red) and after (in blue). We can see here that even when observable indicators point to a very low risk of hostility, the amount of aid our analysis leads us to expect the US to give is greater in the years following the Yom Kippur War than before. But in such cases, this difference is relatively modest. As the number of MIDs that would be expected to occur absent subsidies increases, however, the two lines begin to diverge sharply. This is because, as expected, the US has tended to respond to an elevated risk of conflict by providing more aid since the Yom Kippur War, but did not do so prior to that. This suggests that at least part of what has driven US provision of economic assistance to Israel and Egypt since the Yom Kippur War has been the expectation that doing so would prevent conflicts that would otherwise have occurred.

Further Examples

We now turn to a brief discussion of other examples of third parties providing tangible economic benefits to former/potential belligerents in ways that we think may have reduced the prospects for armed conflict.

In 1974, Cyprus experienced a coup that brought to power a government seeking unification with Greece. Turkish forces invaded Cyprus shortly thereafter. By war's end, the island was divided into a Turkish north and Greek south. The de facto partition is not considered a definitive resolution by any of the parties, and the conflict remains unresolved to this day.[50]

[49] As indicated by the positive and significant coefficient estimate for *Post Yom Kippur*$_t$.

[50] For information about the conflict, see http://www.cyprus-conflict.net/.

Though the Greek military junta that backed the coup collapsed during the conflict, replaced by a democratic government that showed no interest in a military conflict with Turkish forces, the possibility of conflict between the two was considerable. Greece withdrew from NATO in response, only rejoining in 1980. Soon after the war ended, the UN began a series of attempts to settle the conflict. These efforts have been partially successful, but the issue remains unresolved, and the latest UN attempt at mediation, the Annan Plan, was rejected in a referendum by Greek Cypriots in 2004 (New York Times, 4/25/2004).

Attempts to resolve the conflict have been unsuccessful, but the absence of a return to conflict might be attributable to successful conflict management. Both Turkey and Greece saw a dramatic jump in bilateral trade with the US in 1974. The total volume of trade between the US and Greece averaged roughly $155 million between 1948 and 1973.[51] In 1974, this figure jumped to $575 million, dropping slightly to $515 million in 1975 and then increasing back up to $565 million in 1976. Similarly, the total volume of trade between the US and Turkey averaged roughly $205 million between 1948 and 1973. In 1974, that jumped to $500 million, increasing further to $580 million in 1975 and then $675 million in 1976. These patterns can be seen clearly in Figure 4.

[Figure 4 About Here]

While we cannot say for sure that the US was seeking to provide conditional subsidies in order to prevent renewed hostilities, the timing of the simultaneous and dramatic increases in bilateral trade with these two states is quite striking. We are not aware of any plausible alternative explanation for this pattern. Moreover, since these increases occurred under the same administration that initiated the US policy of buying peace between Israel and Egypt through the provision of conditional subsidies, it is not difficult to imagine that a similar strategy may have been at work here.

Recent work similarly indicates that third parties can prevent civil conflict by providing subsidies. Savun and Tirone (2011) demonstrate that democratizing states receiving higher

[51] The Correlates of War Trade Data Set Barbieri and Keshk (2012), Barbieri, Keshk, and Pollins (2009).

levels of aid are less likely to experience conflict than those that receive less aid. The authors explain this finding by claiming that democracy aid resolves commitment problems. Our argument suggests a different interpretation: democracy aid may simply prevent conflict by raising the opportunity cost of war. We need not believe that the underlying commitment problems are resolved in order to explain the pattern identified by the authors.

Finally, talks between Serbia and Kosovo have recently broken down, and this is seen as a major blow to Serbia's EU bid.[52] Though the EU has failed, at least for now, to bring about agreement between these former disputants by linking their behavior to tangible economic benefits, this further indicates that attempts by third parties to buy peace come in a variety of forms from a variety of actors.

Conclusion

Recent literature on conflict management suggests a tension between the ability of third parties to bring peace in the short run relative to the long run. While the overall logic of this argument is persuasive, we believe there are important exceptions that have not been adequately explored previously. While it may be true on average that conflict management only delays the inevitable, this need not be the case.

Our bargaining model suggests that there are two conditions under which third parties may bring lasting peace without directly resolving the information or commitment problems that threaten to cause conflict. First, by their very nature, commitment problems due to rapid shifts in power disappear after said shift in power takes place. If a third party can provide sufficient subsidies, even temporarily, it may discourage inefficient fighting in the short term without promoting conflict in the long term.

Second, sometimes third parties have sufficiently large and/or stable interests to provide subsidies indefinitely. In so doing, they may indefinitely delay conflict. This may not be as desirable as resolving the underlying problem, but it can nonetheless be quite effective.

[52] Reuters, 4/2/2013.

Lest this latter point sound like a mere theoretical possibility of little more than academic interest, we have argued that this is precisely what the United States has done with Israel and Egypt. Our results challenge existing claims about the peace between Israel and Egypt, suggesting that the best account for the reduction in conflict between these two states is external subsidies provided by the US in the form of foreign aid. Moreover, our results suggest that Israeli-Egyptian relations have been *stabilized*, but a return to conflict at some point in the future is not unforeseeable. Provided the United States remains committed to providing foreign aid to these two nations, the specter of war may remain forever on the edge of the horizon. But should the US cease to provide aid, as some members of Congress advocate, the peaceful relations between Israel and Egypt may be put at risk.

To further demonstrate the relevance of our argument, we briefly discussed other examples of third party attempts to link peace to tangible economic benefits, focusing on Turkish and Greek relations with the US following the Turco-Cypriot War, the impact of democracy aid on the risk of civil conflict, and the EU's decision to make Serbian accession conditional on normalized relations with Kosovo. Though we did not discuss any of these examples in great detail due to limitations of space, we believe they illustrate that our argument applies to cases other than the Arab-Israeli conflict, and that conditional subsidies can come in the form of foreign aid, increased trade, or admittance to international organizations.

Though such arguments lie beyond the scope of this analysis, we wish to acknowledge that the strategy of purchasing peace through foreign aid has some unfortunate consequences. Specifically, one might argue that, much as recipients of US foreign aid appear to have an incentive to have a terrorism problem (Bapat 2007), Israel and/or Egypt may have an incentive to make sure that fear of a return to past levels of violence never quite disappears. Moreover, US foreign aid may have allowed Mubarak to remain in office, and to refrain from undertaking democratic reform. We therefore do not wish our claim to have demonstrated a link between US foreign aid and a reduced likelihood of conflict between Israel and Egypt to be taken as an endorsement of this policy.

Our primary goal has been to demonstrate that conflict management can be more effective than recent arguments indicate. Even though it may often be implausible for third parties to practice genuine conflict resolution, that need not mean that they are incapable of facilitating lasting peace—provided that they are willing to pay what may be a rather considerable price. To be sure, third parties often will not be willing to make extended commitments to continuously subsidizing peace. But sometimes they will be. We believe that the history of the Arab-Israeli conflict supports our theoretical arguments.

Table 1: Analysis of *Violent MIDs*$_{d,t}$ For Contiguous Arab-Israeli Dyads, 1948–2001

Covariate	Coefficient Estimate
Violent Mids$_{d,t-1}$	0.54^{***}
	(0.16)
PKO$_{d,t}$	0.65^{**}
	(0.29)
Econ Aid$_{d,t}$	$1.20e^{-03}$
	$(4.40e^{-03})$
Parity$_{d,t}$	11.29
	(8.72)
Future Decline$_{d,t}$	66.87
	(118.49)
Parity$_{d,t}$ × *Econ Aid*$_{d,t}$	$-4.21e^{-03}$
	$(9.45e^{-03})$
Future Decline$_{d,t}$ × *Econ Aid*$_{d,t}$	-0.11
	(0.19)
Constant	-6.77
	(4.18)
Log likelihood	**-119.09**
LR χ^2	**54.42**
Pseudo R^2	**0.19**

Notes: Poisson Regression. N = 188. Cell entries are coefficient estimates; standard errors in parentheses.

* $p < .1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Analysis of $Econ\ Aid_{d,t}$ For Contiguous Arab-Israeli Dyads, 1948–2001

Covariate	Coefficient Estimate
$Econ\ Aid_{d,t-1}$	0.90^{***}
	(0.07)
$Econ\ Aid_{d,t-2}$	-0.40^{***}
	(0.09)
$Econ\ Aid_{d,t-3}$	0.13^{**}
	(0.07)
$Egypt_{d,t}$	277.03^{***}
	(85.22)
$Expected\ MIDs_{d,t}$	-18.72
	(104.81)
$Post\ Yom\ Kippur_{t}$	515.29^{***}
	(128.89)
$Expected\ Mids_{d,t} \times Post\ Yom\ Kippur_{t}$	1561.39^{***}
	(591.71)
Constant	93.52
	(76.78)
$F_{(7,192)}$	**172.47**
Adjusted R^2	**0.86**

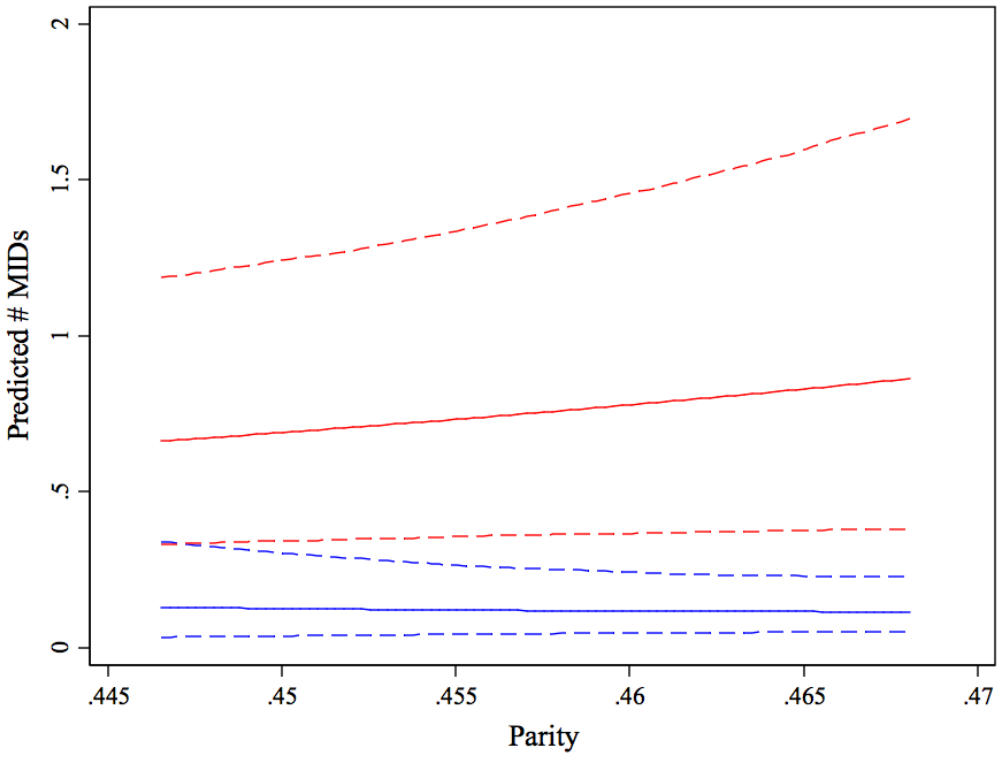
Notes: OLS Regression. N = 200.

Cell entries are coefficient estimates;

standard errors in parentheses.

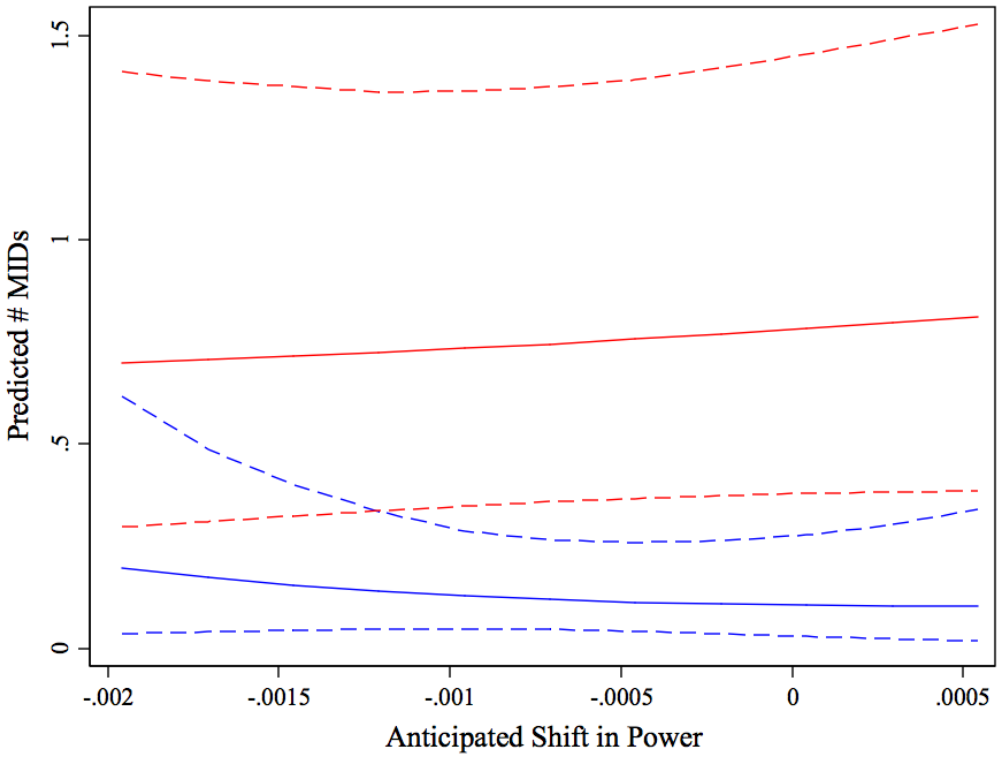
* $p < .1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 1: Predicted Values of *Violent MIDs*$_{d,t}$ by *Parity*$_{d,t}$



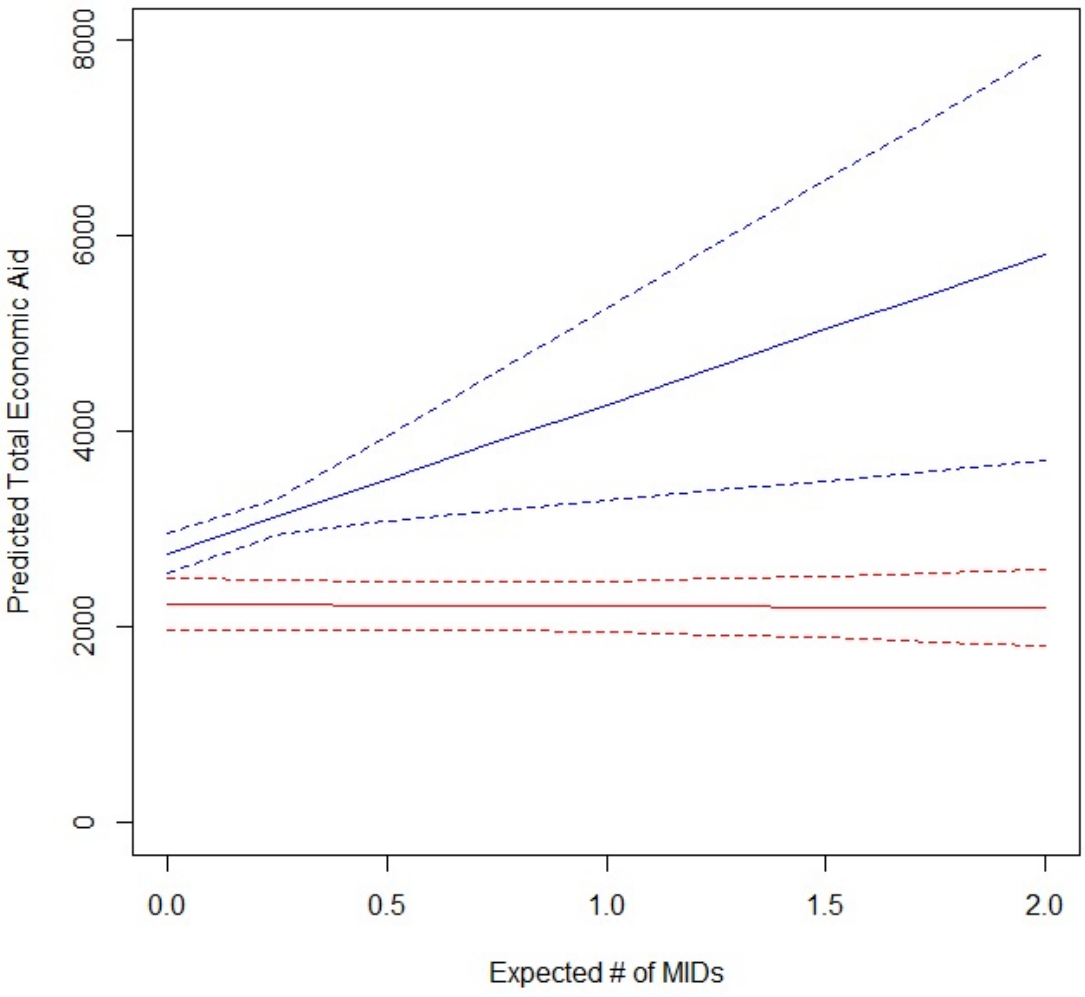
Note: Graph based on the poisson regression shown in Table 1. All variables set to their means for Israel and Egypt after Camp David: *Violent MIDs*$_{d,t} = 0$, $PKO_{d,t} = 2$, and *Future Decline*$_{d,t} = -0.006$. Red line indicates *Econ Aid*$_{d,t}$ is equal to 0. Blue line indicates *Econ Aid*$_{d,t}$ of \$2.9 billion, the mean value for Israel and Egypt after Camp David.

Figure 2: Predicted Values of *Violent MIDs*$_{d,t}$ by *Future Decline*$_{d,t}$



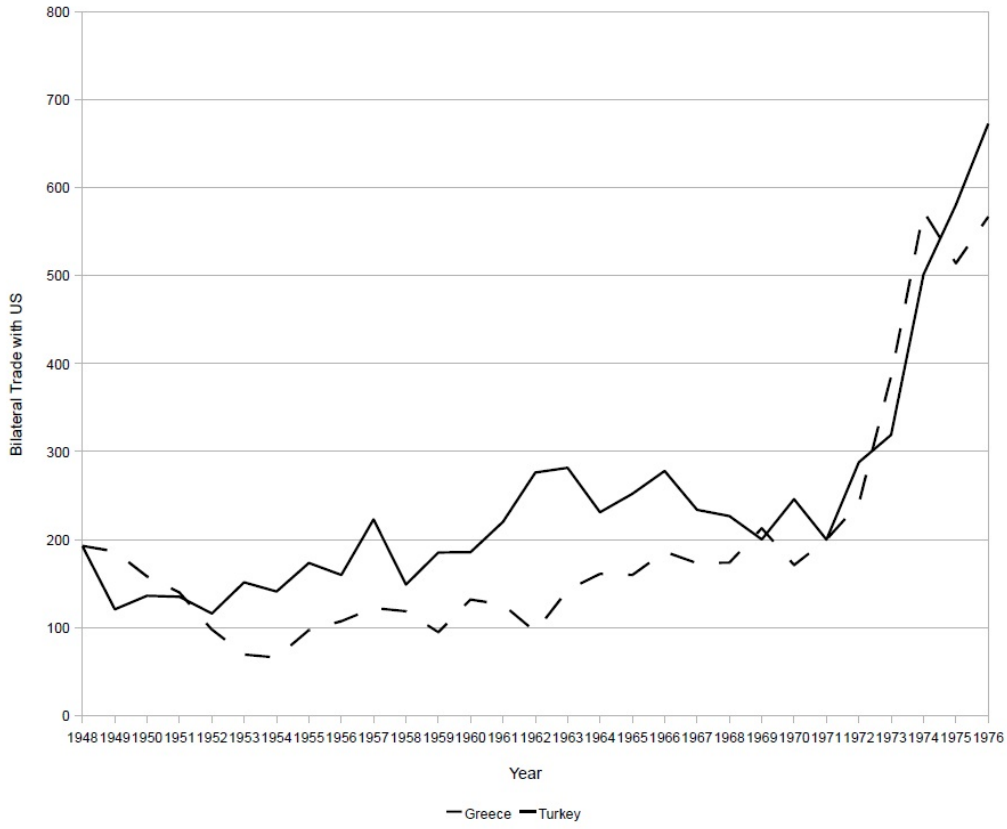
Note: Graph based on the poisson regression shown in Table 1. All variables set to their means for Israel and Egypt after Camp David: *Violent MIDs*$_{d,t} = 0$, $PKO_{d,t} = 2$, and $Parity_{d,t} = 0.46$. Red line indicates *Econ Aid*$_{d,t}$ is equal to 0. Blue line indicates *Econ Aid*$_{d,t}$ of \$2.9 billion, the mean value for Israel and Egypt after Camp David.

Figure 3: Predicted Values of $Econ\ Aid_{d,t}$ by $Expected\ MIDs_{d,t}$



Note: Graph based on the OLS regression shown in Table 2. The lagged values of the dependent variable are set to their means for Israel and Egypt after Yom Kippur. Red line indicates predictions prior to the Yom Kippur War. Blue line indicates the predictions following the Yom Kippur War.

Figure 4: Bilateral Trade with the US for Turkey and Greece



Note: Measured in hundreds of millions of current US dollars. Source: the Correlates of War Trade Data.

Appendix

Before turning to the proofs, we first establish some important preliminary results.

Let $V_{tA}(\cdot, h_t)$ and $V_{tB}(\cdot, h_t)$ denote the continuation values, defined recursively, for A and B given some outcome and some history of play. For example, $V_{tA}(x_t, h_t)$ would denote A's continuation value given history h_t, and given that, in period t, B accepts A's proposal x_t. While many aspects of h_t have no impact on the player's payoffs, the outcomes of previous battles play an important role, as we will discuss more below.

Further, let $\delta \in (0, 1)$ be a common discount factor.

For example, if in all future periods, A neither attacks B nor proposes terms any B would reject, $V_{tA}(x, h_t) = x_t + \sigma_{tA} + \delta V_{t+1A}(x, h_{t+1})$ and $V_{tB}(x, h_t) = 1 - x_t + \sigma_{tB} + \delta V_{t+1B}(x, h_{t+1})$.[53]

Let $V_{tA}(w, h_t)$ and $V_{tB}(w, h_t)$ denote the continuation values for A and B, respectively, following a battle in period t that is won by A. Similarly, let $V_{tA}(l, h_t)$ and $V_{tB}(l, h_t)$ denote their continuation values following battles that A loses, i.e., those won by B.

For example, should A choose to attack B immediately in period t but offer proposals that B will accept regardless of type in all subsequent periods regardless of the outcome of the current battle, A receives $p_{tI}\Big(\overline{q}_t - c + \delta\big(V_{t+1A}(x, h^w_{t+1})\big)\Big) + (1 - p_{tI})\Big(\underline{q}_t - c + \delta\big(V_{t+1A}(x, h^l_{t+1})\big)\Big)$, where h^w_{t+1} denotes the history of play as of period $t+1$ given that A won a battle in period t and h^l_{t+1} denotes the history in $t+1$ given that A lost a battle in t.

We assume $V_{tA}(\cdot, h^w_t) > V_{tA}(\cdot, h^l_t)\ \forall\ t$ and $V_{tB}(\cdot, h^w_t) < V_{tB}(\cdot, h^l_t)\ \forall\ t$. We further assume $V_{tB}(l, h_t) - V_{tB}(w, h_t) = V_{tA}(w, h_t) - V_{tA}(l, h_t)$. The substantive interpretation of these assumptions is that, at any time, for either type of B, players profit from winning battles and suffer when losing them, regardless of whether they continue fighting or subsequently reach a negotiated agreement. Moreover, the extent to which the victor profits is identical to the magnitude of the defeated state's loss. Note, these assumptions are *not* necessary for any our key results. However, they greatly simplify our derivations.

[53] Naturally, $V_{tB}(x, h_t)$ depends on B's type (i.e., the value of m_{tB}. In the interests of space, we report generic representations.

Next, we establish a generic acceptance rule for B. In any given period t, B accepts A's proposal of x_t iff $U_B(acc) \geq EU_B(rej)$, or

$$\begin{aligned} &1 - x_t + \sigma_{tB} + \delta\big(V_{tB}(x, h_t)\big) \geq \\ &p_{tN}\Big(1 - \overline{q}_t - c + \delta\big(V_{tB}(w, h_t)\big)\Big) + (1 - p_{tN})\Big(1 - \underline{q}_t - c + \delta\big(V_{tB}(l, h_t)\big)\Big), \end{aligned}$$

which simplifies to

$$x_t \leq \underline{q}_t + c + \sigma_{tB} + \delta\big(V_{tB}(x, h_t) - V_{tB}(l, h_t)\big) + p_{tN}\Big(\overline{q}_t - \underline{q}_t + \delta\big(V_{tB}(l, h_t) - V_{tB}(w, h_t)\big)\Big).$$

For notational convenience, let

$$\underline{x}_t \equiv \underline{q}_t + c + \sigma_{tB} + \delta\big(V_{tB}(x, h_t) - V_{tB}(l, h_t)\big) + \underline{p}_{tN}\Big(\overline{q}_t - \underline{q}_t + \delta\big(V_{tB}(l, h_t) - V_{tB}(w, h_t)\big)\Big),$$

and

$$\overline{x}_t \equiv \underline{q}_t + c + \sigma_{tB} + \delta\big(V_{tB}(x, h_t) - V_{tB}(l, h_t)\big) + \overline{p}_{tN}\Big(\overline{q}_t - \underline{q}_t + \delta\big(V_{tB}(l, h_t) - V_{tB}(w, h_t)\big)\Big),$$

where

$$\underline{p}_{tN} \equiv \frac{m_{tA}}{m_{tA} + \overline{m}_{tB} + \alpha_t} \quad \text{and} \quad \overline{p}_{tN} \equiv \frac{m_{tA}}{m_{tA} + \underline{m}_{tB} + \alpha_t}.$$

Similarly, it will be useful later to define

$$\underline{p}_{tI} \equiv \frac{m_{tA}}{m_{tA} + \overline{m}_{tB}} \quad \text{and} \quad \overline{p}_{tI} \equiv \frac{m_{tA}}{m_{tA} + \underline{m}_{tB}}.$$

Note that $\underline{x}_t$ and $\overline{x}_t$ are identical, save that one includes $\underline{p}_{tN}$ and one $\overline{p}_{tN}$. Since $\underline{p}_{tN} < \overline{p}_{tN}$, it follows that $\underline{x}_t < \overline{x}_t$, provided $\overline{q}_t - \underline{q}_t > \delta\big(V_{tB}(w, h_t) - V_{tB}(l, h_t)\big)$. This inequality must hold, as the right hand side is strictly negative by assumption.

To ensure interior solutions, we assume throughout that $0 < \underline{x}_t < \overline{x}_t < 1$. Otherwise, A's optimal strategy in equilibrium may involve extreme proposals, those allocating all of the good to either A or B.

We can now state B's acceptance rule more succinctly. The relatively weak type accepts iff $x_t \leq \overline{x}_t$ and the strong type accepts iff $x_t \leq \underline{x}_t$, where $\overline{q}_t - \underline{q}_t > V_{tB}(w, h_t) - V_{tB}(l, h_t)$, and thus $\underline{x}_t < \overline{x}_t$, ensures that any proposal that would be accepted by the relatively strong type will also be accepted by the relatively weak type.

Thus, while A does not know the value of m_{tB}, since A knows that $m_{tB} = \underline{m}_{tB}$ with probability ω, $m_{tB} = \overline{m}_{tB}$ with probability $1 - \omega$, and $\underline{x}_t < \overline{x}_t$, A can infer the following:

$$Pr(war|x_t) = \begin{cases} 1 & \text{if } x_t > \overline{x}_t \\ 1 - \omega & \text{if } \underline{x}_t < x_t \leq \overline{x}_t \\ 0 & \text{if } x_t \leq \underline{x}_t. \end{cases}$$

Therefore, A can also deduce that $EU_A(x_t > \overline{x}_t)$ is

$$\omega\Big(\overline{p}_{tN}\Big(\overline{q}_t - c + \delta\big(V_{tA}(w, h_t)\big)\Big) + (1 - \overline{p}_{tN})\Big(\underline{q}_t - c + \delta\big(V_{tA}(l, h_t)\big)\Big)\Big) + (1 - \omega)\Big(\underline{p}_{tN}\Big(\overline{q}_t - c + \delta\big(V_{tA}(w, h_t)\big)\Big) + (1 - \underline{p}_{tN})\Big(\underline{q}_t - c + \delta\big(V_{tA}(l, h_t)\big)\Big)\Big),$$

while $EU_A(\underline{x}_t < x_t \leq \overline{x}_t)$ is

$$\omega\Big(x_t + \sigma_{tA} + \delta\big(V_{tA}(x, h_t)\big)\Big) + (1 - \omega)\Big(\underline{p}_{tN}\Big(\overline{q}_t - c + \delta\big(V_{tA}(w, h_t)\big)\Big) + (1 - \underline{p}_{tN})\Big(\underline{q}_t - c + \delta\big(V_{tA}(l, h_t)\big)\Big)\Big),$$

and $u_A(x_t \leq \underline{x}_t)$ is simply

$$x_t + \sigma_{tA} + \delta\big(V_{tA}(x, h_t)\big).$$

To simplify the analysis, we focus on cases where war is inefficient and thus A has no incentive to select any value of x_t save $\underline{x}_t$ or $\overline{x}_t$. This requires an additional restriction that primarily concerns the continuation values, which we identify below.

Note that setting $x_t = \underline{x}_t$ is always strictly preferred to $x_t < \underline{x}_t$, since $u_A(x_t \leq \underline{x}_t) = x_t + \sigma_{tA} + \delta\big(V_{tA}(x, h_t)\big)$ and this expression must be smaller when $x_t < \underline{x}_t$ than when $x_t = \underline{x}_t$. Intuitively, if A is unwilling to risk war, it is still best to at least extract the best possible deal to which the strong type of B would agree.

Similarly, setting $x_t = \overline{x}_t$ is strictly preferred to $\underline{x}_t < x_t < \overline{x}_t$, since A provokes war with the strong type of B either way and receives worse agreements from the weak type of B when setting $\underline{x}_t < x_t < \overline{x}_t$ relative to $x_t = \overline{x}_t$. Thus, if A is to risk war, A might as well seek to extract the best possible deal from the weak type of B.

Now consider whether A prefers $x_t = \overline{x}_t$ to $x_t > \overline{x}_t$. Since A provokes a war with the strong B either way, this is equivalent to asking whether A prefers to have the weak B accept $\overline{x}_t$ rather than also fighting a war against a weak B, which is true if and only if war is inefficient. This holds so long as

$$\overline{x}_t + \sigma_{tA} + \delta\big(V_{tA}(x, h_t)\big) \geq \overline{p}_{tN}\Big(\overline{q}_t - c + \delta\big(V_{tA}(w, h_t)\big)\Big) + (1 - \overline{p}_{tN})\Big(\underline{q}_t - c + \delta\big(V_{tA}(l, h_t)\big)\Big),$$

which simplifies to

$$\begin{aligned} 2c + \sigma_t + \delta\Big(\big(V_{tA}(x, h_t) - V_{tA}(l, h_t)\big) + \big(V_{tB}(x, h_t) - V_{tB}(l, h_t)\big)\Big) \geq \\ \overline{p}_{tN}\Big(\delta\Big(\big(V_{tA}(w, h_t) - V_{tA}(l, h_t)\big) - \big(V_{tB}(l, h_t) - V_{tB}(w, h_t)\big)\Big)\Big). \end{aligned} \tag{1}$$

Provided Inequality 1 holds, war is inefficient, and A will only ever select $\underline{x}_t$ or $\overline{x}_t$. Since, as discussed above, we have already assumed that the benefit to the victor of a battle is equal to the loss suffered by the loser, or $V_{tB}(l, h_t) - V_{tB}(w, h_t) = V_{tA}(w, h_t) - V_{tA}(l, h_t)$, the right hand side of Inequality 1 goes to 0, and the inequality must hold. Had we not made this assumption, there would still be cases in which war is inefficient.

What remains then is to determine how A decides between these to proposals.

A prefers $x_t = \underline{x}_t$, which guarantees acceptance, to $x_t = \overline{x}_t$, which risks war, provided

$$\underline{x}_t + \sigma_{tA} + \delta\big(V_{tA}(x, h_t)\big) \geq \omega\Big(\overline{x}_t + \sigma_{tA} + \delta\big(V_{tA}(x, h_t)\big)\Big) +$$
$$(1-\omega)\Bigg(\underline{p}_{tN}\Big(\overline{q}_t - c + \delta\big(V_{tA}(w, h_t)\big)\Big) + (1-\underline{p}_{tN})\Big(\underline{q}_t - c + \delta\big(V_{tA}(l, h_t)\big)\Big)\Bigg).$$

This simplifies to $\omega \leq \hat{\omega}_{tx}$, where $\hat{\omega}_{tx}$ is defined as

$$\frac{2c + \sigma_t + \delta(V^x_{tB} - V^l_{tB}) + \underline{p}_{tN}\big(\delta(V^l_{tB} - V^w_{tB}) + (V^l_{tA} - V^w_{tA})\big)}{2c + \sigma_t + \delta(V^x_{tB} - V^l_{tB}) + (\overline{p}_{tN} - \underline{p}_{tN})(\overline{q}_t - \underline{q}_t) + \overline{p}_{tN}\big(\delta(V^l_{tB} - V^w_{tB})\big) + \underline{p}_{tN}\big(\delta(V^l_{tA} - V^w_{tA})\big)}.$$

Note that, to preserve space, we use V^k_{ti} to denote $V_{ti}(k, h_t)\ \forall\ i \in \{A, B\}, k \in \{x, w, l\}$. We shall continue to do so from this point forward.

Provided both the numerator and denominator are positive, we can be sure that $\hat{\omega}_{tx}$ is strictly bounded between 0 and 1, since the denominator is identical to the numerator but for two differences. First, the denominator includes $(\overline{p}_{tN} - \underline{p}_{tN})(\overline{q}_t - \underline{q}_t)$, which is strictly positive. Second, whereas the numerator contains $\underline{p}_{tN}\big(\delta(V^l_{tB} - V^w_{tB}) + (V^l_{tA} - V^w_{tA})\big)$, the denominator instead contains $\overline{p}_{tN}\big(\delta(V^l_{tB} - V^w_{tB})\big) + \underline{p}_{tN}\big(\delta(V^l_{tA} - V^w_{tA})\big)$, which differs only in that $\delta(V^l_{tB} - V^w_{tB})$ is multiplied by $\overline{p}_{tN}$ in the denominator and by $\underline{p}_{tN}$ in the numerator. Since B's continuation value after A loses battles is greater than after A wins battles, this difference also serves to increase the denominator relative to the numerator.

We can thus succinctly characterize A's optimal proposal in any given period, x^*_t, as

$$x^*_t = \begin{cases} \underline{x}_t & \text{if } \omega \leq \hat{\omega}_{tx} \\ \overline{x}_t & \text{if } \omega > \hat{\omega}_{tx}. \end{cases}$$

Now consider A's decision over whether to attack immediately or to negotiate. First, suppose $\omega \leq \hat{\omega}_{tx}$, indicating that A will propose $\underline{x}_t$, which B accepts regardless of type, should A attempt negotiations at all.

When $\omega \leq \hat{\omega}_{tx}$, A prefers negotiation to attacking immediately provided

$$\underline{x}_t + \sigma_{tA} + \delta V^x_{tA} \geq \omega\big(\overline{p}_{tI}(\overline{q}_t - c + \delta V^w_{tA}) + (1 - \overline{p}_{tI})(\underline{q}_t - c + \delta V^l_{tA})\big) + (1-\omega)\big(\underline{p}_{tI}(\overline{q}_t - c + \delta V^w_{tA}) + (1 - \underline{p}_{tI})\big(\underline{q}_t - c + \delta V^l_{tA}\big)\big).$$

This simplifies to $\omega \leq \hat{\omega}_{tm}$, where $\hat{\omega}_{tm}$ is defined as

$$\frac{2c + \sigma_t + \delta(V^x_{tA} - V^l_{tA} + V^x_{tB} - V^l_{tB}) - \big((\underline{p}_{tI} - \underline{p}_{tN})(\overline{q}_t - \underline{q}_t)\big)}{(\overline{p}_{tI} - \underline{p}_{tI})\big((\overline{q}_t - \underline{q}_t) + \delta(V^w_{tA} - V^l_{tA})\big)} + \frac{\delta\big(\underline{p}_{tN}(V^l_{tB} - V^w_{tB}) - \underline{p}_{tI}(V^w_{tA} - V^l_{tA})\big)}{(\overline{p}_{tI} - \underline{p}_{tI})\big((\overline{q}_t - \underline{q}_t) + \delta(V^w_{tA} - V^l_{tA})\big)}.$$

Now suppose $\omega > \hat{\omega}_{tx}$, indicating that, should A negotiate rather than attacking B immediately, A will propose $\overline{x}_t$, a proposal that B accepts iff relatively weak. Then A prefers negotiation to attacking immediately provided

$$(1-\omega)\Big(\underline{p}_{tN}\Big(\overline{q}_t - c + \delta\big(V_{tA}(w, h_t)\big)\Big) + (1 - \underline{p}_{tN})\Big(\underline{q}_t - c + \delta\big(V_{tA}(l, h_t)\big)\Big)\Big) + \omega\Big(x_t + \sigma_{tA} + \delta\big(V_{tA}(x, h_t)\big)\Big) \geq \omega\big(\overline{p}_{tI}(\overline{q}_t - c + \delta V^w_{tA}) + (1 - \overline{p}_{tI})(\underline{q}_t - c + \delta V^l_{tA})\big) + (1-\omega)\big(\underline{p}_{tI}(\overline{q}_t - c + \delta V^w_{tA}) + (1 - \underline{p}_{tI})\big(\underline{q}_t - c + \delta V^l_{tA}\big)\big),$$

or $\omega \geq \hat{\omega}_{tb}$. For reasons of space, we report $\hat{\omega}^{-1}_{tb}$ rather than $\hat{\omega}_{tb}$, where $\hat{\omega}^{-1}_{tb}$ is

$$\frac{2c + \sigma_t + \delta(V^x_{tA} - V^l_{tA} + V^x_{tB} - V^l_{tB}) + (\overline{p}_{tN} - \underline{p}_{tN})(\overline{q}_t - \underline{q}_t)}{(\underline{p}_{tI} - \underline{p}_{tN})\big(\overline{q}_t - \underline{q}_t\big) + \delta(V^w_{tA} - V^l_{tA})\big)} + \frac{\overline{p}_{tN}\big(\delta(V^l_{tB} - V^w_{tB})\big) - \underline{p}_{tN}\big(\delta(V^w_{tA} - V^l_{tA})\big) + (\overline{p}_{tI} - \underline{p}_{tI})\big(\overline{q}_t - \underline{q}_t + \delta(V^w_{tA} - V^l_{tA})\big)}{(\underline{p}_{tI} - \underline{p}_{tN})\big(\overline{q}_t - \underline{q}_t\big) + \delta(V^w_{tA} - V^l_{tA})\big)}.$$

With these elements in place, we are now prepared to discuss the propositions laid out in the text, all of which concern the likelihood of war.

Proofs of the Propositions

It follows readily from above that A attempts negotiations when $\omega \leq \min\{\hat{\omega}_{tx}, \hat{\omega}_{tm}\}$ or $\omega \geq \max\{\hat{\omega}_{tx}, \hat{\omega}_{tb}\}$, and attacks when $\hat{\omega}_{tm} < \omega \leq \hat{\omega}_{tx}$ or $\hat{\omega}_{tx} < \omega < \hat{\omega}_{tb}$.

This implies that the *ex ante* probability of war can be characterized as follows:

$$pr(war) = \begin{cases} 1-\omega & \text{if } \omega \geq \max\{\hat{\omega}_{tx}, \hat{\omega}_{tb}\} \\ 1 & \text{if } \hat{\omega}_{tm} < \omega \leq \hat{\omega}_{tx} \text{ or } \hat{\omega}_{tx} < \omega < \hat{\omega}_{tb} \\ 0 & \text{if } \omega \leq \min\{\hat{\omega}_{tx}, \hat{\omega}_{tm}\}. \end{cases}$$

Proposition 1. The region in which war occurs with probability 0 lies beneath two cutpoints, $\hat{\omega}_{tx}$ and $\hat{\omega}_{tm}$. As either of these cutpoints decreases, the region in which peace obtains with certainty shrinks. Similarly, as either $\hat{\omega}_{tx}$ or $\hat{\omega}_{tm}$ increases, the region in which war occurs with probability $1-\omega$ shrinks.

Let Δ_t^{IN} denote $p_{tI} - p_{tN}$. Observe that $\hat{\omega}_{tm}$ has $-\big((\underline{p}_{tI} - \underline{p}_{tN})(\overline{q}_t - \underline{q}_t)\big)$ in the numerator. It also contains $\delta\big(\underline{p}_{tN}(V_{tB}^l - V_{tB}^w) - \underline{p}_{tI}(V_{tA}^w - V_{tA}^l)\big)$. Having assumed that $V_{tA}^w - V_{tA}^l = V_{tB}^l - V_{tB}^w$, we can rewrite this second piece as $-\delta\big((\underline{p}_{tI} - \underline{p}_{tN})(V_{tB}^l - V_{tB}^w)\big)$.

If we then evaluate $\dfrac{\partial \hat{\omega}_{tm}}{\partial \Delta_t^{IN}}$, we obtain

$$\frac{-(\overline{q}_t - \underline{q}_t) - \delta(V_{tB}^l - V_{tB}^w)}{(\overline{p}_{tI} - \underline{p}_{tI})\big((\overline{q}_t - \underline{q}_t) + \delta(V_{tA}^w - V_{tA}^l)\big)},.$$

Since $\overline{q}_t > \underline{q}_t$ and $V_{tB}^l > V_{tB}^w$ by assumption, this quantity must be negative.

Naturally, $\dfrac{\partial \Delta_t^{IN}}{\partial \alpha_t} > 0$, and thus the more advantage accruing to B in a given period due to shifting power, or the more rapid power is shifting, the lower $\hat{\omega}_{tm}$ will be, and there will be fewer values of ω under which A's optimal strategy is certain to produce peace.

It is straightforward to establish that $\dfrac{\partial \hat{\omega}_b}{\partial \Delta_t^{IN}} \geq 0$. Thus, as α_t increases, the regions in which war occurs with probability 0 and $1-\omega$ are both decreasing relative to the region in which war occurs with certainty.

This establishes the proposition. □

Proposition 2. Again, note that the region in which war occurs with probability 0 lies beneath two cutpoints, $\hat{\omega}_{tx}$ and $\hat{\omega}_{tm}$.

Let $\Delta_t^N = \overline{p}_{tN} - \underline{p}_{tN}$ and $\Delta_t^I = \overline{p}_{tI} - \underline{p}_{tI}$ denote the extent to which A is uncertain over the likelihood of victory in a battle in period t given that said battle results from failed negotiations or from A attacking immediately, respectively.

Note that $\hat{\omega}_{tx}$ has $\big((\overline{p}_{tN} - \underline{p}_{tN})(\overline{q}_t - \underline{q}_t)\big)$ in the denominator. It also contains $\delta\big(\overline{p}_{tN}(V_{tB}^l - V_{tB}^w) - \underline{p}_{tN}(V_{tA}^w - V_{tA}^l)\big)$. We can rewrite this as $\delta\big((\overline{p}_{tN} - \underline{p}_{tN})(V_{tB}^l - V_{tB}^w)\big)$.

If we then evaluate $\dfrac{\partial \hat{\omega}_{tx}}{\partial \Delta_t^N}$, we obtain

$$-\frac{(\overline{q}_t - \underline{q}_t) + \delta(V_{tA}^w - V_{tA}^l)}{2c + \sigma_t + \delta(V_{tB}^x - V_{tB}^l) + (\overline{p}_{tN} - \underline{p}_{tN})(\overline{q}_t - \underline{q}_t) + \overline{p}_{tN}\big(\delta(V_{tB}^l - V_{tB}^w)\big) + \underline{p}_{tN}\big(\delta(V_{tA}^l - V_{tA}^w)\big)}\hat{w}_{tx}$$

which is negative since $\overline{q}_t > \underline{q}_t$ and $V_{tB}^l > V_{tB}^w$ by assumption.

Therefore, as Δ_t^N increases, $\hat{\omega}_{tx}$ decreases, and war is at least weakly more likely to occur.

What remains is to establish Δ_t^N is greatest when A and B are near parity. Let us then evaluate $\dfrac{\partial \Delta_t^N}{\partial m_{tA}}$, or the effect of m_{tA} on the difference between 1's ability to defeat a weak B and a strong B in the even that B rejects x_t. This is equivalent to

$$\frac{\partial \dfrac{m_{tA}(\overline{m}_{tB} - \underline{m}_{tB})}{(m_{tA} + \underline{m}_{tB})(m_{tA} + \overline{m}_{tB})}}{\partial m_{tA}},$$

which gives us

$$\frac{m_{tA} - \underline{m}_{tB}}{(m_{tA} + \underline{m}_{tB})(m_{tA} + \overline{m}_{tB})} - \frac{m_{tA}(\overline{m}_{tB} - \underline{m}_{tB})}{(m_{tA} + \underline{m}_{tB})^2(m_{tA} + \overline{m}_{tB})} - \frac{m_{tA}(\overline{m}_{tB} - \underline{m}_{tB})}{(m_{tA} + \underline{m}_{tB})(m_{tA} + \overline{m}_{tB})^2},$$

which is positive so long as $m_{tA} \leq \sqrt{\underline{m}_{tB}\overline{m}_{tB}}$.

Thus, Δ_t^N increases in m_{tA} until m_{tA} reaches the geometric mean of $\underline{m}_{tB}$ and $\overline{m}_{tB}$, which we might think of as indicating parity. Further increases in m_{tA} beyond this point decrease Δ_t^N and thus make peace more likely. Therefore, parity increases the likelihood of war. $\square$

Proposition 3. The proof of this proposition follows readily from the previous two proofs. Observe that $\hat{\omega}_{tm}$ contains Δ_t^I in the denominator in precisely the same way that $\hat{\omega}_{tx}$ contains Δ_t^N. If we evaluate the cross partial $\dfrac{\partial^2 \hat{\omega}_{tm}}{\partial \Delta_t^{IN} \partial \Delta_t^I}$, we obtain

$$-\frac{(\overline{q}_t - \underline{q}_t) + \delta(V_{tA}^w - V_{tA}^l)}{(\overline{p}_{tI} - \underline{p}_{tI})\big((\overline{q}_t - \underline{q}_t) + \delta(V_{tA}^w - V_{tA}^l)\big)} \frac{\partial \hat{w}_{tm}}{\partial \Delta_t^{IN}},$$

which must be positive, since both terms are negative.

This tells us that the impact of rapid shifts in power, established by evaluating $\dfrac{\partial \hat{\omega}_{tm}}{\partial \Delta_t^{IN}}$, is increasing in magnitude as we approach parity, or as Δ_t^I increases, and, analogously, this impact is decreasing as we move away from parity. This establishes the result. □

Proposition 4. First, let us define stable interests more precisely. Let $\epsilon_{t\iota}$ denote the exogenous shock to ι_t in period t. As $E(\epsilon_{t\iota})$ increases, we might say that C's interests are less stable.

The following beliefs and strategies constitute an MPE. In any given period t,

1. C sets $\sigma_t = \hat{\sigma}_t$ iff $\iota_t \geq \hat{\iota}_t$, setting $\sigma_t = 0$ otherwise;

2. A attacks B prior to negotiations iff $\hat{\omega}_{tm} < \omega \leq \hat{\omega}_{tx}$ or $\hat{\omega}_{tx} < \omega < \hat{\omega}_{tb}$, sets $x_t = \underline{x}_t$ iff $\omega \leq \hat{\omega}_{tx}$, and $x_t = \overline{x}_t$ otherwise;

3. The weak type of B accepts iff $x_t \leq \overline{x}_t$;

4. The strong type of B accepts iff $x_t \leq \underline{x}_t$.

5. A and C believe B to be weak with probability ω if A sets $x_t = \underline{x}_t$, with probability 1 if A sets $x_t = \overline{x}_t$ and B accepts, with probability 0 if A sets $x_t = \overline{x}_t$ and B rejects, with probability ω_w' if A attacks and wins the ensuing battle, and with probability ω_l' if A attacks and loses the ensuing battle,

where $\omega_w' \equiv \dfrac{\overline{p}_{tI}\omega}{\overline{p}_{tI}\omega + \underline{p}_{tI}(1-\omega)}$ and $\omega_l' \equiv \dfrac{(1-\overline{p}_{tI})\omega}{(1-\overline{p}_{tI})\omega + (1-\underline{p}_{tI})(1-\omega)}$ are posterior beliefs defined by Bayes' Rule.

Let $\hat{\sigma}_t$ be the minimum value of σ_t that ensures that $\omega \leq \min\{\hat{\omega}_{tx}, \hat{\omega}_{tm}\}$ holds. The precise value depends upon which of the two cutpoints is lower, but is identified readily in either case by solving $\omega \leq \hat{\omega}_{tx}$ or $\omega \leq \hat{\omega}_{tm}$ for σ_t.

Let $\hat{\iota}_t$ be the minimum value for which $\iota_t - \hat{\sigma}_t \geq 0$ holds. Of course, then, $\hat{\iota}_t = \hat{\sigma}_t$.

The beliefs follow readily from Bayes' Rule, and incentive compatibility for each players' strategies follows from the preceding results.

Now suppose that had C set $\sigma_t = 0$, we would have $\omega > \max\{\hat{\omega}_{tx}, \hat{\omega}_{tb}\}$. Then if $\iota_t \geq \hat{\iota}_t$, but $\iota_{t+1} < \hat{\iota}_{t+1}$, C will set $\sigma_t = \hat{\sigma}_t$ in period t but $\sigma_{t+1} = 0$ in the following period, and we would conclude that C's subsidies in period t merely shifted the risk of war due to informational problems into the future, as per the equilibrium.

All else equal, it is more likely to be true that $\iota_t \geq \hat{\iota}_t$ while $\iota_{t+1} < \hat{\iota}_{t+1}$ as $E(\epsilon_{t\iota})$ increases. We therefore conclude that C is more likely to shift the risk of war due to information problems into the future as C's interests become less stable. □

Proposition 5. Take the same beliefs and strategies as in the previous proposition.

Now suppose that were C to set $\sigma_t = 0$, we would have either $\hat{\omega}_{tm} < \omega \leq \hat{\omega}_{tx}$ or $\hat{\omega}_{tx} < \omega < \hat{\omega}_{tb}$, but if C sets $\sigma_{t+1} = 0$, we will have $\omega \leq \min\{\hat{\omega}_{tx}, \hat{\omega}_{tm}\}$. This requires α_{t+1} to be arbitrarily small relative to α_t, or that the bulk of the shift in power occurs in t.

Here, even if $\iota_t \geq \hat{\iota}_t$, but $\iota_{t+1} < \hat{\iota}_{t+1}$, in which case C will set $\sigma_t = \hat{\sigma}_t$ in period t but $\sigma_{t+1} = 0$ in the following period, peace obtains in both periods in equilibrium. We therefore conclude that even temporary subsidies ensure lasting peace, as per the proposition. □

Proposition 6. Consider once more the same beliefs and strategies as above.

Suppose that were C to set $\sigma_t = 0$ in any given t, we would have $\omega > \max\{\hat{\omega}_{tx}, \hat{\omega}_{tb}\}$ and thus there would be a risk of war due to informational problems.

Provided either that ι_t through ι_{t+k} are sufficiently large or $E(\epsilon_{t+1\iota})$ through $E(\epsilon_{t+k\iota})$ are sufficiently small, for some $k \in [1, \infty)$, C will set $\sigma_t = \hat{\sigma}_t$ in periods t through $t + k$, and peace is expected to obtain in equilibrium for at least k periods even though there would be a risk of war due to information problems otherwise. This establishes the result. □

References

Arena, Philip, and Scott Wolford. 2012. "Arms, Intelligence and War." *International Studies Quarterly* .

Balch-Lindsay, Dylan, Andrew J. Enterline, and Kyle A. Joyce. 2008. "Third-Party Intervention and the Civil War Process." *Journal of Peace Research* 45(3): 345–363.

Bapat, Navin. 2007. "The Internationalization of Terrorist Campaigns." *Conflict Management and Peace Science* 24(2): 265–280.

Barbieri, Katherine, and Omar Keshk. 2012. "Correlates of War Project Trade Data Set Codebook, Version 3.0." Available at: http://www.correlatesofwar.org/.

Barbieri, Katherine, Omar Keshk, and Brian Pollins. 2009. "TRADING DATA: Evaluating our Assumptions and Coding Rules." *Conflict Management and Peace Science* 26(5): 471–491.

Barsky, Robert, and Lutz Kilian. 2004. "Oil and the Macroeconomy Since the 1970s." *Journal of Economic Perspectives* 18(4): 115–134.

Beardsley, Kyle. 2008. "Agreement Without Peace? International Mediation and Time Inconsistency Problems." *American Journal of Political Science* 52(4): 723–740.

Beardsley, Kyle. 2011. *The Mediation Dilemma*. Ithaca: Cornell University Press.

Brambor, Thomas, William Roberts Clark, and Matt Golder. 2006. "Understanding Interaction Models: Improving Empirical Analyses." *Political Analysis* 14(1): 63–82.

Doyle, Michael W., and Nicholas Sambanis. 2000. "International Peacebuilding: A Theoretical and Quantitative Analysis." *The American Political Science Review* 94(4): 779–801.

Fearon, James. 1995. "Rationalist Explanations for War." *International Organization* 49(3): 379–414.

Fearon, James. 1997. "Signaling Foreign Policy Interests: Tying Hands versus Sinking Costs." *Journal of Conflict Resolution* 41(1): 68–90.

Fey, Mark, and Kristopher Ramsay. 2010. "Uncertainty and Incentives in Crisis Bargaining: Game-Free Analysis of International Conflict." *American Journal of Political Science* 55(1): 149–169.

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(4): 819–838.

Fortna, Virginia Page. 2003. "Scraps of Paper? Agreements and the Durability of Peace." *International Organization* 57: 337–372.

Fortna, Virginia Page. 2004. "Does Peacekeeping Keep Peace: International Intervention and the Duration of Peace After Civil War." *International Studies Quarterly* 48(2): 269–292.

Ghosn, Faten, Glenn Palmer, and Stuart Bremer. 2004. "The MID3 Data Set, 1993-2001: Procedures, Coding Rules, and Description." *Conflict Management and Peace Science* 21(2): 133–54.

Gilligan, Michael, and Ernest Sergenti. 2008. "Do UN Interventions Cause Peace? Using Matching to Improve Causal Inference." *Quarterly Journal of Political Science* 3(2): 89–122.

Hamilton, James. 1983. "Oil and the macroeconomy since World War II." *Journal of Political Economy* 91(2): 228–248.

Hamilton, James. 2003. "What Is an Oil Shock?" *Journal of Econometrics* 113(2): 363–398.

Kilian, Lutz. 2008. "Exogenous Oil Supply Shocks: How Big Are They and How Much Do They Matter for the US Economy?" *The Review of Economics and Statistics* 90(2): 216–240.

Kydd, Andrew. 2003. "Which Side Are You On? Bias, Credibility, and Mediation." *American Journal of Political Science* 47(4): 597–611.

Lemke, Douglas. 2002. *Regions of War and Peace*. Cambridge: Cambridge University Press.

Lo, Nigel, Barry Hashimoto, and Dan Reiter. 2008. "Ensuring Peace: Foreign-Imposed Regime Change and Postwar Peace Duration, 1914 - 2001." *International Organization* 62(Fall): 717–736.

Meirowitz, Adam, and Anne Sartori. 2008. "Strategic Uncertainty as a Cause of War." *Quarterly Journal of Political Science* 3(4): 327–352.

Organski, A.F.K. 1958. *World Politics*. New York: Alfred A. Knopf.

Organski, A.F.K., and Jacek Kugler. 1980. *The War Ledger*. Chicago: University of Chicago Press.

Powell, Robert. 1996. "Stability and the Distribution of Power." *World Politics* 48(2): 239–267.

Powell, Robert. 2004*a*. "Bargaining and Learning While Fighting." *American Journal of Political Science* 48(2): 344–361.

Powell, Robert. 2004*b*. "The Inefficient Use of Power: Costly Conflict with Complete Information." *American Political Science Review* 98(2): 231–241.

Powell, Robert. 2006. "War as a Commitment Problem." *International Organization* 60(1): 169–203.

Powell, Robert. 2012. "Persistent Fighting and Shifting Power." *American Journal of Political Science* 56(3): 620–637.

Quackenbush, Stephen, and Jerome Venteicher. 2008. "Settlements, Outcomes, and the Recurrence of Conflict." *Journal of Peace Research* 45(6): 723–742.

Reed, William. 2003. "Information, Power and War." *American Political Science Review* 97(4): 633–641.

Reed, William, Scott Wolford, and Philip Arena. N.d. "Gambling on Diplomacy: Bargaining in the Shadow of Uncertain Shifting Power.".

Regan, Patrick, and Aysegul Aydin. 2006. "Diplomacy and Other Forms of Intervention in Civil Wars." *Journal of Conflict Resolution* 50(5): 736–756.

Regan, Patrick M. 2002. "Third-Party Interventions and the Duration of Intrastate Conflicts." *Journal of Conflict Resolution* 46(1): 55–73.

Savun, Burcu, and Daniel Tirone. 2011. "Foreign Aid, Democratization, and Civil Conflict: How Does Democracy Aid Affect Civil Conflict?" *American Journal of Political Science* 55(2): 233–246.

Schultz, Kenneth. 2010. "The Enforcement Problem in Coercive Bargaining: Interstate Conflict over Rebel Support in Civil Wars." *International Organization* 64(2): 281–312.

Senese, Paul, and Stephen Quackenbush. 2003. "Sowing the Seeds of Conflict: The Effect of Dispute Settlements on Durations of Peace." *Journal of Politics* 65(3): 696–717.

Singer, J. David, Stuart Bremer, and John Stucky. 1972. "Capability Distribution, Uncertainty, and Major Power War, 1820-1965." In *Peace, War, and Numbers*, ed. Bruce M. Russett. Beverly Hills, CA: Sage Publications pp. 19–48.

Slantchev, Branislav. 2003*a*. "The Power to Hurt: Costly Conflict with Completely Informed States." *American Political Science Review* 97(1): 123–133.

Slantchev, Branislav. 2003*b*. "The Principle of Convergence in Wartime Negotiations." *American Political Science Review* 97(4): 621–632.

Slantchev, Branislav. 2004. "How Initiators End Their Wars: The Duration of Warfare and the Terms of Peace." *American Journal of Political Science* 48(4): 813–829.

Slantchev, Branislav. 2005. "Military Coercion in Interstate Crises." *American Political Science Review* 99(4): 533–547.

Slantchev, Branislav, and Bahar Leventoğlu. 2007. "The Armed Peace: A Punctuated Equilibrium Theory of War." *American Journal of Political Science* 51(4): 755–771.

Smith, Alastair, and Allan Stam. 2003. "Mediation and Peacekeeping in a Random Walk Model of Civil and Interstate War." *International Studies Review* 5(4): 115–135.

Smith, Alastair, and Allan Stam. 2004. "Bargaining and the Nature of War." *Journal of Conflict Resolution* 48(6): 783–813.

Tarar, Ahmer, and Bahar Leventoğlu. 2008. "Does Private Information Lead to Delay or War in Crisis Bargaining?" *International Studies Quarterly* 52(3): 533–553.

US Agency for International Development. 2011. "US Foreign Aid by Year." Available at: http://www.usaid.gov/.

Wagner, R. Harrison. 2000. "Bargaining and War." *American Journal of Political Science* 44(3): 469–484.

Werner, Suzanne, and Amy Yuen. 2005. "Making and Keeping Peace." *International Organization* 59(2): 261–292.