War as a Redistributive Problem

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Abstract

War is commonly conceived of as the result of a bargaining process between states. However, war also has redistributive consequences within a state: certain groups face disproportionate costs (e.g. likely conscripts), while other groups may accrue most of the benefits (military contractors, politicians, etc.). War should thus be viewed simultaneously as the result of a bargaining process between domestic groups. This paper presents a two-level game in which the relative importance of different domestic groups to a government can impact the likelihood of going to war, but only under certain conditions. In particular, a necessary condition for domestic distributive politics to matter for war onset is the existence of redistributive frictions between domestic parties. This also allows the model to produce a new explanation for why war may occur despite the fact that it is Pareto inefficient: inability to costlessly redistribute value domestically between war's beneficiaries and the beneficiaries of any peaceful bargain.

Introduction

When can unevenly distributed consequences across domestic groups be a cause of war? The core intuition that this might matter - i.e. that those who are weighted most highly in decisions of whether to go to war might experience more of its benefits and fewer of its costs, leading to a higher propensity for conflict - is certainly not a new one. Indeed, in 1795, Immanuel Kant wrote:

> "It is the easiest thing in the world to decide upon, because war does not require of the ruler... the least sacrifice of the pleasures of his table, the chase, his country houses, his court functions, and the like. He may, therefore, resolve on war as on a pleasure party for the most trivial reasons." (Immanuel Kant, Perpetual Peace)

Moreover, the idea that the benefits of a war might be concentrated amongst the powerful, while the costs are borne mostly by the weak, has regularly been a part of the popular narratives about major conflicts - from World War I's arguments over war profiteering, to the concerns about the influence of oil and military contractor interests during the Iraq War. Despite this, the rationalist conflict literature has historically given little attention to these kinds of domestic distributive politics as an explanation for war, focusing instead on interstate bargaining failures resulting from commitment problems, information asymmetries, or (to a lesser extent) indivisibility problems.

More recently, however, international relations scholars have begun to address this gap by introducing a fourth category of rationalist explanation for war: agency problems.[1] Agency problems arise when the incentives of the decision-makers responsible for entering a war - generally, the leaders of a country - differ from the incentives of the country as a whole. For instance, if politicians are responsive to the median voter, and the median voter experiences

[1] Jackson and Morelli 2011 discusses this in a survey of the rationalist conflict literature.

fewer costs from war than the country as a whole, we might expect such a country to exhibit "political bias" towards war (Jackson and Morelli 2007). Importantly, this creates space for domestic distributive politics - i.e. who wins and who loses from war within a country - to have an impact on war onset, as it may not matter if the country benefits as a whole from a peaceful bargain if the key constituencies do not.

Or does it? In this paper, I develop a model that demonstrates that domestic distributive politics can only have an impact on war onset under particular scope conditions. Specifically, in the absence of costs to redistributing value internally, the configuration of power and interests within a country should have *no impact* on war, since a state would still have an incentive to pursue an aggregate welfare maximizing peaceful bargain and then redistribute the surplus among domestic actors. Indeed, it would not matter if a pro-war constituency is 10 times or 1000 times more influential than those who face the burdens of war, as the "inefficiency puzzle" at the heart of interstate conflict would simply have been relocated intrastate and left unresolved.

Instead, what is causally relevant in a rationalist account of war is not the agency problem alone, but a combination of distributive politics with some kind of internal redistributive frictions. These frictions - essentially costs to side payments between domestic parties - could arise from a wide-variety of different factors, including political optics, policy constraints, or straightforwardly, deadweight losses and administration/enforcement costs from taxing and redistributing between parties.

When redistributive frictions exist, the bargaining process between domestic parties becomes essential to understanding interstate conflict, given that the state-level actors responsible for interstate bargaining are highly unlikely to value every domestic group proportionately. Even without commitment problems or information asymmetries, war becomes possible if the government values the beneficiaries of conflict (e.g. military contractors, or elites with a larger stake in some contested policy) significantly more than those who are harmed most by that conflict (e.g. the soldiers). Furthermore, when these other issues exist, redistributive frictions exacerbate their effect, rendering commitment problems more likely to generate conflict, and increasing the probability that war will result from miscalculations about capacities or resolve.

This paper develops a two-level game to demonstrate the importance of redistributive frictions in a rationalist account of war. In so doing, it also illustrates another important empirical implication: it is not only the distribution of power across groups that matters for war onset, but the distribution of these redistributive frictions. Decisions about war and peace should be biased towards those groups from which value can be extracted relatively easily - e.g. easily taxable groups. Furthermore, while redistributive frictions are a necessary condition for domestic distributive politics to impact war, it is not uniformly the case that they always increase the likelihood of war - increasing the costs of transferring value from those who benefit most from war actually makes war *less* likely.

Thus, this paper contributes to our understanding of the causes of conflict in two ways: (1) it clarifies the conditions under which domestic politics driven agency problems can be pivotal in war onset, demonstrating that distributive politics should have no role absent costs to redistributing value internally; (2) it derives new empirical implications about how the distribution of both power and redistributive frictions should relate to war onset, in a way that can be useful in explaining empirical patterns of conflict.

Linking Domestic Distributive Politics to War

What do we already know about the impact of domestic distributive politics on war? While there is an extensive literature examining linkages between domestic politics and security policy (e.g. Fearon 1994, Gowa 1998, Schultz 1998, Tarar and Levontoglu 2009, Tomz and Weeks 2013), this work has rarely addressed distributive politics per se, instead focusing on domestic audiences as a whole (e.g. by discussing "audience costs"), or on things like the impact of regime type on conflict propensity (e.g. Weeks 2012).

Some exceptions exist, including Snyder's work on the role of interest group logrolling in imperial overexpansion (Snyder 1991), Fordham's work exploring the role that conflicting interests played in shaping security policy during the Cold War (1998, 2002) and American decisions regarding intervention abroad (Fordham 2008), Narizny (2007) on the domestic distributional implications of grand strategy, and Carter (2017) on the political costs of war mobilization. Scholars studying the linkages between trade and conflict have sometimes been more attentive to distributive effects (Fordham and Kleinberg 2013, Fordham 2019), as have those who study the financing of wars (Kreps 2018).

What is absent from this work, however, is a clear linkage between the distributive politics of war and our theoretical models for how war emerges within a rationalist framework. Jackson and Morelli (2007) represents a significant shift on this dimension, though it is also not primarily about domestic distributive politics. They discuss how the "political bias" of pivotal decision makers (i.e. politicians, the median voter, or others) may lead to war, arguing that "there are cases with a strong enough bias on the part of one or both countries where war cannot be prevented by any transfer payments." (Jackson and Morell 2007, p.1) This outlines an "agency problem" explanation for war, in which the incentives of the agents differ from the country as a whole they are representing.

While Jackson and Morelli (2007) does not focus on the *sources* of this agency problem, the argument nonetheless creates space for domestic distributive politics to have an impact on war onset, as pivotal decision makers may exhibit a pro-war bias if the groups that experience the burdens of war are less politically important than those that benefit. Recent work has begun to examine the implications of domestic political institutions, including redistributive taxation, on political bias, thus providing the concept some microfoundations (Fearon 2008, Krainin and Ramsay 2018). Other work has examined the implications of political bias by building it into a dynamic model of crisis bargaining (Krainin and Slinkman 2017). Selectorate theory (Bueno de Mesquita et al. 2003) outlines a distributive politics driven agency problem, but does not show how it would generate war in a bargaining framework[2]- this linkage was made later in work by Goemans and Fey (2009).

While this agency literature has begun to gain traction, it is worth noting that the default attitude amongst many has been skepticism of a role for distributive politics in the bargaining model of war. Lake (2010), for instance, argues that "Given that bargaining theory is silent on exactly what a country's preferred policy might be, differential policy preferences require no significant modifications. One can think of the national ideal point simply as the sum of different individual ideal points as aggregated through some set of domestic political institutions." (Lake 2010, p.14)

This paper helps to reconcile these two perspectives. First, it demonstrates that distributive politics can only serve as a microfoundation for political bias with respect to war in the

[2]While negotiations feature in their model, the expected payoffs are specified exogenously (Bueno de Mesquita et al. 1999, p.795).

presence of costs to redistribution - otherwise the inefficiency puzzle remains, but at the domestic level. Indeed, without these impediments to smooth bargaining internally, the process of aggregating domestic preferences should be efficient, such that no new analysis would be needed to accommodate a variety of domestic political institutions and preference distributions into the standard bargaining model of conflict. Second, the paper provides a new set of microfoundations for political bias, demonstrating that when redistributive frictions are present, these frictions and political power can interact in ways that may lead pivotal decision makers to prefer war to peace, despite war's costs.

Side Payments and War

The potentially pacifying effect of "side payments" has not been absent from the rationalist conflict literature. These have often been conceptually linked with indivisibility problems, as it has been argued that the presence of side payments can create a bargaining range that an indivisible good or issue would otherwise eliminate (Fearon 1995, p.389).

However, there is no clear theoretical reason to believe side payments will always be available, or more importantly, that they will always be *costless*. Indeed, given that most transfers of value between groups entail costs (for instance, deadweight losses from taxation) we might expect costlessness to be the exception rather than the norm.

This paper discusses the implications of costly side payments *between domestic parties* for when intrastate bargaining can be a generator of interstate conflict. Kennard et al. (n.d.), in contrast, arrives at some similar conclusions to this paper, but for bargaining between states. It demonstrates that "the impact of power on cooperative outcomes is circumscribed in the presence of side payments", noting that Coase Theorem (Coase 1960) implies that when side payments exist and are costless, "the outcome of bargaining [will be] invariant to the distribution of power among the bargaining parties" (Kennard et al. n.d., p.10), which is essentially an interstate analogue to one of the core results about distributive politics produced in this paper. However, Kennard et al. (n.d.) does not consider the possibility that side payments might exist but be costly, so there is no interstate analog to the results from this paper about varying the costs to these transfers.

The Model

Set-Up

The model outlined in this paper is a simple distributive politics model - in which a government maximizes a weighted sum of utilities across two groups - embedded in a standard take-it-or-leave-it crisis bargaining model. There are two states, G and F, and only G's domestic politics is explicitly modeled - for simplicity, F is assumed to have "unbiased" and risk-neutral political preferences. G chooses an offer $x \in [B, A] \subset \mathbb{R}^+$ (with $A > B$) to make to state F as an alternative to conflict, and state F chooses to accept that offer, or to reject it and begin a war. Thus $A \in \mathbb{R}^+$ is the value of winning a war, while $B \in \mathbb{R}^+$ is the value of losing.

If the offer is rejected, state G wins the war with probability p, loses with probability $1-p$, and both countries pay cost $c \in \mathbb{R}^+$. However, for state G, this war payoff is initially captured by domestic group 1. If the offer is accepted, then state G keeps value x, but the peace payoff is initially captured by group 2.

This set-up implies stark redistributive implications of war. However, one way of interpreting this is as representing the *net* value allocated: each group may experience both costs and benefits in either peace of war, but the values in the model aggregate these. The results of the model are also robust to a wide-variety of more complicated specifications of war's redistributive implications[3]; the approach chosen is a simplification which helps to clarify the results. The key substantive assumption is that there is some underlying redistributive consequences of pursuing war or a peaceful bargain, which could arise from benefits accruing to certain groups from the activities of war (as with military contractors), the costs of an unfavorable policy disproportionately harming certain groups (e.g. with colonial merchants and the Tea Act, discussed in more detail later), or a differential assignment of costs from the war (e.g. when certain groups are disproportionately involved in fighting).

After the resolution of peace or war, state G can then redistribute value domestically between groups via taxation, but doing so may destroy some of the value of what is transferred, due to redistributive frictions. This loss of value will be captured in the model by "leaky bucket" parameters $\theta_1, \theta_2 \in [0, 1]$, which determine the percentage of the amount taken from one group that is ultimately consumed by the other group. The timeline of the model is as follows:

1. State G makes offer x to state F.
2. State F chooses whether to accept or reject. If they reject, the outcome is war, which state G wins with probability p.
3. After the resolution of peace or war, state G chooses tax rate τ_1 or τ_2 to redistribute value between the two domestic groups.

The tax rates $\tau_1, \tau_2 \in [0, 1]$ could mean redistributive taxation, but should more broadly

[3] As examples, one could include a weighting parameter which determines a percentage of the total value allocated to each group, with that weighting skewed towards the war-benefitting group when conflict occurs, or one could set up a variant of the model where the benefits of war are always captured by group 1 but the costs of war are experienced by group 2.

be considered as any means by which the government could try to transfer value from one domestic party to another. State G's simple objective function of weighted group utilities takes the following form:

$$U_G = \alpha U_1 + U_2 = \alpha log(y) + log(z)$$

Where $y, z \in \mathbb{R}^+$ stand in for whatever value is ultimately captured by group 1 and group 2 respectively. $\alpha \in \mathbb{R}^+$ reflects the weighting placed on group 1; when $\alpha > 1$, this implies that the beneficiaries of war are weighted more highly than those who disproportionately experience its burdens, whereas when $\alpha < 1$ war's beneficiaries are weighted less. While none of the results in this paper depend on α being in either range, I am primarily concerned substantively with situations where $\alpha > 1$, such that war's beneficiaries are more heavily weighted by the representative political agent.

Each group's utility function has natural logarithmic form, which implies that their forms are strictly concave (since $log(\cdot)$ is strictly concave). This builds in the assumption that there are decreasing returns to whatever value is claimed by each group, which is both substantively sensible, and helps to ensure that G will always choose τ_1 or τ_2 such that each group receives some positive value, i.e. that τ_1 or τ_2 will be at an interior solution.[4] Natural logarithms are also chosen so that state G's objective function will have log-Cobb-Douglas form, which gives the solution of the model a convenient mathematical form.

This way of setting up the distributive politics model is extremely spare, but also very general. The model does not make any claims about what factors are likely to make one group more politically influential than another; instead, political weightings are determined exoge-

[4]This conclusion also relies on the property that $\lim_{x \to 0} \frac{\partial log(x)}{\partial x} = \infty$.

nously and assigned to the different groups (via α). While this approach endows the model with less power to generate precise empirical predictions about war and peace, it has the advantage of allowing the model to accommodate a wide-variety of domestic institutional features and political arrangements, thus ensuring that the model's results cannot be tied to any particular assumptions about how the domestic political game unfolds.

Consider that different models of distributive politics tend to reduce, in their ultimate conclusions, to an assignment of weightings across groups. A Grossman-Helpman style lobbying contribution model, for instance, uses the contributions of groups to determine how much each is ultimately weighted relative to the welfare costs of providing them with specific benefits (Grossman and Helpman 2001). Viewed in terms of this model, α would thus index the relative contribution levels of groups; if both groups contributed equally, $\alpha = 1$.

Swing or core voter models use specific features of the situation - such as political geography, ideology, or other characteristics - to determine which voters (and therefore ultimately which groups) will be considered most strongly by governments looking to maximize their chances of reelection (see Cox 2009 for a review). Similarly, work that focuses on collective action problems (Olson 1965) would predict that groups that are better able to organize will be better able to extract concessions from the government, i.e. will be weighted higher by the government (higher α). A developed literature in comparative politics is dedicated to addressing when certain groups will be weighted more highly than others, and this model does not look to contribute to this analysis; instead, the model simply characterizes the ways in which redistributive frictions will interact with these weightings to impact a government agent's choices between war and peace.

Analysis

To solve for the Subgame Perfect Nash Equilibrium (SPNE) of the game, we use backwards induction, starting in Stage 3 of the model, i.e. the domestic redistributive politics stage. Consider that there are three possible outcomes that state G could face at this stage:

1. Winning the war. Payoff of $A - c$ captured by group 1.
2. Losing the war. Payoff of $B - c$ captured by group 1.
3. Peaceful settlement. Payoff of $x \in (B, A)$ captured by group 2.

This leads to the following Stage 3 objective functions for state G.

1. $U_G(war, won) = \alpha log[(A - c)(1 - \tau_1)] + log[(A - c)\tau_1\theta_1)]$
2. $U_G(war, lost) = \alpha log[(B - c)(1 - \tau_1)] + log[(B - c)\tau_1\theta_1)]$
3. $U_G(peace) = \alpha log[x\tau_2\theta_2] + log[x(1 - \tau_2)]$

As mentioned earlier, $\tau_1, \tau_2 \in [0, 1]$ are the tax rates on group 1 or group 2 respectively. The model is set up so that one group gets all of the value from a policy initially, with some of that value being redistributed after the fact; as a consequence, one of τ_1, τ_2 will necessarily be zero, since one group will have nothing to tax. Specifically, $\tau_1 = 0$ when a peaceful bargain is arrived at, while $\tau_2 = 0$ when war occurs.

$\theta_1, \theta_2 \in [0, 1]$ are the costs to taxation, i.e. the redistributive frictions; these are structured as "leaky buckets", in which some of the value of the transfer is lost instead of consumed by the recipient party. This could mean something as straightforward as deadweight losses to taxation, but they are intended to stand in for something more general, namely *any* loss of value generated by redistributing from one party to another. This could entail, for instance, political optics costs; as an example, a government agent might find it politically costly to directly extract funds from civilian soldiers in order to better compensate the management of defense contractors, even if this could be done with minimal allocative inefficiency.

Consequently, state G's Stage 3 choice variable is τ_1 after a war, or τ_2 after a peaceful settlement. Solving for τ_1^* and τ_2^* produces:

$$\tau_1^* = \frac{1}{1+\alpha}, \tau_2^* = \frac{\alpha}{1+\alpha}$$ [5]

Which we can substitute into the objective functions to obtain the following indirect utility functions:

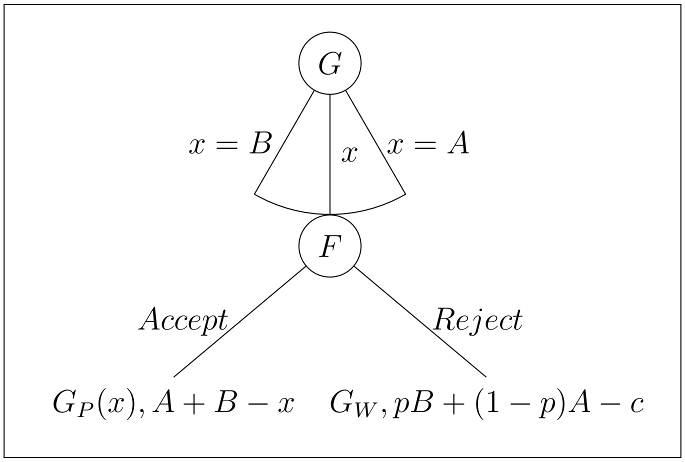
1. $U_G^*(war, won) = \alpha log\left[(A-c)\,\frac{\alpha}{1+\alpha}\right] + log\left[(A-c)\frac{\theta_1}{1+\alpha}\right]$
2. $U_G^*(war, lost) = \alpha log\left[(B-c)\,\frac{\alpha}{1+\alpha}\right] + log\left[(B-c)\frac{\theta_1}{1+\alpha}\right]$
3. $U_G^*(peace) = \alpha log\left[x\frac{\theta_2\alpha}{1+\alpha}\right] + log\left[x\frac{1}{1+\alpha}\right]$

We can now use these indirect utility functions to determine the following two expected utility functions for state G.

1. $G_W = EU_G(war) = p\left[\alpha log\left((A-c)\,\frac{\alpha}{1+\alpha}\right) + log\left((A-c)\frac{\theta_1}{1+\alpha}\right)\right] + (1-p)\left[\alpha log\left((B-c)\,\frac{\alpha}{1+\alpha}\right) + log\left((B-c)\frac{\theta_1}{1+\alpha}\right)\right]$
2. $G_P(x) = EU_G(peace|x) = \alpha log\left(x\frac{\theta_2\alpha}{1+\alpha}\right) + log\left(x\frac{1}{1+\alpha}\right)$

With these expressions in mind, we can move on to a consideration of the crisis bargaining model that occurs in the first two stages of the model. The game tree is as follows:

[5] This is the standard solution when a problem has Cobb-Douglas form, but can easily be derived by taking first order conditions.



State G has two possible equilibrium strategies. They can choose the x^* defined implicitly by $A + B - x = pB + (1 - p)A - c$, i.e.:

$$x^* = pA + (1 - p)B + c$$

Which will make state F indifferent between accepting and rejecting in Stage 2. Or state G can choose any $x > x^*$ if they would prefer war to that peaceful resolution. They will choose this latter strategy if $G_P(x^*) < G_W$, in which case war will be the outcome.

We can now return to considering the domestic politics subgame (i.e. Stage 3 of the model). What happens if there are no redistributive frictions, i.e. if $\theta_1 = \theta_2 = 1$? This leads to the following proposition:

Proposition 1. *Without redistributive frictions, the unique subgame perfect equilibrium of the model is a peaceful resolution in which state G offers $x^* = pA + (1 - p)B + c$ and state F accepts.*

Proof. Following from the preceding discussion, we have these Stage 3 expected utility functions when $\theta_1 = \theta_2 = 1$.

$$G_W = \underbrace{p\alpha log\left((A-c)\,\frac{\alpha}{1+\alpha}\right) + (1-p)\alpha log\left((B-c)\,\frac{\alpha}{1+\alpha}\right)}_{\beta}$$

$$+ \underbrace{plog\left((A-c)\frac{1}{1+\alpha}\right) + (1-p)log\left((B-c)\frac{1}{1+\alpha}\right)}_{\phi}$$

$$G_P(x^*) = \underbrace{\alpha log\left((pA+(1-p)B+c)\frac{\alpha}{1+\alpha}\right)}_{\beta'} + \underbrace{log\left((pA+(1-p)B+c)\frac{1}{1+\alpha}\right)}_{\phi'}$$

Note that even if $c = 0$ (i.e. there are no direct costs to war), $\beta' > \beta$ and $\phi' > \phi$ by properties of concavity ($log(\cdot)$ is a concave function). Substantively, this follows because the concave group utility functions induce risk-aversion in state G. This implies that $\beta' + \phi' > \beta + \phi$, and thus peace is preferred to war. Finally, with an offer of x^*, state F is indifferent between accepting or rejecting (by construction), and thus accepting is a best response. □

This result establishes that without redistributive frictions, peace is always the outcome when there are no other factors that might independently lead to war (e.g. information or commitment problems). This is regardless of the difference in weightings placed on different groups; indeed, it would not matter if war's beneficiaries (group 1) were weighted 100 times more highly than group 2, since without the presence of some kind of impediment to internal bargaining, states would choose the aggregate-value maximizing option and then redistribute ex post.

This is one of the core results of this paper's model, so it is important to be clear about what contributes to this result, and how it differs from existing work. The international bargaining protocol used in this model - i.e. a take-it-or-leave-it offer, or ultimatum game - is both standard in the literature, and according to recent work, equivalent in terms of the outcomes produced to virtually any complex bargaining protocol, such that "crisis bargaining can be modeled as a simple ultimatum game with surprisingly little loss of generality" (Fey and Kenkel, forthcoming, p.28). Research using this protocol and others like it has generically found that peace is the outcome without information or commitment problems; indeed, this is the core foundation of the "inefficiency puzzle" of war.

What this paper demonstrates is what happens as a result of incorporating an equally general domestic distributive politics model, in which the state-level agent simply has varying weightings on different groups, where those weightings could be generated from lobbying, specific institutional features, political geography, or any other number of other characteristics. The upshot is that disaggregating the state-level agent's preferences in this way has *no impact* on the model's outcome without the existence of redistributive frictions; thus, war cannot be a result of domestic distributive politics alone.

When these redistributive frictions exist (i.e. when $\theta_1, \theta_2 \in (0, 1)$), however, war becomes a possibility without the existence of information or commitment problems. This leads to the following proposition:

Proposition 2. *Redistributive frictions can be a proximate cause of war. Furthermore, it is less likely that the conditions for war will be met when θ_2 is higher, and more likely that the conditions for war will be met when θ_1 is higher.*

Proof in the Appendix. Thus, with redistributive frictions, it becomes possible for war to be the outcome of a standard crisis bargaining model without any commitment problems or information problems. Redistributive frictions are thus a proximate cause of war. However, this proposition also establishes that despite this, redistributive frictions are not always a *contributing* factor to war onset; in fact, when they make it more difficult to redistribute from war's beneficiaries, they make it easier to sustain the conditions for peace.

This also leads to the following interesting lemma:

Lemma 1. *The impact of θ_2 on the likelihood that war is preferred by the state-level agent is higher when α is higher.*

Proof in the Appendix. This is substantively straightforward; as the importance of "compensating" the group that would otherwise push for war instead of a peaceful resolution increases, the *ability* to do this becomes more important. This suggests, roughly, that societies with highly unequal distributions of power across groups will be more heavily impacted by redistributive frictions.

Finally, conditional on the existence of these redistributive frictions, domestic distributive politics becomes an important factor in whether war occurs or not, leading to the following proposition:

Proposition 3. *If redistributive frictions exist, the relative weightings placed on group 1 and group 2 by state G can determine whether or not war occurs. Specifically, higher α will increase the likelihood of war whenever group 1 receives less than their certainty equivalent for war in a peaceful bargain.*

Proof in the Appendix. Proposition 3 establishes that domestic distributive politics can indeed matter for war onset, but only conditionally. Without redistributive frictions, Proposition 1 establishes that domestic politics can have *no impact* on whether war occurs or not. Indeed, in order for domestic distributive politics to matter, θ_2 needs to be low enough that group 1 receives not only less than their on average returns from war, but less than their certainty equivalent, which given that they are risk-averse (as implied by the concavity of $log(\cdot)$), may be significantly lower than their average return from war.

We can also put some additional structure on when war will be chosen over peace with the following lemma:

Lemma 2. *War will occur whenever the following condition is met:*

$$G_W - G_P(x) = (\alpha + 1)\left(plog(A - c) + (1 - p)log(B - c) - log(x^*)\right) + log(\theta_1) - \alpha log(\theta_2) > 0$$

Furthermore, a necessary (but not sufficient) condition for war is:

$$log(\theta_1) - \alpha log(\theta_2) > 0$$

Proof in the Appendix. How can we interpret this lemma? To start, note that the first part of this expression is negative, as it is essentially capturing the aggregate loss in value from choosing war instead of peace, i.e.:

$$\underbrace{(\alpha + 1)\left(plog(A - c) + (1 - p)log(B - c) - log(x^*)\right)}_{\text{aggregate cost of war}} < 0$$

Given this, war can occur only when this second part of the expression:

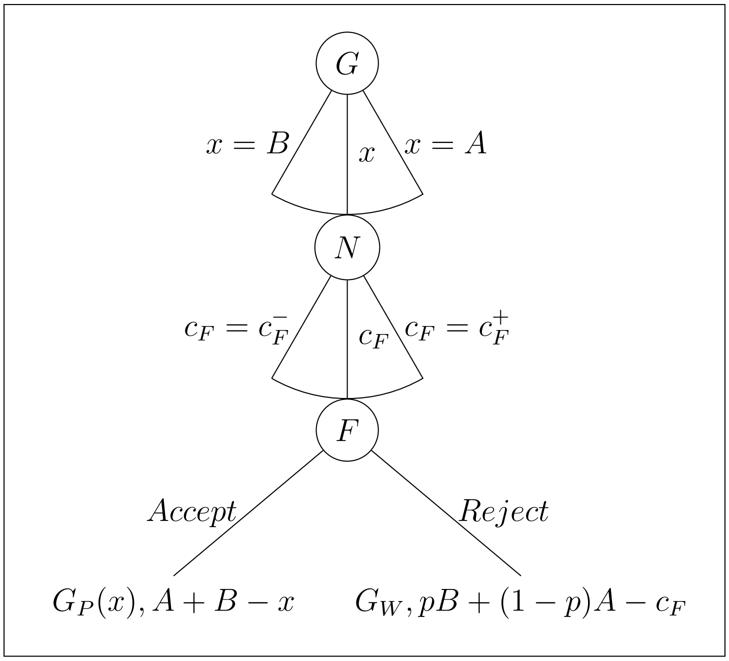
$$log(\theta_1) - \alpha log(\theta_2)$$

is sufficiently positive to compensate for the loss of value implied by war being both costly and risky. In interpreting this condition, one must be careful to note that given that $\theta_1, \theta_2 \leq 1$, it is also the case that $log(\theta_1), log(\theta_2) \leq 0$. So, for instance, if $\theta_1 = \theta_2 < 1$ and $\alpha > 1$, then $log(\theta_1) - \alpha log(\theta_2) > 0$, though whether or not it will be sufficiently positive to lead to war depends on the magnitude of A, B, c, and p. This condition draws attention to the importance of both the *relative* ability to redistribute from each group and the weightings on each group in determining whether war occurs. Indeed, in order for war to occur, at least one of the following things must be true: (1) war's beneficiaries need to be weighted more highly ($\alpha > 1$); (2) it needs to be easier to extract value from the war's beneficiaries than the beneficiaries of peace ($\theta_1 > \theta_2$).

Introducing Uncertainty

We can now consider a variant of the model with incomplete information. This demonstrates how redistributive frictions can interact with information asymmetries to produce war, allowing us a better understanding of the role these bargaining frictions play in a more complete account of the causes of conflict. An especially valuable insight from this approach is that redistributive frictions can matter even when they are not the sole or primary cause of conflict, and can indeed be pivotal even when they are relatively small, or in cases where the balance of power across groups is not especially disproportionately skewed.

In this variant of the model, we assert that the costs of war to state G and state F are different (call these $c_G \in \mathbb{R}^+$ and $c_F \in \mathbb{R}^+$). State F observes its cost (c_F) but state G does not. State G's cost (c_G) is common knowledge. c_F is absolutely continuously distributed $c_F \sim f(c)$ on some closed interval $[c_F^-, c_F^+]$. This structure is represented by the following game tree:



The important difference between this and the earlier variant of the model is that the uncertainty induces a risk-return trade-off for state G, wherein even without redistributive frictions war may be the outcome if state G offers state F a lower amount in the hope that state F's costs are high enough that they will accept it anyway, but state F's costs turn out to be low enough that they prefer war to that offer. State F's best response is to accept if and only if:

$$A + B - x \geq pB + (1-p)A - c_F$$
$$\leftrightarrow x \leq pA + (1-p)B + c_F$$

This allows us to define the probability of war and peace as a function of any given x thusly:

$$Pr(war) = Pr[c_F \leq x - pA + (1-p)B] = \int_{c_F^-}^{x-pA+(1-p)B} f(c)dc$$

$$Pr(peace) = 1 - Pr[c_F \leq x - pA + (1-p)B] = 1 - \int_{c_F^-}^{x-pA+(1-p)B} f(c)dc$$

Note that since the upper bound of these integrals is increasing in x, it must be the case that $\frac{\partial Pr(war)}{\partial x} \geq 0$ and $\frac{\partial Pr(peace)}{\partial x} \leq 0$. This also has a clear intuition: demanding more from a bargain increases the probability of war.

Following from this, we can write the expected utility for state G as:

$$EU_G(x) = G_P(x)Pr(peace) + G_W(1 - Pr(peace))$$

Which allows us to characterize the optimal x^* when it is an interior solution (i.e. is located on (B, A)) with the following first order condition.

$$\frac{\partial EU_G}{\partial x} = (G_P(x) - G_W)\frac{\partial Pr(Peace)}{\partial x} + \frac{\partial G_P(x)}{\partial x}Pr(Peace) = 0$$

This gives us the contours of the decision problem faced by G in an environment of incomplete information. In some ways, the situation looks very similar to how it appears elsewhere in the literature; in determining their offer to state F, G faces a trade-off between improving the terms of that bargain and increasing the probability that bargaining breaks down, leading to war. What is distinct in this model is that the relative weightings on these two sides of the trade-off are determined by domestic distributive politics. An analysis of the model leads to the following proposition:

Proposition 4. *x^* is decreasing (weakly) in θ_2, i.e.:*

$$\frac{\partial x^*}{\partial \theta_2} \leq 0$$

This is also strict whenever x^* is at an interior solution. This further implies that in equilibrium:

$$\frac{\partial Pr(war)}{\partial \theta_2} \leq 0$$

and this relationship is again strict whenever x^* is at an interior solution.

Proof in the Appendix. This demonstrates that being better able to tax the "winners" of peace makes peace more likely, by reducing the equilibrium x^*, which in turn reduces the probability that the offer is rejected, which would result in war.

To reemphasize, ability to "tax" is considered by this paper more broadly as the ability to redistribute value, and the costs to "taxation", or redistributive frictions, need not only be about things like deadweight losses or enforcement costs, but could include political optics, norms, distrust between groups, or any other number of characteristics. In many cases, it may be that taxation of peace's winners may be technically feasible, but very costly for reasons that go beyond the scope of this model.

However, if one interprets this as about literal taxation, this result stands in contrast with work that suggests that fiscal capacity (i.e. the ability to raise tax revenues) is likely to increase the likelihood of war by improving the capacity for a state to engage in it (e.g. Besley and Persson 2008)[6]; in this model, because taxation can also serve a redistributive purpose, the relationship is more ambiguous.

We can compute similar comparative statics for θ_1, i.e. the ability to tax war's beneficiaries, which allows us to derive the following proposition:

Proposition 5. *x^* is increasing (weakly) in θ_1, i.e.:*

$$\frac{\partial x^*}{\partial \theta_1} \geq 0$$

[6]To be clear, this work largely reverses the causal arrow in talking about the effect of war on fiscal capacity. However, implicit in this argument is the conjecture that higher fiscal capacity is an important part of sustaining the conditions for conflict.

This is also strict whenever x^* is at an interior solution. This further implies that in equilibrium:

$$\frac{\partial Pr(war)}{\partial \theta_1} \geq 0$$

and this relationship is again strict when x^* is at an interior solution.

Proof in the Appendix. This establishes that being better able to tax the winners of war will make war more likely. A key thing to note about this result is that it implies that redistributive frictions are not always "bad", as evaluated from the perspective of someone who wishes to reduce the incidence of war. While they are a necessary condition for war in the model without uncertainty, in this version of the model there is a positive probability of war stemming from incomplete information, and whether or not redistributive frictions raise or lower the probability of war depends on which parties they affect.

It is also worth emphasizing again that while with complete information, redistributive frictions matter only if they are quite large, such that they impose enough costs on reallocating the surplus from peace that the gains are exhausted before the key constituencies are satisfied, here these frictions *always* matter, because the probability of war varies continuously with anything that affects the risk-return trade-off via the relative value placed on peace and war. This dramatically increases the scope of conflict situations in which redistributive frictions are a relevant part of the story.

Finally, we can compute the comparative statics for α, i.e. the weight state G places on the group that benefits most from war. This provides insight into whether a state's disproportionate weighting of war-benefiting groups over others can increase the likelihood of war. Surprisingly, this turns out to have an ambiguous effect in this version of the model, as summarized in the following proposition:

Proposition 6. *The impact of α on x^* is ambiguous. It is negative whenever:*

$$\underbrace{\left[plog\left((A-c)\frac{\alpha}{1+\alpha}\right)+(1-p)log\left((B-c)\frac{\alpha}{1+\alpha}\right)-log\left(\frac{x\theta_2\alpha}{1+\alpha}\right)\right]}_{\text{Difference in Group 1's utility in war versus peace}}\underbrace{\frac{\partial Pr(Peace)}{\partial x}}_{\text{Effect on } Pr(Peace) \text{ of higher } x} > \frac{Pr(Peace)}{x}$$

Since $\frac{\partial Pr(War)}{\partial x} \geq 0$, this implies that the impact of α on the probability of war occurring is ambiguous.

Proof in the Appendix. This surprising result suggests that increasing the weight that government places on the party that benefits more from war can in some cases make war *less likely*. How could this be the case? The intuition is that if the offer x^* is high enough, and the ability to tax peace's beneficiaries is also high enough, then the war-benefitting group may end up getting more or nearly as much in a peaceful outcome as they get from war, once redistribution is taken into account. Note that from the proposition, because $\frac{\partial Pr(Peace)}{\partial x}$ is negative, the utility obtained by group 1 from a peaceful bargain must be higher than the expected utility they obtain in war for the condition to hold.

If this is the case, then there can still be a positive probability of war due to the risk-reward trade-off state G faces, but since increases in α in this range have the impact of making peace *relatively* more attractive compared to war, the increase in α leads to a decreased probability of war as state G becomes less willing to accept the risk. This is distinct from the complete information model, where any situation in which group 1 receives more from peace than war would result in a peaceful bargain.

Applying the Model

The model draws our attention to the interplay between the distribution of political power and redistributive frictions in the generation of conflict, establishing that the former should have little impact absent the latter. Moreover, conditional on the existence of these redistributive frictions, the model shows us that we should also be attentive to their magnitude, as decisions about war will be biased towards both the most powerful and those whom it is easiest to extract value from in order to redistribute to other important constituencies. The remainder of the paper looks to use this framework as a lens through which to evaluate substantive issues, literatures, and specific cases.

Selectorate Theory

Selectorate theory (Bueno de Mesquita et al. 2003) provides a convenient framework for thinking about how leaders might assign weightings to different groups in a wide variety of different institutional settings. Specifically, the theory suggests that the "winning coalition" would receive a higher weighting (high α) compared to the rest of the selectorate, with the specific institutional setup determining who these two groups are. In democracies, it could be the voting bloc necessary to receive a majority versus all eligible voters, while in many autocratic regimes the higher α group would be whomever is required to rig elections or otherwise hold on to power, while the remaining residents would form the lower weighted group.

One of the core results of selectorate theory is that leaders facing institutions characterized by a high $\frac{W}{S}$ - i.e. a large winning coalition size relative to the size of the selectorate - have greater incentives to provide public goods. This is because public goods are welfare improving but less targeted towards the winning coalition than private goods, and thus leaders in high $\frac{W}{S}$ countries value them more because they have to satisfy more constituents. Bueno de Mesquita et al. (2003) applies this to war by treating war outcomes as a public good that leaders in high $\frac{W}{S}$ countries would have a higher stake in, producing predictions about war effort and the democratic peace.

What this paper shows is that these implications are conditional on implicitly assumed redistributive frictions. Selectorate theory does not allow for the value generated by public goods to be taxed and redistributed to members of the winning coalition.[7] In effect, this assumes that there is some friction preventing redistribution of this kind; if there were not, then this paper suggests that even dictatorships with low $\frac{W}{S}$ would have the same incentives as democracies with respect to war, because the spoils of war success or peace could be extracted from the broader selectorate and transferred to the winning coalition. Thus, this paper demonstrates that an important assumption underlies selectorate theory, and suggests that variability in the magnitude of redistributive frictions (i.e. in the ability to tax the value produced by public goods) will condition when selectorate theory's predictions should hold.

Diversionary War

A collection of leader-centric theories in the literature (e.g. Tarar 2006, Goemans and Fey 2009, Debs and Goemans 2010) - that have sometimes been classified under the label "diversionary war" - draw attention to the fact that leaders may sometimes have incentives to go to war to retain office even though war destroys value. This outlines another kind of agency problem explanation for war, and it is clarifying to assess how it diverges from the story outlined in this paper.

A key feature of most of these models is that inefficient war outcomes are driven by the leader's value for staying in office. Indeed, in Tarar (2006), the leader-centric model is embedded directly in a standard bargaining model of conflict, and it is shown that war arises only when the valuation on holding office is high enough to eliminate the normal

[7] Specifically, it assumes uniform tax rates across individuals (so tax rates are not redistributive), and public goods consumption is additively separable in an individual's utility function from private consumption, and is non-taxable (Bueno de Mesquita et al. 2003, p.108).

bargaining range generated by the costs of war. If the value of retaining office is the current value of holding the office minus the costs of being deposed (Debs and Goemans 2010), then the redistributive question is whether or not leaders can be "bought off" rather than pursuing an inefficient gamble to stay in power. But here, the key constraint to achieving this outcome is not that there are redistributive frictions, but that the redistribution needs to happen ex-post (after the outcome of war), when constituents will have no incentive to follow-through. As Goemans and Fey (2009) note, this is a commitment problem between the leader and the selectorate. This highlights that while redistributive frictions of the kind described in this paper are one mechanism by which internal divisions can lead to interstate conflict, there may be others that could apply as well, including commitment problems[8], and potentially information asymmetries between domestic parties. Indeed, we might expect that these different kinds of domestic bargaining problems could act in concert in producing conflict.

Trade and Conflict

The literature connecting international trade and conflict has long been dominated by a simple story: if trade with another country increases the costs of going to war, then we should expect trade to have a pacifying effect.[9] However, as some scholars have noted, there are two kinds of microfoundations that this story generally neglects: (1) a clear explication of the linkage between opportunity costs and our theoretical models of war causation[10]; (2) an assessment of whom within a country would actually be impacted by a disruption of trade.

While each of these limitations have been addressed separately to some extent, what this paper can provide is a more precise way of combining both of these kinds of microfoundations

[8] See also Powell 2006 p.189, Chapman et al. 2015.

[9] See Gartzke and Zhang 2015 for a review of this work.

[10] Morrow 1999 identifies this issue and shows an ambiguous effect of higher opportunity costs from trade in a bargaining model with information asymmetries.

together into a coherent theory linking trade and conflict. Clearly, trade has distributive effects, and scholars have identified how these distributive effects can lead certain constituencies to benefit from conflict that protects their trade interests (see Fordham 2007, 2019), or be harmed by conflict that would disrupt these interests (Fordham and Kleinberg 2013).

Having identified that conflict has these distributive consequences via trade, a rationalist explanation of trade's effect on war requires a model that links these distributive effects and war within a bargaining framework. This paper's model is well-suited to bridge this gap. For instance, this paper suggests that when trade interests are likely to be advanced by going to war, the key questions to ask are: (1) are these interests politically influential (are they assigned high α)?; (2) are there other means of redistributing value to these interests (what is θ_2)? If they are weighted highly and the substitute means of redistributing value are costly, then protection of export interests (for instance) could conceivably lead to a higher propensity of conflict. Conversely, if the groups that are most harmed by potential disruptions from trade are especially influential and relatively easy to extract value from - as may plausibly be the case for the large multinational firms that dominate trade (see Osgood n.d.) - then we would expect the pacifying effect of increased trade to emerge via the agency problem outlined in this paper.

Empirical Illustrations

American Revolutionary War

The following empirical illustrations, while far from dispositive about the mechanisms entailed in this paper, can nonetheless highlight the important substantive implications of this paper's theoretical contribution. Consider first the American Revolutionary War. Historians estimate that the war was actively supported by approximately 40% of the population of the colonies prior to war onset (Calhoon 2000, p.235); a possible plurality of the population, but not by much. Moreover, economists estimate that the total cost of The Navigation Acts was fairly minimal - about 0.6% of colonial income (Irwin 2017, p.37) - while the war resulted in possibly the greatest income slump ever in the United States in percentage terms (Lindert and Williamson 2013, p.741). These characteristics - in conjunction with the fact that the British-imposed taxes that escalated the conflict were, at least in isolation, fairly trivial - has led some historically-driven political economists to suggest that the revolutionary war is a puzzle for rationalist conflict scholars, with some extant explanations relying on non-standard solution concepts such as self-confirming equilibrium (de Figueiredo et al. 2006), or invoking a "costly peace"' mechanism of investment distortions from the perceived possibility of predation (Coe 2011).

This paper draws our attention to another possible contributing factor: distributive politics. While the costs of Britain's system of tariffs and subsidies to the United States were overall fairly low, there were significant distributive effects, with many of the most serious costs concentrated on the strongest supporters of the war, such as farmers in Maryland and Virginia who were hit hard by a collapse in tobacco prices (Irwin 2017). Furthermore, the impact of the taxes imposed by the British in the lead-up to the war was often highly unequal, and the *responses* to these taxes also often had significant redistributive implications. For instance, the "non-importation" movement that first arose in response to the Stamp Act began as a private initiative amongst colonial merchants who were "not simply acting out of principle... they were also taking advantage of the opportunity to reduce their large inventories, which had accumulated during the recession that followed the initial boom at the end of the French and Indian War, at much higher prices than would otherwise be possible." (Irwin 2017, p.40) Similarly, the Tea Act, which reduced duties on tea but gave a monopoly to the East India Company in an attempt to undercut colonial smugglers, produced a strong and escalatory response from colonial merchants, many of whom were very likely also involved in smuggling (Irwin 2017, p.43).

Important to emphasize is that this revolutionary coalition made up a very small percentage of the population. The "merchants of revolution" that dominate popular narratives of the war were concentrated in urban areas where only 10% of Americans lived (Jensen 1969, p.107), but "they wielded economic and political power within most of the Colonies far out of proportion to their numbers." (Jensen 1969, p.109) Meanwhile, most of the remaining 90% of the population, who lived on farms and plantations, "did not share the economic grievances of either merchants and tradesmen of the coastal cities or of the tobacco growing planters of Virginia and Maryland" (Egnal and Ernst 1972), setting up a distributional conflict in which a concentrated group that would benefit from war was disproportionately weighted (i.e. received higher α) in political decision-making.

Moreover, this distributional conflict came at a time in which there was very little redistribution amongst the colonists (e.g. few taxes of any kind or government spending programs), such that merchants and tobacco farmers were left with few policy tools through which to advance their interests (implying θ_2 was low). For instance, farmers could not realistically organize to lobby for farm subsidies, and merchants could hardly petition the government to help manage the sales of surplus inventories, while these kinds of policies would likely be the focus were similar grievances to arise in modern times. This paper's model suggests that in this environment of limited ability to redistribute, the conditions were ripe for an influential minority to wield disproportionate influence over the decision of whether or not to go to war. The collision course between the colonists and the British was driven to a significant extent by factional interests, but this was only possible because other forms of redistribution were especially costly at the time.

Mass Warfare and Progressive Taxation

Scheve and Stasavage (2010, 2012, 2016) provide a comprehensive set of studies in which they identify an important regularity: namely, that mass warfare in the US and Europe appears to have been linked with sharp increases in the *progressivity* of taxation, not just in the *amount* of taxation. For instance, their 2010 piece focuses on World War I, and compares countries that were active participants in the war (including the U.K., Canada, France, and the U.S.) with those that were not. They demonstrate that "Either during or soon after the end of the war, participant countries adopted steeply graduated rate schedules with top rates... that had previously [been] seen as 'preposterous' " (Scheve and Stasavage 2010, p.538), while neutral or minor participants - such as Sweden, the Netherlands, and Japan - saw no such dramatic changes. Furthermore, they describe the circumstances in which these policy changes occurred: namely, they were the result of strong pressure from labor and other left-wing groups who explicitly invoked the idea that war's burdens were not equally shared across groups, and thus more progressive taxation was needed in order to ensure "equal sacrifice" for all (Scheve and Stasavage 2010, p.541).

This paper does not have anything to add to Scheve and Slaughter's empirical analysis; what the model offers is a new way of interpreting this regularity. Propositions 2 and 5 outline that the conditions for war become easier to satisfy as the ability to tax those who experience fewer of its burdens increases (higher θ_1). In the case of World War I, states clearly had the ability to redistribute value from those who were less affected by the war, given that they explicitly exercised this ability in the form of "war profits" taxes and significant increases in the progressivity of income taxation. Moreover, they did so as part of a clear domestic bargain aimed at sustaining support for the war, at a time when enthusiasm had waned in the face of growing awareness of the war's costs. Moreover, it is quite likely that regressive redistribution would have been infeasible for political optics reasons, and there were few other tools readily available to governments to redistribute value to the wealthy groups who would benefit most from conflict.[11]

While this paper's model is not explicitly dynamic, as it is designed to interrogate the effects of domestic politics at any particular "slice" in time, it draws attention to the fact that sustaining the conditions for war will often entail compensating groups who are differentially subject to war's costs. It is therefore striking to see these kinds of compensatory bargains unfold with fairly similar features in a wide variety of countries faced with similar circumstances during World War 1, and to see them reflected more generally in broader patterns linking mass warfare and progressive taxation.

Iraq War

What role did distributive politics play in the Iraq War? They were certainly a significant part of the popular narrative surrounding the conflict: the billions of dollars in contracts awarded to Halliburton[12] came under particular scrutiny given Vice President Cheney's role as CEO from 1995-2000, and more broadly claims abounded that the conflict was driven by oil interests and profit opportunities for military contractors. Representative Charles Rangel regularly advocated for Congress to bring back the military draft, with his argument explicitly linked to the idea that those making the decisions to authorize force were likely to experience few of the war's burdens, noting in a New York Times op-ed that "A disproportionate number of the poor and members of minority groups make up the enlisted ranks of the military, while the most privileged Americans are underrepresented or absent."[13]

Given the information asymmetries present - for instance, about both resolve and the exis-

[11] In the US, these groups included a variety of traders who were eager to protect their export markets (Fordham 2007, 2019).

[12] New York Times, 28 September 2004.

[13] Charles Rangel in New York Times, 31 December 2012.

tence of weapons of mass destruction (Lake 2010) - the Iraq War is an ideal case to examine via the lens of the incomplete information variant of this paper's model. To start, for reasons of political optics and perhaps ethics, it would prove very difficult for a state-level agent to engage in any obvious peacetime redistribution from those who experienced the higher burdens of the war (e.g. potential volunteer soldiers) to those who would experience the highest gains (oil and defense contractors). This did not eliminate the possibility that war's potential beneficiaries could lobby for other implicitly redistributive forms of favor from the government - for instance, they could pursue better tax treatment, or other support for their operations abroad - but it did introduce some degree of friction in the redistributive politics game surrounding the war, implying a relatively low θ_2.

Moreover, another relevant feature of the Iraq War is the degree to which it relied on financing via borrowing. As Kreps (2018) argues, this had the effect of displacing many of the costs of the war on to future generations. This paper's model provides a convenient framework for thinking about this piece of the story: future constituents are a group that would naturally receive relatively little weighting by American Presidents (who are term-limited) relative to current constituents, and borrowing costs were quite low at the onset of the Iraq War, implying a low cost of redistributing from future residents. Thus, a collection of redistributive frictions helps to predict the equilibrium: it would be costly to redistribute value to defense contractors and oil interests, but quite low-cost to redistribute value from future constituents to current middle-class taxpayers to buy off opposition towards the war.

Key to establishing a role for distributive politics in the Iraq War story is this: information problems had already generated a baseline positive probability of war from the risk-return trade-off entailed in the Bush administration's bargaining demands. It is therefore not necessary to demonstrate that defense contractors or oil interests exerted a dominating level of control over the executive branch; Proposition 6 suggests that *any* degree of disproportionate weighting on these interests would have led the Bush administration to take a harder line in negotiations than they would have if they were unbiased (i.e. they would demand a higher x^* in equilibrium), leading to a higher probability of war. This appears to correspond closely with what we observed: there were legitimate tensions between the United States and Iraq over the existence of WMDs and their future visions for the region, but many were still surprised by the hastiness with which the Bush administration was willing to push for war, and its unwillingness to work with international allies.

Conclusion

In this paper, I have presented a model that demonstrates that costs to side payments (i.e. redistributive frictions) between domestic parties can be a determinative cause of war, or a factor that exacerbates other possible causes of war. I have also demonstrated that redistributive frictions play an essential role in incorporating domestic distributive politics into the bargaining model of war. Without them, no amount of disproportionate influence wielded by war's beneficiaries can affect the onset of conflict. Furthermore, while the model demonstrates that redistributive frictions are a necessary condition for distributive politics to be a proximate cause of war, it also shows that reducing these bargaining frictions does not always lead to a decrease in the probability of war; in fact, reducing the costs to transferring value from war's beneficiaries makes war more politically achievable. Thus, this paper contributes to our understanding of the conditions under which an agency problem derived from domestic distributive politics can lead to war, and provides a new set of empirical implications that can be useful for understanding specific cases and broader mechanisms of conflict.

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Appendix for War as a Redistributive Problem

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1 Proofs

1.1 Proof of Proposition 2

Proof. To start, since war occurs whenever $G_W > G_P(x^*)$, the second part of this proposition is merely calculating $\frac{\partial G_W}{\partial \theta_1}$ and $\frac{\partial G_P(x^*)}{\partial \theta_2}$. This is straightforward, and produces the following:

$$\begin{aligned}
\frac{\partial G_W}{\partial \theta_1} &= p\frac{1}{(A-c)\frac{\theta_1}{1+\alpha}}(A-c)\frac{1}{1+\alpha} + (1-p)\frac{1}{(B-c)\frac{\theta_1}{1+\alpha}}(B-c)\frac{1}{1+\alpha} \\
&= \frac{p}{\theta_1} + \frac{1-p}{\theta_1} = \frac{1}{\theta_1} \\
\frac{\partial G_P(x^*)}{\partial \theta_2} &= \alpha\frac{1}{x\theta_2\frac{1}{1+\alpha}}(x)\frac{1}{1+\alpha} = \frac{\alpha}{\theta_2}
\end{aligned}$$

Since both of these are positive, it implies that higher θ_2 makes it less likely that war will be chosen, while higher θ_1 makes it more likely that war will be chosen.

For the first part of Proposition 2, given that Proposition 1 establishes that if $\theta_1, \theta_2 = 1$ peace is always the outcome, it is sufficient to demonstrate that there exist cases where war is preferred when $\theta_1, \theta_2 \in (0,1)$. Consider, for instance, a case where $p = 0.5$, $A = 8$, $B = 2$, $c = 1$, $\alpha = 3$, $\theta_1 = 0.9$, $\theta_2 = 0.3$. This gives $x^* = 6$. Substituting these values into the expected utility expressions above gives $G_W = 3.02$, $G_P(x^*) = 2.02$. Since in this case, $G_W > G_P(x^*)$, the equilibrium is one where state G offers $x > x^*$ and state F rejects the offer; the outcome is war. This establishes existence. □

1.2 Proof of Lemma 1

Proof. From the proof of the last proposition, we have that $\frac{\partial G_P(x^*)}{\partial \theta_2} = \frac{\alpha}{\theta_2}$, and thus it is the case that:

$$\frac{\partial^2 G_P(x^*)}{\partial \theta_2 \partial \alpha} = \frac{1}{\theta_2}$$

Which since this is positive, means that the impact of θ_2 on $G_P(x^*)$ is higher when α is higher. Meanwhile, α is not in the expression for $\frac{\partial G_W}{\partial \theta_1}$, so it does not impact that half of the $G_W > G_P(x^*)$ comparison. □

1.3 Proof of Proposition 3

Proof. To determine the impact of α on the likelihood of conflict, note that conflict occurs whenever:

$$G_W > G_P(x^*) \leftrightarrow G_W - G_P(x^*) > 0$$

So to determine the impact of α on war, we need to determine its impact on $W_S = G_W - G_P(x^*)$, where W_S denotes the "surplus" captured by G from war. Thus, we have:

$$\frac{\partial W_S}{\partial \alpha} = \frac{\partial G_W}{\partial \alpha} - \frac{\partial G_P(x^*)}{\partial \alpha}$$

So to sign this, we need to compute two partial derivatives. We start with:

$$\begin{aligned}
\frac{\partial G_P(x)}{\partial \alpha} &= log\left(\frac{x\theta_2\alpha}{1+\alpha}\right) + \frac{\alpha}{\frac{x\theta_2\alpha}{1+\alpha}}(x\theta_2)\frac{1}{(1+\alpha)^2} + \frac{1}{\frac{x}{1+\alpha}}\frac{-x}{(1+\alpha)^2} \\
&= log\left(\frac{x\theta_2\alpha}{1+\alpha}\right) + \frac{1+\alpha}{(1+\alpha)^2} - \frac{1+\alpha}{(1+\alpha)^2} \\
&= log\left(\frac{x\theta_2\alpha}{1+\alpha}\right)
\end{aligned}$$

And then compute:

$$\begin{aligned}
\frac{\partial G_W}{\partial \alpha} &= p\left[log\left((A-c)\frac{\alpha}{1+\alpha}\right) + \frac{1}{1+\alpha} - \frac{1}{1+\alpha}\right] + (1-p)log\left[\left((B-c)\frac{\alpha}{1+\alpha}\right) + \frac{1}{1+\alpha} - \frac{1}{1+\alpha}\right] \\
&= plog\left((A-c)\frac{\alpha}{1+\alpha}\right) + (1-p)log\left((B-c)\frac{\alpha}{1+\alpha}\right)
\end{aligned}$$

We can substitute in for the equilibrium x^*, but in this case it is somewhat clearer to leave the value as x. $\frac{\partial G_W}{\partial \alpha}$ is simply the (unweighted) expected utility of war for group 1, while $\frac{G_P(x)}{\partial \alpha}$ is the utility obtained (with certainty) from a peaceful bargain (note that $\frac{x\theta_2\alpha}{1+a}$ is the value captured by group 1). So in order for $\frac{\partial W_S}{\partial \alpha} > 0$ (the condition for α to increase the likelihood of war), it is *not* sufficient that group 1 receive an equivalent expected *value* from war, they need to also be paid a risk premium, otherwise peace is preferred.

For the first part of Proposition 3, like with Proposition 2, we need a simple existence proof. Take the parameter values specified in the proof of Proposition 2, but change the weighting on group 1 from $\alpha = 5$ to $\alpha = 2$. In this case, $G_W = 0.90$ and $G_P(x^*) = 1.05$. Since $G_P(x^*) > G_W$, state G offers x^* and state F accepts; the outcome is peace. Thus, we have demonstrated that simply by increasing the weighting placed on group 1 - the group that benefits most from a war outcome - the equilibrium outcome can change from peace to war. □

1.4 Proof of Lemma 2

Proof. The first part of this is just simplifying the expression for $G_W - G_P(x)$.

$$\begin{aligned}
G_W &= p\left[\alpha log\left((A-c)\frac{\alpha}{1+\alpha}\right) + log\left((A-c)\frac{\theta_1}{1+\alpha}\right)\right] + (1-p)\left[\alpha log\left((B-c)\frac{\alpha}{1+\alpha}\right) + log\left((B-c)\frac{\theta_1}{1+\alpha}\right)\right] \\
&= (1+\alpha)\left[plog(A-c) + (1-p)log(B-c)\right] + \alpha log(\alpha) + log(\theta_1) - (1+\alpha)log(1+\alpha) \\
G_P(x) &= \alpha log\left(x\frac{\theta_2\alpha}{1+\alpha}\right) + log\left(x\frac{1}{1+\alpha}\right) \\
&= (1+\alpha)log(x) + \alpha log(\theta_2) + \alpha log(\alpha) - (1+\alpha)log(1+\alpha) \\
G_W - G_P(x) &= (\alpha+1)(plog(A-c) + (1-p)log(B-c) - logx) + log(\theta_1) - \alpha log(\theta_2)
\end{aligned}$$

And as discussed before, war occurs whenever $G_W - G_P(x) > 0$. Now note that if $x^* = pA + (1-p)B + c$, then the first part of the expression will be negative by the concavity of $log(\cdot)$:

$$(\alpha+1)\left(plog(A-c) + (1-p)log(B-c) - log[pA + (1-p)B + c]\right) < 0$$

So war will only occur if the second part of the expression in the proposition is sufficiently positive to compensate. $\square$

1.5 Proof of Proposition 4

Proof. An interior solution is defined by the first order condition:

$$\frac{\partial EU_G}{\partial x} = (G_P(x) - G_W)\frac{\partial Pr(Peace)}{\partial x} + \frac{\partial G_P(x)}{\partial x}Pr(Peace) = 0$$

We have a corner solution of $x^* = B$ when $\frac{\partial EU_G}{\partial x}(x = B) < 0$, since this means that at the lowest possible offer G's expected marginal benefit to increasing the offer is negative. A corner solution of $x^* = A$ is obtained when, conversely, $\frac{\partial EU_G}{\partial x}(x = A) > 0$, which suggests a positive marginal benefit to increasing the offer at the highest possible offer.

If we are instead at an interior solution, we can use the above expression to determine the properties of the optimal x^*. First, note that:

$$\frac{\partial G_P(x)}{\partial x} = \frac{\alpha}{x} + \frac{1}{x} > 0$$

Following from earlier results. So we can sign the different parts of the earlier first order condition as follows:

$$\frac{\partial EU_G}{\partial x} = \underbrace{(G_P(x) - G_W)}_{?}\underbrace{\frac{\partial Pr(Peace)}{\partial x}}_{<0} + \underbrace{\frac{\partial G_P(x)}{\partial x}}_{>0}\underbrace{Pr(Peace)}_{\geq 0} = 0$$

Clearly, state G will choose an x in equilibrium such that $G_P(x) > G_W$ if we are at an interior solution; if the war payoff is higher than the peace payoff, then nothing is being risked by demanding a higher x. This expression helps clarify that the main trade-off facing state G when deciding whether to claim a higher x is between increasing the $G_P(x)$ payoff they receive in a peaceful outcome, and the higher likelihood that war may occur if state

F's costs turn out to be higher than hoped.

Without solving explicitly for x^*, we can determine the sign of the relevant comparative statics by taking additional partial derivatives and then invoking results from monotone comparative statics, as outlined by Milgrom and Shannon (1994). By demonstrating the impact of parameter changes on the equilibrium x^*, we can also determine the impact these parameter changes have on the equilibrium likelihood that war occurs, given that we have established that $\frac{\partial Pr(war)}{\partial x} \geq 0$.

For instance, consider the parameter θ_2, which characterizes the ease with which the pro-peace domestic group can be taxed. We start by deriving the following expression:

$$\frac{\partial^2 EU_G}{\partial x \partial \theta_2} = \frac{\partial G_P(x)}{\partial \theta_2} \frac{\partial Pr(Peace)}{\partial x} + \frac{\partial^2 G_P(x)}{\partial x \partial \theta_2} Pr(Peace) = 0$$

We can show that $\frac{\partial^2 G_P(x)}{\partial x \partial \theta_2} = 0$ easily by taking the relevant partial derivative of the earlier derived expression for $\frac{\partial G_P(x)}{\partial x}$. We can also compute:

$$\frac{\partial G_P(x)}{\partial \theta_2} = \frac{\alpha}{\theta_2}$$

Which allows us to sign the different parts of the earlier expression:

$$\frac{\partial^2 EU_G}{\partial x \partial \theta_2} = \underbrace{\frac{\partial G_P(x)}{\partial \theta_2}}_{>0} \underbrace{\frac{\partial Pr(Peace)}{\partial x}}_{\leq 0} < 0$$

$\frac{\partial^2 EU_G}{\partial x \partial \theta_2} < 0$ is a sufficient condition for submodularity, so by monotone comparative statics, we have established that x^* is weakly decreasing in θ_2. By Edlin and Shannon (1998), we also know this relationship is strict when x^* is at an interior solution; this establishes Proposition 4. $\square$

1.6 Proof of Proposition 5

Proof. First, we compute:

$$\frac{\partial G_W}{\partial \theta_1} = \frac{p}{\theta_1} + \frac{1-p}{\theta_1} = \frac{1}{\theta_1} > 0$$

And then compute the cross-partial:

$$\frac{\partial^2 EU_G(x)}{\partial x \partial \theta_1} = -\underbrace{\frac{\partial G_W}{\partial \theta_1}}_{>0} \underbrace{\frac{\partial Pr(Peace)}{\partial x}}_{\leq 0} > 0$$

Which is a sufficient condition for supermodularity. Thus, by monotone comparative statics results in Milgrom and Shannon (1994) we have:

$$\frac{\partial x^*}{\partial \theta_1} \geq 0$$

Furthermore, by Edlin and Shannon (1998), this is strict whenever x^* is at an interior solution. Since $\frac{\partial Pr(war)}{\partial x} \geq 0$, this implies that in equilibrium:

$$\frac{\partial Pr(war)}{\partial \theta_1} \geq 0$$

$\square$

1.7 Proof of Proposition 6

Proof. To determine the impact of α on x^* we need to determine the sign of the following expression:

$$\frac{\partial^2 EU_G(x)}{\partial x \partial \alpha} = \left(\frac{\partial G_P(x)}{\partial \alpha} - \frac{\partial G_W}{\partial \alpha}\right)\frac{\partial Pr(Peace)}{\partial x} + \frac{Pr(Peace)}{x}$$

We know $x > 0$, $Pr(Peace) \geq 0$, and $\frac{\partial Pr(Peace)}{\partial x} < 0$, but evaluating the sign of this expression also requires determining whether $\frac{\partial G_P(x)}{\partial \alpha} - \frac{\partial G_W}{\partial \alpha} > 0$. This is equivalent to part of the proof for Proposition 3, i.e. we start with:

$$\begin{aligned}
\frac{\partial G_P(x)}{\partial \alpha} &= log\left(\frac{x\theta_2\alpha}{1+\alpha}\right) + \frac{\alpha}{\frac{x\theta_2\alpha}{1+\alpha}}(x\theta_2)\frac{1}{(1+\alpha)^2} + \frac{1}{\frac{x}{1+\alpha}}\frac{-x}{(1+\alpha)^2} \\
&= log\left(\frac{x\theta_2\alpha}{1+\alpha}\right) + \frac{1+\alpha}{(1+\alpha)^2} - \frac{1+\alpha}{(1+\alpha)^2} \\
&= log\left(\frac{x\theta_2\alpha}{1+\alpha}\right)
\end{aligned}$$

And then compute:

$$\begin{aligned}
\frac{\partial G_W}{\partial \alpha} &= p\left[log\left((A-c)\frac{\alpha}{1+\alpha}\right) + \frac{1}{1+\alpha} - \frac{1}{1+\alpha}\right] + (1-p)log\left[\left((B-c)\frac{\alpha}{1+\alpha}\right) + \frac{1}{1+\alpha} - \frac{1}{1+\alpha}\right] \\
&= plog\left((A-c)\frac{\alpha}{1+\alpha}\right) + (1-p)log\left((B-c)\frac{\alpha}{1+\alpha}\right)
\end{aligned}$$

Thus, as in Proposition 3, we have that $\frac{\partial G_P(x)}{\partial \alpha} - \frac{\partial G_W}{\partial \alpha} > 0$ iff the expected utility obtained by group 1 in peace exceeds their expected utility obtained in war.

Therefore, via substitution, $\frac{\partial^2 EU_G(x)}{\partial x \partial \alpha} < 0$ whenever the following holds:

$$\left[plog\left((A-c)\frac{\alpha}{1+\alpha}\right) + (1-p)log\left((B-c)\frac{\alpha}{1+\alpha}\right) - log\left(\frac{x\theta_2\alpha}{1+\alpha}\right)\right]\frac{\partial Pr(Peace)}{\partial x} > \frac{Pr(Peace)}{x}$$

While the reverse holds when this condition is reversed. Since $\frac{\partial^2 EU_G(x)}{\partial x \partial \alpha} < 0$ is a sufficient condition for submodularity, when this holds x^* is decreasing in α, and thus the probability of war is decreasing in α. Since $\frac{\partial^2 EU_G(x)}{\partial x \partial \alpha} > 0$ is sufficient for supermodularity, when this holds x^* is increasing in α, and thus the probability of war is increasing in α. This establishes that the impact of α on x^* and thus the probability of war is ambiguous. $\square$

References

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