# UC Berkeley
## Working Papers

**Title**
Political Bias and War

**Permalink**
https://escholarship.org/uc/item/4979h9g2

**Authors**
Jackson, Matthew O.
Morelli, Massimo

**Publication Date**
2006-03-01

# Political Bias and War[*]

Matthew O. Jackson[†] and  Massimo Morelli[‡]

This Draft: January 11, 2006

### Abstract

We examine the incentives for countries to go to war as they depend on the comparison between how much their pivotal decision-makers have at risk and how much they stand to gain from a war. How this ratio compares to the country at large is what we term "political bias." If there is no political bias, then there are always payments that one country would like to make to the other that will avoid a war in the presence of commitment or enforceability of peace treaties. If there is a bias on the part of one or both countries, then war can result and in some cases cannot be prevented by any transfer payments. We examine how war technology and relative wealth levels interact with political bias in determining whether countries make transfers, go to war, and form alliances. Our results shed some new light on the uneven contender paradox and the interpretation of the "democratic peace".

JEL Classification Numbers: C78, D74

Keywords: War, Political Bias, Alliances, Bargaining, Transfers, Commitment, Democratic Peace, War Technology.

[†]Division of Humanities and Social Sciences 228-77, California Institute of Technology, Pasadena, California 91125, USA. Email: jacksonm@hss.caltech.edu, http://www.hss.caltech.edu/~jacksonm/Jackson.html

[‡]Department of Economics and Department of Political Science, The Ohio State University, Columbus OH - 43210, USA. Email: morelli.10@osu.edu, http://economics.sbs.ohio-state.edu/morelli/

# 1  Introduction

The rich history of war provides evidence of its devastating consequences and of the wide variety of circumstances that lead to it.[1]  While there is much that we know about wars, there is still much to be learned about how the choices to go to war differ across countries and circumstances, and in particular how this relates to economic situations and political regimes. Although religious and ethnic conflicts have played key roles in many wars, balance of power, territorial disputes, expansion of territory, and access to key resources or wealth are often either involved or the primary driving force behind wars.[2] In this paper, we build a model of war based on bargaining that serves as a basis for understanding how political structure (crudely modeled) interacts with economic incentives to determine when wars will occur.

Our model of war is described as follows. Two countries are faced with a possible war, and each knows their respective probability of winning, which depends on their respective wealth levels. If a war ensues, each country incurs a cost, and then the victor claims a portion of the loser's wealth. The incentives of each country thus depend on the costs, the potential spoils, and the probability that each will win. If either country wishes to go to war then war ensues. Countries can offer to give (or receive) some transfer in order to forgo a war.

The way in which we tie the analysis back to political structure is crude but powerful. We model a country's decisions through the eyes of the pivotal decision-maker in the society. For instance, this could be an executive, monarch, military leader, or the median voter. The ratio of relative share of benefits from war compared to share of costs for this pivotal agent is thus a critical determinant of a country's decisions. We call this ratio "political bias." If it is close to one, then the country's critical decision maker's relative benefits/costs are similar to the country at large. If this ratio is greater than one, then we say that the country leader has a "positive bias". An unbiased leader is "representative" of the interests of the country, in the sense that he or she sees the same relative benefits and costs from a war as

---

[1]See, for example, Blainey [2] and Kaiser [20].

[2]Resources and wealth are the focus of much of the recent formal literature on war, as discussed below. Moreover, materialistic motivations have been identified as primary source of wars in the history of empires (see, for example, Harris [15] and Findlay [13]), and some scholars argue that modernization has further increased the profitability of conquest (see Liberman [24] who discusses Hitler's exploitation of occupied territories during World War II). A recent example of a war related to materialistic expansion motivations is the invasion of Kuwait in 1990. We stress that by materialistic motivations we include power and control motivations of country leaders, and hence our arguments apply even when no territory or resource is a cause of war.

the country does as a whole. Hence unbiasedness may be seen as an operationalization of a representativeness property associated with the level of democracy of a political regime.

Political bias essentially embodies anything that might lead to different incentives for the critical decision maker relative to the society as a whole. For instance, in an authoritarian regime, it might be that a leader can keep a disproportionate share of the gains from a war. It might also be that the leader sees other gains from war, in personal recognition or power. Similarly, if the military is leading a country, then it may be that military leaders gain disproportionately from war in terms of accumulated power, or even in keeping their troops occupied. These effects are not unique to autocratic or oligarchic regimes, but can also occur in democracies.[3] Sometimes a leader knows that (s)he is more easily reelected if the country is at war at the time of the elections, or may have other indirect benefits in terms of benefiting friends or companies to which he or she has ties. It is also important to note that bias can also go in the other direction. For instance, if a democratic leader risks losing office if a war is lost then that might lead him or her to over-weight the costs of war relative to gains, resulting in a bias factor less than one.[4]

We show that if both countries have unbiased leaders then war can be avoided, provided the countries can make transfers and provided they can commit to peace conditional on receiving transfers. However, if either country has a leader with positive bias, then war can ensue, and whether or not it does depends on the specifics of the war technology, relative wealths, potential costs and spoils of war, and the size of the biases. We also study such bargaining when neither country can commit to peace after receiving transfers.[5] Here the incentives are more complicated, as it must be that after receiving a transfer, a war would no longer be worthwhile for the potential aggressor.[6] When peace treaties are not enforceable,

---

[3] An argument in favor of the hypothesis that democracies tend to be less biased can be found in Lake [23]: "State rent seeking creates an imperialist bias in a country's foreign policy. This bias is smallest in democracies, where the costs to society of controlling the state are relatively low, and greatest in autocracies, where the costs are higher."

[4] For an analysis of the political costs of war for different regimes, see Bueno de Mesquita and Siverson [4] and Chiozza and Goemans [6]. Our notions of costs and benefits include the risk of losing power after a war, as one of the many elements that enter the cost-benefit calculation of a political leader. See Downs and Rocke [8] for a detailed discussion of the incentives of an executive to engage in war relative to the electorate's incentives to retain the executive.

[5] This commitment problem is usually studied in dynamic models. For example, in Schwarz and Sonin [31] war can be avoided with a continuous stream of transfers that comes at a fast enough rate to always have the aggressor wish to delay rather than attack.

[6] Given that the attention of empirical studies and historians has largely been on wars or armed conflicts that actually occurred, it is difficult to find direct empirical evidence of transfers that helped avoid a war, for the obvious counterfactual reasons. However, one can certainly see the role of transfers in many epochs:

even two countries with unbiased leaders (or, in short, unbiased countries) may go to war, depending on the "war technology."

Our model thus suggests some novel considerations regarding the so-called "Democratic Peace" (or "Liberal Peace") observation, where two democracies are much less likely to go to war with each other than are two countries when at least one is not a democracy (e.g., see Doyle [9] and Russett [29]). We show that at most one of two unbiased countries will want to go to war, and if binding treaties can be written, then two unbiased countries can always reach an agreement over transfers that will avoid a war. We can call this *unbiased peace*, and it can be interpreted as a new explanation of the democratic peace observation under the hypothesis that democracies tend to be less biased than non democratic regimes.[7] Wars between democracies are avoided not due to similarity of norms or cultural affinities, but due to a lack of political bias in the bargaining process (determined perhaps by the system of checks and balances typical of a democracy). Our model does predict that two *politically biased* democracies could still go to war with each other if they are each sufficiently biased. Thus, mutual democracy is neither a necessary nor sufficient condition for peace.

Our model also has implications regarding two puzzles often referred to as "paradoxes" in the literature. First, in our model it is possible for two countries to go to war even though they both have complete information about the relative likelihood of winning, and despite the fact that they could bargain and make payments to avoid war and that war burns resources. This is related to the "Hicks Paradox" from the bargaining literature that ponders the occurrence of strikes and failed bargaining in general contexts. For bargaining to break down, one needs some sort of friction or failure in the process, and there are many that have been discussed with an overwhelming focus on asymmetric information and differences in beliefs, but also with some attention to indivisibilities and agency problems.[8] Our model operates from an

---

In the 18th and 19th centuries there was an explicit system of compensations among European great powers (the first (1772) and the third partition of Poland (1795) are cases in point); The most important principle in UN Security Council 242 was "land for peace", and such a principle was used as the basis for Israel's peace treaty with Egypt in 1979, and was at the center of the Oslo accords with the PLO; Another example is the provision of iron and logistical support by Sweden to Hitler for military operation in World War II. A famous example of failure of appeasement due to lack of commitment is the Munich Agreement of 1938.

[7]Using political bias as the key driver of war and assuming a negative correlation between political bias and the level of democracy, our model provides an explanation of the stylized fact that democracies tend to win wars against autocracies: Ceteris paribus, biased leaders are willing to enter conflicts which they have a lower probability of winning. See Lake [23] for a related argument.

[8]Explanations of wars based on miscalculations or errors due to lack of information or to different priors about relative power have been discussed by Blainey [2], Gartzke [14], Wagner [36], among others. As argued by Fearon [10], [11], once we allow for bargaining and communication, these explanations are consistent if

agency perspective, where political bias reflects the different cost/benefit calculation of the agent (the leader or pivotal decision maker in the government) who bargains on behalf of the principal (the country). This explains why wars can happen even when countries have accurate intelligence about each other's military capabilities, and even when they have the power to bargain and make transfers to avoid a war.[9]

Second, political bias yields an explanation of things like the *uneven contenders paradox*, first discussed by von Clausewitz [7], which refers to cases in which one small or weak country doesn't concede even though it expects losses from a war. In our model the weaker country can in fact be the aggressor because of high bias and/or insensitive war technology.

We also discuss the stability of peace among larger numbers of countries, allowing for offensive and defensive alliances. A strong form of stability, where no group of countries could gain by reorganizing themselves into new alliances, will generally not be attainable when the war technology is sensitive to relative wealths. This is related to issues of empty-cores in a variety of coalitional games with some sort of competition. In settings where core-stability fails, it makes sense to explore weaker forms of stability.[10] We show that it is possible to sustain large alliances of countries.

Even though in most of our analysis we treat political bias as an exogenous parameter, we also examine the incentives of citizens to (s)elect leaders of different bias. In the absence of transfers, a country would prefer to have an unbiased leader. On the other hand, when transfers are available, a country may benefit from having a biased leader who extracts

---

there are strategic incentives to hide (or not to reveal) information or problems with signalling. For work on indivisibilities in bargaining and the relation to war see Kirshner [22]. There are also various types of spiral theories of war (based on the insights of Waltz [37] and Schelling [30]), analyzed by Jervis [17], [18]: The game between two contenders who have to decide whether to engage or not in an arms race is represented as a stag-hunt game, in which each player prefers to arm only if the other does so. Baliga and Sjöström [1] have shown that even if there is an infinitesimally small belief that the opponent is someone who would arm no matter what, a spiral of mutual distrust can arise and lead to an arms race with probability one (in the absence of communication).

[9]By transfers we do not refer to explicit monetary transfers only; we also refer to transfers of territory, control over seas, and even implicit transfers of wealth and control linked to the marriages between royal families across Europe up to the end of the 19th century.

[10]Another possibility is to appeal to other predictions about outcomes such as von Neumann-Morgenstern stable sets, as in Jordan [19] who studies pillage games. Those are coalitional games in which a coalition with more wealth than another can make the other surrender all or part of it's wealth at no cost. Pillage is clearly related to war, but differs in that it is costless and the outcome is certain (the stronger takes from the weaker). See also Piccione and Rubinstein [28], who examine distributions of resources across countries so that no country has any incentive to take from another, where stronger countries can take costlessly and at will from weaker countries.

transfers from other countries, provided the bias is not so strong to lead the country into undesired wars.

To further clarify the connection of this paper with the existing rational choice literature in international relations (in addition to the connections already identified) note that in any "realist" framework (a term due to von Clausewitz [7]), war is based on practical cost/benefit calculations and with full knowledge of circumstances. As an example of rational realist model, Bueno de Mesquita [3] studies war as based on cost/benefit calculations by countries (interpreted as unitary actors). In such models, if one allows for bargaining and transfers war should not be possible. Our introduction of political bias, as a crude model of the political process, allows us to study the bargaining between countries in a way that makes non-trivial predictions about the possibility and circumstances leading to war. And, as discussed above, our modeling of political bias allows us to do this without relying on poor information or incompatible beliefs among countries.

Bueno de Mesquita, Morrow, Siverson, and Smith [5] analyze the variation across countries in terms of the necessary support for a leader within the so called "selectorate". In their model democratic leaders need a larger coalition to support them relative to non democratic leaders. Keeping a larger coalition satisfied is more costly and hence losing a war is relatively more costly for democratic leaders, and generally makes them less prone to war. Thus, beside the fact that Bueno de Mesquita, Morrow, Siverson, and Smith [5] do not analyze transfers, their theory is based on a political leader maintaining an "internal" base, while ours is a complementary theory that focuses on political bias with respect to "external" bargaining. The difference is important, because, for example, in their framework a democratic leader could decide to attack another country only in case of overwhelming military advantage, whereas this is not the case when the primary cause of war is political bias.

## 2    A Materialistic Model of War

We first focus on a potential war between two countries in complete isolation. We denote the countries by $i$ and $j$. We return to the case of more countries below.

Let $w_i$ denote the total *wealth* of country $i$.

We model the technology of war in a simple way. If countries $i$ and $j$ go to war against each other, country $i$ prevails with probability $p_i(w_i, w_j)$, which is nondecreasing in $w_i$ and nonincreasing in $w_j$.[11] When the wealth levels are clear, we let $p_{ij}$ denote $p_i(w_i, w_j)$. The

---

[11]For empirical support of the hypothesis that the probability of winning depends on the relative wealth levels (supposing that relative wealth levels determine relative levels of war mobilization), see Harrison [16]

probability that country $j$ prevails is $p_{ji} = 1 - p_{ij}$. This simple form ignores the possibility of a stalemate or any gradation of outcome, but still captures the essence of war necessary to understand the incentives to go to war. Note that it is possible that $p_i(w_i, w_j) \neq 1/2$ when $w_i = w_j$. This allows, for instance, $i$ to have some geographic, population, or technological advantage or disadvantage.

In terms of the consequences of a war, we model the costs and benefits as follows. Regardless of winning or losing, a war *costs* a country a fraction $C$ of its wealth. If a country wins, then it *gains* a fraction $G$ of the other country's wealth.[12] So, after a war against country $j$, country $i$'s wealth is $w_i(1 - C - G)$ if it loses and $w_i(1 - C) + Gw_j$ if it wins.

When two countries meet, they each decide whether to go to war and if either decides to go to war then a war occurs. As part of the decision process they may be able to make transfers of resources or territory, or to make other concessions.

Let $a_j$ denote the fraction of $w_j$ controlled by the agent who is pivotal in the decisions of country $j$. The fraction of the spoils of war that the pivotal agent might control can differ from the fraction of the wealth that they hold, especially in non-democratic regimes or in situations where there might be other sorts of benefits from war (for instance, to a pivotal military leader). The fraction of the spoils of war obtained by the pivotal agent is $a'_j$. Thus, in the absence of any transfers the pivotal agent of a country $j$ wishes to go to war if and only if[13]

$$(1 - C)a_j w_j - (1 - p_{ji})Ga_j w_j + p_{ji}Ga'_j w_i > a_j w_j, \tag{1}$$

where the left hand side is the expected value of a war and the right hand side is the expected value of not going to war.

We can rewrite this so that the expected gains are on the left hand side and the expected losses are on the right hand side:

$$p_{ji}Ga'_j w_i > [C + (1 - p_{ji})G] a_j w_j. \tag{2}$$

**Political Bias**

Let $B_j = \frac{a'_j}{a_j}$ denote the ratio of the percentage that the pivotal decision making agent stands to gain versus what he or she has at risk. We call this the *political bias* of country $j$.

---

and Tilly [34].

[12] We could also add fixed costs and/or benefits. However, adding such parameters would add little to the qualitative analysis of the interaction of political bias and war incentives.

[13] We examine this as if the other country is choosing not to go to war. Although this could turn out to be a hypothetical comparison, it is still the relevant one as the equilibrium outcome (in the absence of transfers) would be that the countries end up going to war if and only if the inequality holds for at least one of the two countries' leaders.

It is important to emphasize that although we model the relative gains and losses as being proportional to wealth, the critical aspect of political bias in our model is that there is a difference between the incentives of the pivotal decision maker and the country as a whole. This might, more generally, include things like potential power that a military leader or politician might gain from winning a war, which would bias them away from considering the pure costs and gains from war and can effectively be viewed as a distorted view of gains $(a'_j > a_j)$. We also note that bias could similarly be less than 1. It could be, for instance, that a politician fears losing office due to a lost war, and this could manifest itself in having the politician overly weight the losses of a war.

We can rewrite 2 as:

$$B_j p_{ji} G w_i > [C + (1 - p_{ji})G]\, w_j. \tag{3}$$

This inequality, where the left hand side is the normalized expected gains (having divided by $a_j$) and the right hand side is the normalized expected costs, makes the role of the bias quite clear. If $B_j > 1$, then the leader overweights potential gains (since in this case the rest of the country has a ratio at stake $\frac{(1-a'_j)}{(1-a_j)} < 1$); while if it is less than 1 then it underweights potential gains.

We note some intuitive comparative statics.

The "tendency" of $j$ to want to go to war (as measured in the range of parameter values where $j$ wants to go to war)

- is increasing in $B_j$ and $G$, and decreasing in $C$.

- depends only on the ratio of $C/G$ and not on the absolute levels of either $C$ or $G$.

- depends only on $B_j$ and not on the absolute levels of either $a_j$ or $a'_j$.

These show the intuitive comparative statics that a larger bias makes a country more prone to war, as does an increase in the ratio of benefits to costs of war. The effects of the wealth levels, $w_i$ and $w_j$, are ambiguous, as they enter through $p_{ji}$, as well as directly. For instance as $w_i$ increases, the potential spoils from war increase, but the probability of winning for $j$ decreases. Which of these two effects dominates depends on the technology of war.

Given this dependence on the technology, for the purposes of illustration it is useful to carry several examples of winning probabilities throughout.

EXAMPLE **1** *Proportional Probability of Winning*

We say that the probability of winning is proportional (to relative wealths) if $p_{ji} = \frac{w_j}{w_j + w_i}$.
In this case, (3) can be rewritten as

$$\frac{(B_j - 1)Gw_i}{w_i + w_j} > C. \tag{4}$$

REMARK **1** *Under a proportional probability of winning, a politically unbiased country never wishes to go to war. If $B_j > 1$, then the tendency for $j$ to want to go to war is increasing in $w_i$ and decreasing in $w_j$.*

EXAMPLE **2** *Fixed Probability of Winning*

We say that the probability of winning a war is fixed if $p_{ji} = \frac{1}{2}$, regardless of wealth levels. This is an extreme case of situations in which wealth has no impact on the probability of winning a war.

In that case, (3) can be rewritten as

$$B_j \frac{w_i}{w_j} > 1 + \frac{2C}{G}. \tag{5}$$

Here an unbiased country could want to go to war, but only if its wealth is low compared to the other country. In general, in this case a country's tendency to want to go to war is higher if they have relatively less wealth.

EXAMPLE **3** *Higher Wealth Wins*

We say that the higher wealth wins if $p_{ji} = 1$ when $w_j > w_i$, $p_{ji} = 0$ when $w_j < w_i$, and $p_{ji} = \frac{1}{2}$ when $w_j = w_i$. This is another extreme case that captures situations in which wealth is the critical determinant of the probability of winning a war.

In this case, a country $j$ wishes to go to war (in the absence of transfers) whenever $w_j > w_i$ and gains outweigh losses, $B_j G w_i > C w_j$. When wealths are equal, the expected gains vs. losses condition is as in the fixed case.

Example 2 and example 3 will also be referred to, respectively, as the extremely insensitive and extremely sensitive war technologies.

# 3   The Interplay between Political Bias and Transfers

We begin with the important benchmark where no transfers are possible.

## 3.1 War incentives in the absence of transfers

When two countries meet it could be that neither country wishes to go to war, just one country wishes to go to war, or both countries wish to go to war. If neither wishes it, then clearly there is no war, and transfers would be irrelevant. If both countries wish war, then there is a war and no transfers could possibly avoid it. The only situation where one country might be willing to make transfers that could induce the other country to avoid a war come when just one country has an interest in engaging in war. Let us first make some observations regarding the parameters that lead to the various possible scenarios, and then come back to focus on transfers.

PROPOSITION **1** No Transfers. *Consider any fixed $w_i$, $w_j$ and $p_{ij}$.*

(I) *If $B_i = B_j = 1$, then at most one country wishes to go to war regardless of the other parameters.*

(II) *Fixing any ratio $\frac{C}{G}$, if $B_i$ and $B_j$ are both sufficiently large, then both countries wish to go to war.*

(III) *Fixing any $B_i$ and $B_j$, if $\frac{C}{G}$ is large enough, then neither country wishes to go to war.*

**Proof:** See the appendix.

For fixed biases $B_i > 1$, $B_j > 1$, and a fixed ratio $\frac{C}{G}$, whether or not one or both countries wish to go to war depends on the technology $p_i(\cdot, \cdot)$ and the wealth levels in ways that may not be purely monotone.

## 3.2 Transfers to avoid a war: the commitment case

We now examine situations where in the absence of any transfers one country would like to go to war but the other would not.

When transfers are made from country $i$ to country $j$, we assume that the decision maker in country $j$ gets $a'_j$ of the transfer, and the decision maker in country $i$ loses $a_i$ of the transfer. Thus, decision makers' biases towards transfers are the same as towards gains and losses from war. This is not critical to any of the results, as it is only important that a bias be present somewhere. We make this assumption to be consistent with gains and losses.[14]

The aim is to identify when it is that transfers will *avoid* a war. That is, we would like to know when is it that:

---

[14]For instance, our results still hold qualitatively (with some differences in the exact equations), if we assume that decision makers evaluate all transfers (in or out) at a rate of $a_j$ (or all at $a'_j$).

- in the absence of transfers $j$ wants to go to war with $i$,

- $i$ prefers to pay $t_{ij} > 0$ to $j$ rather than going to war, and

- $j$ would prefer to have peace and the transfer $t_{ij}$ to going to war.

It is important to note that when we say that transfers *avoid* a war, we are imposing the constraint that a war would have occurred in the absence of any transfers.[15]

We start with the case where countries can commit to peace conditional on the transfer $t_{ij}$. This is a situation where the countries can sign some (internationally) enforceable treaty so that they will not go to war conditional on the transfer. In the absence of such enforceability or commitment, it could be that $i$ makes the transfer to $j$ and then $j$ invades anyway. We deal with the case of no commitment in the next section.

PROPOSITION **2** *Consider a case where $j$ wishes to go to war (in the absence of any transfers) while $i$ does not. Holding all else equal, the range of relative costs to gains $\frac{C}{G}$ where a transfer can be made that will avoid a war increases (in the sense of set inclusion) when*

- *$B_i$ decreases,*

- *$p_{ji}$ increases, and*

- *$w_i/w_j$ increases (holding $p_{ji}$ fixed).[16]*

**Proof:** See the appendix.

The proposition is fairly intuitive. Reducing $B_i$ makes $i$ less likely to want to go to war, and to gain less from a war, and hence willing to make larger transfers to avoid it. Increasing $p_{ji}$ or $w_i/w_j$ (holding $p_{ji}$ fixed) have the same effect, and also increase the range where $j$ would like to go to war in the absence of any transfers. So, for instance, a technological change that exogenously favors one country in a war (an increase in $p_{ji}$) makes transfers more likely to avoid war, especially when the challenger is more politically biased and/or

---

[15]There are other possibilities that arise as well, that we ignore. For instance, if two countries both have high biases, their leaders might benefit from making transfers in both directions - as each is able to more easily keep a larger share of the transfers they receive. Essentially, they loot each other's countries. While this is plausible within the model, it is not something that we investigate seriously.

[16]If we do not hold $p_{ji}$ fixed, then things are ambiguous, as larger relative wealth makes $i$ better able to pay, but also better able to win.

poorer.[17] It is important to note that it need not be the wealthier country that is the challenger. A poor but politically biased country can extract transfers.

The proof of the proposition appears in the appendix, where we show that the following condition:

$$p_{ji}(1 + B_j \frac{w_i}{w_j}) - 1 > \frac{C}{G} > \frac{(1 - p_{ji})(B_i B_j - 1)}{(1 + B_j \frac{w_i}{w_j})}, \tag{6}$$

characterizes the situations where transfers avoid a war. The left hand side corresponds to country $j$ wanting to go to war in the absence of any transfers, while the right hand side corresponds to the willingness of $i$ to make a transfer that would induce $j$ to no longer want to go to war. The effect of the political bias of the potential attacking country $j$, $B_j$, is ambiguous. It makes country $j$ more aggressive, but also leads $i$ to be willing to make larger transfers. Which effect dominates depends on a variety of factors.

In the case of two unbiased countries, we obtain the following result.

PROPOSITION **3** [Unbiased Peace] *Two unbiased countries ($B_i = B_j = 1$) will never go to war if they can make transfers to each other and the receiver of a transfer can commit not to go to war after receiving the transfer.*

**Proof:** See the appendix.

The result is easy to understand. War imposes costs, and so when bargaining is unbiased, the total pie from avoiding a war is larger than the total pie from going to war. Thus transfers avoid a war. The formal proof comes from noting that the right hand side of (6) becomes 0 when $B_i = B_j = 1$, so one country is always willing to buy the other off. So either war is avoided because neither wanted it in the first place, or because one country is willing to pay the other off (recalling that at most one unbiased country ever wants to go to war).

Proposition 3 identifies a new explanation for the observation that democracies rarely go to war with one another. Most of the explanations of this fact in the literature concern internal checks and balances within a democracy, or the cultural norms and relative affinities that one democracy has for another. Here we point out that two unbiased countries (and hence two democracies to the extent that they have smaller biases than dictatorships, at least on average) never go to war because they can always find some transfer (perhaps bargaining under the threat of war) that makes it irrational to go to war.

---

[17]Note that this description is consistent with some interpretations of the behavior of the dictator of North Korea (even though there is also a security concern): The biased leader of a poor country with access to a potential jump in the probability of winning a war with a neighbor may obtain transfers from other countries. Such transfers may depend on whether commitment problems can be overcome, something that we come back to below.

It is important to note that this conclusion is only true for two politically unbiased countries and is not true if either country is politically biased. Also, this further makes the point that it is not *democracy* that is the key determinant of peace, but *absence of political bias* .

Let us also say a few words about commitment. Commitment could come from international organizations that could enforce peace agreements (e.g., the U.N.); or alternatively from longer-term reputation effects. If a country is to face a number of countries over time, then by abiding by its promises it will earn future transfers, while otherwise it will end up fighting a series of wars. Clearly, if transfers are preferable to war in each case, then the country would prefer to have a series of transfers over a series of wars. With sufficient attention to the future, the country would prefer to abide by its agreements, rather than to go to war and lose all possibilities of transfers in the future.

We return to some of our benchmark cases, to get a better feeling for when transfers will avoid a war.

In the benchmark case where $p_{ji} = \frac{1}{2}$ regardless of wealth levels (Example 2), (6) implies that there exists a range of values of $\frac{C}{G}$ such that transfers help avoid war if and only if

$$B_i < B_j \left( \frac{w_i}{w_j} \right)^2 .$$

So in this case it is very clear that transfers help the most when $B_i$ is small, $B_j$ is large, and/or $\frac{w_i}{w_j}$ is large. These correspond to situations where the transferring country is less biased, the aggressor is more biased, and the wealth at risk for the transferring country relative to the aggressor is larger.

In the other extreme case where the higher wealth wins (Example 3), and when $j$ has a relative wealth advantage, (6) simplifies to

$$B_j \frac{w_i}{w_j} > \frac{C}{G} > 0.$$

Here, war is again "more avoidable" with larger bias $B_j$ and larger $w_i/w_j$ (which leads to larger relative transfers), but now $B_i$ is irrelevant as $i$ is sure to lose.

## 3.3   The no-commitment case

Let us now suppose that a country cannot commit to avoid a war if it receives transfers. As discussed above, commitment can relate to a number of factors: the presence or lack of international organizations which (have the incentives to) enforce agreements, the patience

of the challenger, the likelihood of meeting other countries in the future from which the challenger might gain from having maintained a reputation for abiding by its agreements, etc. So, a lack of commitment power might be due to a variety of reasons.

In the no commitment case, to avoid a war not only does a transfer have to be such that the potential aggressor is willing to forego the current opportunity for a war, but it also needs to be such that after the transfer has been made a war is no longer in the aggressor's interest. Transfers do three things:

- They make the target poorer and less appealing,

- They make the challenger richer and have more to lose,

- They increase the probability that the challenger will win.

Here, we can see that there are countervailing effects. If the probability is not affected too much by a transfer, then it is possible for transfers to avoid a war, as transfers can change the wealths of the two countries so as to make it no longer in one country's interest to invade the other.

There are a number of things that we observe about the no commitment case.

First, we can show that the situations where war is avoided due to transfers in the case of no commitment are a strict subset of those when there is commitment. In both cases, the transfers that the potential target country is willing to make are the same. The only differences are from the challenger's perspective. The difference between the two cases is that in the commitment case, a potential aggressor compares the value of no war (their wealth plus any transfers) to what they would gain from a war in the absence of any transfers; while in the no commitment case a potential aggressor compares the value of no war (again, their wealth plus any transfers) to what they would gain from a war after transfers have been made. The value of a war to an aggressor after they have received transfers is strictly higher than the value of a war before any transfers, as the probability of winning is weakly higher and in the case where transfers have already been made, the aggressor gets to keep a portion of those transfers regardless of whether they win or lose, while in the other case they only get that wealth if they win.

Next, the no commitment case has the following interesting feature. There are some transfers $t_{ij} > 0$ which would not avoid a war, but yet there are lower transfers, $t'_{ij}$ where $t_{ij} > t'_{ij} > 0$, which would avoid a war. Thus, it is possible that too high a transfer will lead to war while a lower transfer will avoid a war. This can be true in a case where the changes in transfers lead to substantial enough differences in the probability that the challenger wins

14

the war. Larger transfers can lead the country making the transfers to be more vulnerable in terms of being more likely to lose a war, and thus higher transfers can end up leading to a war that lower transfers might have averted. This is illustrated in the following example.

First, we note that a transfer $t_{ij}$ from country $i$ to $j$ makes it so that $j$ does not want to go to war after having received the transfer in the case of no commitment if[18]

$$p'_{ji}B_jG(w_i - t_{ij}) \leq (C + (1 - p'_{ji})G)(w_j + B_jt_{ij}), \tag{7}$$

where $p'_{ji} = p_{ji}(w_j + t_{ij}, w_i - t_{ij})$.

EXAMPLE **4** *Smaller Transfers Avoid a War*

Let $B_i = 1$, $B_j = 4$, $w_i = w_j = 100$, $C = \frac{1}{10}$ and $G = \frac{1}{10}$. Have $p_{ij}(w, w) = \frac{1}{2}$.

Note that in this case (3) is satisfied, so initially $j$ wishes to go to war with $i$.

We estimate (see (14) in the appendix) that $i$ would be willing to make a maximal transfer of $\bar{t}_{ij} = 10$ to avoid war. In the case of commitment, we can then check that this would avoid war (see (12) in the appendix, which is then satisfied).

Suppose that $p_{ji}(110, 90) = 3/4$. Thus, if a transfer of $\bar{t}_{ij} = 10$ is made, then $j$ would still wish to go to war after the transfer as (7) is not satisfied, and so the transfer would not avoid a war.

However, consider a smaller transfer of $t = 8$. Suppose that $p_{ji}(108, 92) = 1/2 + \varepsilon$. For small enough $\varepsilon$, (7) is satisfied and so this smaller $t$ avoids a war!

This means that in general we can no longer adopt the method used to prove results in the last section, where we deduce the maximal possible transfer that a country is willing to make to avoid a war and see if that avoids a war. Without specifying the $p$ function, one cannot determine which transfers will avoid a war.

What we do know is that:

- transfers can still avoid a war,

- the set of parameter values where transfers avoid a war is a subset of the commitment case,

- the set of parameters for which war is avoided grows as $\frac{C}{G}$ increases;

- The set of parameters for which war is avoided grows as $B_i$ decreases.

---

[18]This is simply a rewriting of (3) where $i$'s wealth is $w_i - t_{ij}$, and where $j$'s wealth from the biased decision maker's perspective is $w_j + B_jt_{ij}$ but enters into the war technology as $w_j + t_{ij}$.

The fact that smaller $B_i$ helps avoid war is due to the fact that this results in an increase in the set of transfers that $i$ is willing to make. The effect of $\frac{C}{G}$ increasing is clear, as it helps make both countries wish to avoid a war. The effects of $B_j$ and $w_i$, $w_j$ are ambiguous, as again the technology of war $(p_{ji})$ matters.

There are cases where we can deduce things about the ability of transfers to avoid war. The key to Example 4 is that there is a large change in probability due to a larger transfer, so there is a sort of convexity of the probability of winning function. If the probability function is not affected at all (e.g., Example 2) or are proportional, as in Example 1, then we can examine the maximal transfers as the relevant benchmark. The possibilities of avoiding war are still reduced relative to the commitment case, but the comparative statics are then similar.

In particular, the *unbiased peace* result still holds for the case of a proportional $p$ function.

PROPOSITION **4** [Unbiased Peace Without Commitment] *If the probability of winning is proportional to relative wealths, then two unbiased countries ($B_i = B_j = 1$) will never go to war if they can make transfers to each other (even without commitment).*

**Proof:** In the case of proportional winning probabilities, we know that an unbiased country will not wish to go to war with or without transfers. ∎

This is clearly not true for all probability of winning functions. What is subtle, is that while it is true for proportional probabilities, it is not true for probability functions that are either less sensitive to relative changes in wealths or more sensitive to relative changes in wealths. This is seen as follows. First, consider a case where $p$ is constant and equal to $\frac{1}{2}$. In this case, a smaller country will wish to go to war with a larger one, as it has relatively little at risk and much to gain. The transfer that a larger country is willing to make is relative to its expected losses from a war. After having received a transfer the small country could still have relatively more to gain from a war than it expects to lose.[19] At the other extreme, where the higher wealth wins for sure, it is the larger country that is the aggressor. The smaller country is willing to pay something to avoid a war, but not its entire wealth. After having received a transfer, the larger country can still want to go to war provided there is enough wealth left in the smaller country to justify the cost of war, as the larger country will win for sure.[20]

---

[19]For a numerical example, suppose that $w_j = 1$ and $w_i = 10$, and that $C = .1$ and $G = .2$. The maximal transfer that $i$ is willing to make is 1.9. If such transfers were made, the smaller country would have wealth 2.9 and the larger 8.1. The smaller country would still wish to go to war.

[20]For a numerical example, suppose that $w_i = 20$ and $w_j = 25$, and $C = .1$ and $G = .4$. Here the maximal

## 3.4 Endogenous Bias

As political bias affects a country's decisions of whether to go to war and whether it receives or makes transfers, it is a critical dimension of a country. Most importantly, it could be that the representative citizen (that is, an unbiased citizen) of a country would prefer to have a biased leader. As such, we ask which political bias a country prefers its leader to have, as viewed from the perspective of a representative (unbiased) citizen. This is not only relevant because some countries choose their leaders, but also because it tells us which country leaders might best benefit its citizens.

We start by noting that in the absence of any transfers, the representative citizen of a country always prefers an unbiased leader over any other leader. In the absence of any transfers, the only decision is whether or not to go to war, and the representative (unbiased) citizen, would prefer to have a decision maker who makes the same decisions the citizen would. An unbiased decision maker makes the same decisions that the representative citizen would, while someone with any bias would make different decisions in at least some contexts.

Now consider the case in which transfers are available and there is commitment. Here, having a biased leader can potentially benefit a country, as such a leader may extract transfers from other countries.[21] It is useful to start with an example.

EXAMPLE **5** *Endogenous Bias and a Hawk-Dove Outcome*

Let $w_1 = w_2 = 100$ and $p(w, w) = 1/2$. Let $C = 0.1$ and $G = 0.2$.

In the absence of transfers, a country would choose to attack the other if and only if its leader's bias is above 2. It is also useful to note that an unbiased leader is willing to pay up to 10 to avoid war.

So let us examine what happens for different combinations of biases of the leaders. To keep things simple, let us suppose that the bias levels that can be chosen are either 1 or 4. If both countries have leaders with bias 4, then war is unavoidable. If both countries have leaders with bias 1, then no war occurs and no transfers are made. If one country has a leader with bias 1 and the other with bias 4, then a transfer of at least and no more than 10 occurs and the countries do not go to war.

---

transfer that $i$ is willing to make is 10. After such a transfer, the wealths are $w_i = 10$ and $w_j = 35$. A war then costs the larger country 3.5, but yields 4 in gains (as it wins for sure), and so the larger country will still go to war.

[21]This can be seen as an example of a delegation game, where players might like to have agents play for them who have different preferences from their own (e.g., see Fershtman and Judd [12]). See also Smith [32].

In such a situation, we can think of "equilibrium" biases. Two countries choosing their leaders' biases in this example are essentially playing a Hawk-Dove game. The unique (pure-strategy) equilibrium is for one of the countries to have a biased leader and the other not to.

More generally, the presence of transfers provides incentives for countries to select leaders with high bias (more hawkish looking than the citizens would want in the absence of strategic considerations). However, the example above suggests that this cannot be generally true for both countries, since the representative citizens prefer to avoid war. Hence the model suggests a simple reason for the coexistence of endogenously biased and unbiased leaders in equilibrium.

We can state this more generally. Consider two countries, and fix $w_1, w_2, C, G$, and $p$. As there is a continuum of transfers that would avoid war in a case where war would occur in the absence of transfers, let us follow the convention where the minimum transfer to avoid war is made. An equilibrium is a pair $b_1, b_2$ such that for each $i$ there does not exist any $b_i'$ such that the expected utility of an unbiased citizen of country $i$ is greater under $b_i', b_j$ than under $b_i, b_j$.

We remark that there will always be some equilibria where war is not avoided. For instance, if the other country chooses a sufficiently high bias, then the first country is willing to as well, as war is essentially inevitible. However, there also exist equilibria where war is avoidable.

PROPOSITION **5** *(I) In the presence of transfers with commitment, there always exists an equilibrium that avoids war.*
*(II) If in the absence of transfers the representative citizen of at least one country would strictly prefer to avoid war, and assuming $C > 0$, , then in* any *equilibrium that avoids war at least one of the two countries has a leader with a positive bias.*

**Proof:** (I) Start with biases of 1 for both countries. By our unbiased peace result, war would be avoided under transfers with commitment. Suppose, without loss of generality, that country 2 is the one that would weakly prefer not to go to war in the absence of transfers. Raise the bias of country 1 until the point where the leader of the country 1 is exactly indifferent between going to war and accepting the maximal transfer country 2 is willing to make. This bias for country 1 and a bias of 1 for country 2 is an equilibrium.
(II) Follows from the observation that if at least one country (say 2) would strictly prefer to avoid war, then if biases are both no more than 1, by raising its bias country 1 could extract larger transfers from country 2 while still avoiding war. ∎

The above result gives us an idea that there is a well-defined sense in which countries would prefer to have biased leaders. This is tempered by introducing uncertainty into the world. If there is some uncertainty as to the other countries that will be faced in terms of bias, or wealth, or technology, then it could be that a high bias leads to wars, which a representative citizen would prefer to avoid. A representative citizen can generally only lose by having a leader with bias lower than 1 (as the only time that changes outcomes is where the leader would make transfers that are larger than the citizen would be willing to make to avoid war). Thus, we can still deduce that in any sort of equilibrium with uncertainty, the leaning would still be towards choosing leaders with higher bias, and exactly how high that bias would be would depend on the distribution of other countries and circumstances to be faced. The availability of transfers and enforceable treaties may therefore be themselves indirect causes of war, insofar as they give ex-ante incentives to (s)elect biased leaders.

# 4    Stability and Alliances

Let us now consider settings where there are many countries.

## 4.1    Bilateral Stability

Consider some set of countries $\{1, \ldots, n\}$, their respective wealths $(w_1, \ldots, w_n)$ and biases $(B_1, \ldots, B_n)$, a technology of war that is specified for each pair $ij$, $p_{ij}$, and relative costs and gains $C$ and $G$. We say that such a configuration of countries is *bilaterally stable* if there would be no war between any two of the countries if they met, even in the absence of any transfers.

Bilateral stability is characterized by having (3) fail to hold for each pair of countries. We can see directly from (3) that if the relative costs of war ($C/G$) are high enough, then we will have bilateral stability. Beyond that, we need to know more about the probability of winning function and how that compares to the biases. The following proposition outlines one case where bilateral stability holds.

PROPOSITION **6** *[Democratic Stability] If all countries are politically unbiased and the probability of winning a war is proportional to wealth, then the countries are bilaterally stable.*

**Proof:** It follows directly from Remark 1. ∎

We can also say something about how biased countries can be while still having bilateral stability. The following proposition works for more general war technologies, but starting from a point where all countries have equal wealths.

PROPOSITION **7** *If all countries have equal wealth and $p_{ij}$ is symmetric,*[22] *then the configuration is bilaterally stable if and only if $B_j \leq 1 + 2\frac{C}{G}$.*

**Proof:** It follows from (3), setting $p_{ji} = 1/2$ and $w_i = w_j$. ∎

Beyond these propositions, bilateral stability can be directly characterized by bilateral checks of (3).

## 4.2   Coalitional Stability

Another question we address when examining many countries concerns alliances and coalitional stability.

Alliances can be assumed to work as follows. When a set $K$ of countries form an alliance, the decision maker from country $i$ still has $a_i w_i$ in terms of wealth at risk (and thus loses $(C + G)a_i w_i$ if a war is lost), and shares $a_i' \frac{w_i}{\sum_{j \in K} w_j}$ of the spoils of war or transfers. Alliances decisions are unanimous (pure collective action). Each country's decision maker must be willing to undertake an offensive war in order for it to happen. The default is not to attack unless the coalition is unanimous about doing so, which reflects the idea that the coalition might dissolve otherwise.[23]  The maximum total transfer that an alliance might make in order to avoid a war is the maximum sum of transfers across its members, such that each would be willing to contribute their part in order to avoid a war.

The technology of war is presumed to be given by a function $p$ which only depends on the total wealths of the warring alliances.

With this structure of alliances in mind, there are a number of different things we can consider. We can consider whether there exist configurations of alliances such that the alliances are bilaterally stable (no alliance wishes to attack any other alliance). We can also consider whether there exist configurations of alliances that are immune to deviations by any subset of countries (who might quit their current alliance and join with others to form a new alliance). We can consider weaker deviations, asking whether there is any single country

---

[22]$p_{ij}$ is symmetric if $p_{ij}(w, w') = p_{ji}(w', w)$.

[23]As explained in Maggi and Morelli [25], a unanimity requirement for collective action is the norm when the participation of all allies is necessary and the value of future expected cooperation with the other allies is not sufficient to convince a dissenting member to go along with the decision of a majority. When the participation of all allies is not necessary, then the formation of a "coalition of the willing" can suffice. We do not consider this distinction here. See Morrow [26] for the view that alliances entail a pledge of future coordination between the allies. Note also that the degree of consensus necessary in an alliance could be different depending on whether it is a defensive or an offensive alliance. A world with large defensive alliances and small offensive ones could be quite stable.

who wishes to quit its current alliance and would be unanimously accepted into some other alliance. Finally, we can differentiate between offensive and defensive alliances.

Let us begin with a couple of examples that make clear some of the issues that arise.

The first example illustrates why there are interesting alliance issues that arise and why we might want to move beyond simply studying bilateral stability.

EXAMPLE **6**

Consider three equal sized countries with $w_1 = w_2 = w_3$ and $B_1 = B_2 = B_3$. If the corresponding $B_i$'s are not too high, this could be bilaterally stable. However, this is not necessarily coalitionally stable. Two countries might have an incentive to form an (offensive) alliance and exclude the third country. This could strengthen them so that they might either wish to go to war regardless of any transfers, and both benefit in expected terms from doing so, or obtain a transfer. For example, in the case of unbiased countries and higher wealth winning, two countries that band together expect to gain from going to war with the third country.

The next example illustrates that it could be that countries form alliances not for offensive purposes (as above), but instead for defensive purposes.

EXAMPLE **7**

Consider three countries where one's wealth is twice the size of each of the others. By forming an alliance, for some choices of $B_i$'s, the two smaller countries avoid being attacked or having to pay a transfer. For example, if it is the larger wealth that wins, then separately the countries are sure to lose a war, while allied they have an even chance of winning.

Clearly, from the examples above, it is possible that there will not exist any configuration of countries and alliances that is bilaterally stable (so that no alliance would attack another in the absence of any transfers).

These examples also suggest that the incentive to form an alliance (offensive and defensive respectively) derives from the sensitivity of the $p$ function. If $p$ were independent of wealth, then countries would not gain at all from forming an alliance. If the probability of winning were proportional to the relative wealths for any pair of potential opponents (countries or alliances), then if countries were not too biased, the core would be very large, as unbiased countries or alliances would not wish to go to war in the face of such a technology. Thus, the incentives to form alliances are more prevalent when relative wealth swings the anticipated outcome more dramatically.

When we allow for configurations with heterogeneity of bias levels, it is difficult to characterize conditions for the non emptiness of the core, or to determine which alliances are most likely to form. However, we can still explore a few things.

It is possible to have alliance configurations that are bilaterally stable and such that no individual country would strictly want to quit its existing alliance either to be alone or to join another alliance. Let us call such an alliance configuration *individually stable*. Let $W$ denote the total wealth of an alliance.

PROPOSITION **8** *Consider any parameters $C$ and $G$, and any continuous $p$ such that $p(w, W) < w/W$ when $w/W$ approaches $0$.[24] If there exist at least two countries with biases close enough to 1, biases of countries are bounded above, and there are enough countries such that each country's wealth is sufficiently small relative to the total world wealth, then there exists a division of countries into two alliances that is individually stable. In such a situation, a single alliance of all countries is also individually stable.*

The proof is relatively straightforward, and hence we simply outline it. Separate the two countries with lowest biases. Then around each, form an alliance so that the total wealths in the two alliances are as close to each other as possible. Given the continuity of $p$, the probability of either alliance winning a war approaches $\frac{1}{2}$. With a small enough bias, the least biased country in each alliance will prefer not to go to war. Consider any country switching alliances. Their wealth, if small enough relative to total wealth, will make too small a change in probabilities of outcomes to change the incentives of the alliances.[25] The only remaining possibility is that a country could gain from autarchy. However, in that case, providing countries are small enough relative to total wealth, even with maximal bias, (3) fails to hold for the departing country, as its probability of winning is so small relative to the maximal potential gains that it will not have an incentive to go to war with one of the (large) alliances.

Comparing the situation described in example 6 with the constructed stability of a pair of alliances in proposition 8, one can conclude that in our model a "bipolar" system will (under the right circumstances) be stable when a multipolar one may not be.[26]

---

[24]More precisely, consider $p$ such that $p(w, W)W/w \to 0$ as $w \to 0$, for any fixed $W > 0$.

[25]The only possible exception is if the least biased country leaves and the remaining countries are strongly biased, but then that can only lead to the biased country alliance wanting to attack the other alliance, which does not benefit the country that switched.

[26]This is in line with the general concerns about tripolar systems, for instance, as expressed by Kaplan [21]. For counterarguments about the special stability features of tripolar systems, see Ostrom and Aldrich [27] and Wagner [35].

# 5 Further Results and Discussion

As should be clear from some of the above analysis, this basic model of political bias opens the door for much future research. Let us comment on a few of the more obvious areas for further exploration.

First of all, one can examine the predictions of the model empirically. One can do this by a structural fit of the model, estimating wealths, costs, gains, and war technology ($p$) directly from the data, and either imputing the biases or estimating them based on other political variables.[27]

One can also develop variations on the model which endogenize various parameters (other than bias) that we have taken to be exogenous. Let us mention a few ideas in this direction.

- The model could be coupled with a growth model so that wealths change over time. As wealths change, so will incentives to go to war (and incentives to capture territory to help with growth), and one could track how the economics of growth interacts with the incentives for international conflict.

- One could enrich the technology of war to allow for investments in arms, so that the probability of winning a war depended on military spending and not simply on wealth directly.

- We could enrich the model to endogenize the timing and choice of confrontation, so that we do not only examine stability or the choices of two countries once faced with war, but also more completely model how it is that two countries start to consider a war and how this might depend on the more general environment.

## 5.1 Dynamics

As our analysis has been static, and yet international relations are clearly dynamic, we close with some observations on this topic.

The most basic and important aspect that dynamics introduces is that as countries get richer, their incentives change. As a country $j$ has won past wars, three things happen. First, its wealth increases, and so the $w_{ij} = w_i/w_j$ ratios it faces will decrease. This in turn has a second effect which is that $p_{ji}$ increases. Third, as more wealth is acquired, the pivotal agent's percentage share of the wealth increases and so $B_j$ decreases. To see this, note that

---

[27]Another possible application and testing of the model involves strikes and biases of union leaders.

before a war the agent's share is $a_j$. After the war, if the country wins, the agent's share is

$$\frac{a_j(1-C)w_j + a'_j G w_i}{(1-C)w_j + G w_i}.$$

(8)

If $a'_j > a_j$, then this new share is larger than $a_j$. Thus, the new $B_j$ is $a'_j$ over this new share, and so as a country keeps winning wars, $B_j$ will decrease.

Let us examine the implications of these changes over time. We know from (3) that a country will want to go to war (without consideration of transfers) if

$$p_{ji} > \frac{1 + \frac{C}{G}}{1 + B_j \frac{w_i}{w_j}}.$$

(9)

As we see from above, if a country has become wealthier through the winning of past wars, then the right hand side of this expression will have increased as both $B_j$ and $w_{ij}$ will have decreased (if we are holding the wealth of a given opponent constant). On the other hand, the left hand side will also go up as $p_{ji}$ increases.

While we cannot say what the short-term effects of this are, we can say that a country will not wish to go on going to war for too long. This follows from noting that $p_{ji}$ is bounded above by 1, while $w_{ij}$ can go to 0. As a country becomes much wealthier than other countries, it no longer desires to go to war, as the right hand side of (9) will converge to $1 + \frac{C}{G}$, while the left hand side is bounded above by 1. Essentially, even if the country is sure to win the war, it does not wish to go to war because the costs outweigh the spoils of war against a much smaller country.[28] Thus, the model displays a novel "endogenous limit to the expansion of an empire," in contrast with the systemic explanations in the literature.

Interestingly, depending on the technology of war, as one country becomes much wealthier it may no longer wish to go to war, but it may become an attractive target for smaller countries, since they may have much to gain and little to lose.[29] Whether or not this is the case depends on how fast $p_{ji}$ increases in $w_j$. In the long run (i.e., after each pair of countries has faced the temptation of war or gone to war sufficiently many times), a war between countries of very different wealths (winners and losers of past wars respectively) will be possible only if the poorer country wants it. Finding situations where it is the stronger countries that would be the aggressors, would require some of the other extensions mentioned above, such as changing technologies, growth, or changes in political bias.

---

[28] It might be more reasonable to presume that the costs of going to war against a much smaller country are small. However, if the costs of going to war have any lower bound, then the conclusion will still hold.

[29] Again, this seems to be consistent with the history of how the largest empires came to an end after a sequence of attacks by weaker challengers.

# References

[1] Baliga, S. and T. Sjöström (2004): "Arms Races and Negotiations," *Review of Economic Studies*, 71(2), 351-69.

[2] Blainey, G. (1973): *The Causes of War*, New York: the Free Press.

[3] Bueno de Mesquita, B. (1981): *The War Trap*, Yale University Press.

[4] Bueno de Mesquita, B., and R.M. Siverson (1995): "War and the Survival of Political Leaders: A Comparative Study of Regime Types and Political Accountability," *American Political Science Review*, 89(4), 841-55.

[5] Bueno de Mesquita, B., J.D. Morrow, R.M. Siverson and A. Smith (2003): *Logic of Political survival*, MIT Press.

[6] Chiozza, and H. Goemans (2004): "International Conflict and the Tenure of Leaders: Is War Still Ex Post Costly?" *American Journal of Political Science*, 48(3), 604-19.

[7] Clausewitz, C. von (1832)[1976]: *On War*, edited and translated by M. Howard and P. Paret, Princeton University Press.

[8] Downs, G.W. and D.M. Rocke (1994): "Conflict, Agency, and Gambling for Resurrection: The Principal-Agent Problem Goes to War," *American Journal of Political Science*, 38(2), 362-80.

[9] Doyle, M. (1986): "Liberalism and World Politics," *American Political Science Review*, 80(4), 1151-169.

[10] Fearon, J. (1995): "Rationalist Explanations for War," *International Organization*, 49(3), 379-414.

[11] Fearon, J. (1997): "Signaling Foreign Policy Interests: Tying Hands versus Sinking Costs," *Journal of Conflict Resolution*, 41(1), 68-90.

[12] Fershtman, C., and K. Judd (1987): "Equilibrium Incentives in Oligopoly," *American Economic Review*, 77(5), 927-41.

[13] Findlay, R. (1996): "Towards a Model of Territorial Expansion and the Limits of Empires," in M. Garfinkel and S. Skaperdas eds., *The Political Economy of Conflict and Appropriation*, Cambridge University Press.

[14] Gartzke, E. (1999): "War Is in the Error Term," *International Organization*, 53(3), 567-87.

[15] Harris, W.V. (1979): *War and Imperialism in Republican Rome 327-70 BC*, Oxford: Oxford University Press.

[16] Harrison, M. (2005): "Why the Rich Won: Economic Mobilization and Economic Development in Two World Wars," University of Warwick working paper.

[17] Jervis, R. (1976): *Perception and Misperception in International Politics*, Princeton: Princeton University Press.

[18] Jervis, R. (1978): "Cooperation under the Security Dilemma," *World Politics*, 30(2), 167-214.

[19] Jordan, J.S., (2005): "Pillage and Property", *Journal of Economic Theory*, in press.

[20] Kaiser, D. (1990): *Politics and War: European Conflict from Philip II to Hitler*, Harvard University Press: Cambridge, MA.

[21] Kaplan, M.A. (1957): *System and Process in International Relations*, New York: Wiley.

[22] Kirshner, J. (2000): "Rationalist Explanations for War?" *Security Studies*, 10(1), 143-50.

[23] Lake, D.A. (1992): "Powerful Pacifists: Democratic States and War," *American Political Science Review*, 86(1), 24-37.

[24] Liberman, P. (1993): "The Spoils of Conquest", *International Security*, 18(2), 125-53.

[25] Maggi, G. and M. Morelli (2006): "Self Enforcing Voting in International Organizations," *American Economic Review*, in press.

[26] Morrow, J. (1991): "Alliances and Asymmetry: an Alternative to the Capability Aggregation Model of Alliances," *American Journal of Political Science*, 35(4), 904-33.

[27] Ostrom, C.W. and Aldrich J.H. (1978): "The Relationship Between Size and Stability in the Major Power International System," *American Journal of Political Science*, 22(4), 743-771.

[28] Piccione, M. and A. Rubinstein (2004) "Equilibrium in the Jungle," mimeo, London School of Economics.

[29] Russett, B. (1993) *Grasping the Democratic Peace: Principles for a Post-Cold War World*, Princeton University Press: Princeton N.J.

[30] Schelling, T.C. (1960) *The Strategy of Conflict*, Harvard University Press.

[31] Schwarz, M. and K. Sonin (2004): "A Theory of Brinkmanship, Conflicts, and Commitments," mimeo.

[32] Smith, A. (1998): "Fighting Battles, Winning Wars," *Journal of Conflict Resolution*, 42(3), 301-20.

[33] Taylor, A.J.P. (1954): *The Struggle for Mastery in Europe, 1848 to 1918*, Oxford, Clarendon Press.

[34] Tilly, C. (1992): *Coercion, Capital, and European States: AD 990-1992,* Blackwell Publishers.

[35] Wagner, R.H. (1986): "The Theory of Games and the Balance of Power," *World Politics*, 38(4), 546-576.

[36] Wagner, R. H. (2000) "Bargaining and War," *American Journal of Political Science*, 44(3), 469-84.

[37] Waltz, K. (1959): *Man, the State, and War*, Columbia University Press: N.Y.

# Appendix

Let $w_{ji} = w_j/w_i$.

**Proof of Proposition 1:** We know that (3) is the condition to satisfy for $j$ to be willing to go to war against $i$ in the absence of transfers. Similarly, country $i$ wishes to go to war with country $j$ if and only if

$$1 - p_{ji} > \frac{1 + \frac{C}{G}}{1 + B_i w_{ji}}. \tag{10}$$

Part (III) follows directly from (3) and (10), as both right hand sides are increasing in $\frac{C}{G}$.

Next, note that from (3) and (10) it follows that both countries want to go to war if and only if

$$1 - \frac{1 + \frac{C}{G}}{1 + B_i w_{ji}} > p_{ji} > \frac{1 + \frac{C}{G}}{1 + B_j w_{ij}}. \tag{11}$$

27

It is clear that if $B_i = B_j = 1$ then the inequalities in (11) require that

$$1 - \frac{1 + \frac{C}{G}}{1 + w_{ji}} > \frac{1 + \frac{C}{G}}{1 + w_{ij}}.$$

To see this is impossible, rewrite the above inequality as

$$1 + w_{ij} - \frac{1 + \frac{C}{G}}{w_{ji}} > 1 + \frac{C}{G}.$$

This simplifies to

$$-w_{ij}\frac{C}{G} > \frac{C}{G},$$

which is clearly impossible. This proves (I).

The proof of (II) derives from the following observation: the left hand side of (11) converges to 1 as $B_i$ gets large and the right hand side of (11) converges to 0 as $B_j$ gets large. ∎

**Proof of Proposition 2:** As $j$ wishes to go to war but $i$ does not, (3) holds but (10) does not. The condition that needs to be satisfied for country $j$ to no longer wish to go to war against $i$ if offers $t_{ij} > 0$ is

$$(1 - C - G)a_j w_j + p_{ji}G(a_j w_j + a'_j w_i) \leq a_j w_j + a'_j t_{ij}.$$

This simplifies to

$$p_{ji}G(w_j + B_j w_i) \leq (C + G)w_j + B_j t_{ij} \tag{12}$$

Similarly, the condition for $i$ to be willing to make a transfer $t_{ij} > 0$ to avoid a war is

$$(1 - p_{ji})G(w_i + B_i w_j) \leq (C + G)w_i - t_{ij} \tag{13}$$

Note that we assume that the pivotal agent in country $j$ gets the same proportion $(a'_j)$ of $t_{ij}$ as they would if it were a spoil of war, and the pivotal agent in country $i$ pays the same proportion $(a_i)$ of $t_{ij}$ as it risks of its wealth in a war.

Let $\bar{t}_{ij}$ be the transfer that makes country $i$ (who wishes to avoid war) indifferent between going to war and paying such a transfer, i.e., the transfer that makes (13) hold as equality. In other words, $\bar{t}_{ij} > 0$ is the maximum transfer that $i$ is willing to make in order to avoid the war. Then

$$\bar{t}_{ij} = (C + G)w_i - (1 - p_{ji})G(w_i + B_i w_j) \tag{14}$$

Substituting (14) in (12), a transfer can be made so that country $j$ no longer wishes to go to war if

$$p_{ji}G(w_j + B_j w_i) \leq (C + G)w_j + B_j(C + G)w_i - B_j(1 - p_{ji})G(w_i + B_i w_j).$$

28

This can be rewritten as

$$\frac{C}{G} \geq \frac{(1 - p_{ji})(B_i B_j - 1)}{1 + B_j w_{ij}} \tag{15}$$

When we combine this with (3) we obtain the following characterization of when transfers avoid a war:

$$p_{ji}(1 + B_j w_{ij}) - 1 > \frac{C}{G} > \frac{(1 - p_{ji})(B_i B_j - 1)}{(1 + B_j w_{ij})}. \tag{16}$$

The comparative statics in the proposition are then clear. ▊

**Proof of Proposition 3:** Given proposition 1(I), we know that when two unbiased countries meet, the situation without transfers is either such that they both wish to avoid war or that one country alone wishes to go to war. If the situation is the former, we are done. If it is the latter case, then assume without loss of generality that $j$ is the one who wants to go to war and $i$ is the one who does not. We have established above that in this case the availability of transfers eliminates the incentive of $j$ to go to war if (15) holds. Thus, the result follows, noting that the RHS of (15) is 0 with two unbiased countries. ▊