Elites, Institutions, and International Conflict[*]

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Abstract

Although elites within countries are the ones who make important foreign policy decisions, most studies of international conflict have treated countries as the primary unit of analysis. We consider a crisis bargaining model that incorporates the decision-making process at the domestic level, and propose a micro-mechanism of rational war. Previous studies have found that war is not possible in equilibrium if players have complete information, war is a one-shot costly lottery, and the distribution of power does not change within the standard bargaining framework. We show that war can occur in equilibrium under the same conditions if we take the decision-making process among elites into account. Political uncertainty induced by decision-making processes at the domestic level creates incentives for elites to take the risk of war when the distribution of power in their country favors such a course. As a result, elites are tempted to take such risks against unstable regimes because of their political uncertainty. Moreover, incentives of elites to initiate war depend on the political institution and the distribution of power within their country. The incentives of elites, the type of institution, and the distribution of power at the domestic level are important elements of rational non-unitary-actor explanations for war.

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Contents

1 Introduction

On September 22, 1980, the Iraqi force initiated offensive operations on Iranian territory after Iran and Iraq failed to reach an agreement by peaceful means. It was five years after the two countries surprised the world by signing the Algiers Accord. Although their relationship had improved since the agreement, everything changed in the aftermath of the Iranian Revolution in 1979, which threw the domestic politics of Iran into chaos. The political chaos inside Iran was one of the factors that led to Sadam Hussein's decision to take the risk of war.[1] However, existing formal analyses of international conflict do not have much to say about this situation because they often sacrifice the consideration of domestic politics.[2] In this paper, we seek to provide an explanation for war based on domestic political factors. To that end, we consider a crisis bargaining model that incorporates the decision-making process at the domestic level, and we demonstrate that political uncertainty induced by decision-making processes at the domestic level creates incentives for elites to take the risk of war when the distribution of power in their country favors such a course.

The history of international conflict has demonstrated that elites of countries are the ones who make important foreign policy decisions (e.g., Kennedy 1987; Schroeder 1994; Taylor 1954, 1961). However, most studies of international conflict have treated countries as the primary unit of analysis (e.g., Fearon 1995; Mearsheimer 2001; Powell 1999; Waltz 1979). It is not until recently that scholars in international relations have started paying attention to leaders of countries as the unit of analysis. Recent studies focusing on leaders argue that they have incentives to stay in power, and that war can be an instrument to improve their chances of staying in office (e.g., Bueno de Mesquita et al. 1999; Chiozza and Goemans 2004; Downs and Rocke 1994; Fey and Goemans 2008; Goemans 2000). Although these studies implicitly assume that leaders are able to do whatever they want, in reality, they are not necessarily able to do so because they need the support of the people of their country unless they are dictators (Bueno de Mesquita et al. 1999). Moreover, they are not necessarily essential players in foreign policy making on every single issue. Leaders delegate certain authorities to other elites since they cannot do everything by themselves. Since it is difficult, if not impossible, for leaders to observe how their opponents make decisions, this process can generate a

[1] There are other explanations for this war, such as Saddam Hussein's ambitions or increasing oil price, among others (McLachlan 1993). We revisit this case later.

[2] Studies that analyze domestic politics do exist, but they often focus on democracies (e.g., Bueno de Mesquita et al. 1999; Ramsay 2004; Schultz 1998).

great deal of uncertainty. Hence, it can be misleading to pay too much attention to leaders.

Formal models of international conflict often assume that countries are unitary actors who have preferences. This is a convenient simplifying assumption, but it implicitly ignores the fact that foreign policy decisions are made through the aggregation of elites' preferences. When elites within countries decide to start fighting, each country must have a group of elites who have incentives to take the risk of a bargaining breakdown, and that group must be sufficiently powerful to get its way. This fact suggests that modeling collective decision making processes at the domestic level may generate interesting insights for studies of international conflict.

We analyze a crisis bargaining model that incorporates the decision-making processes within two conflicting countries, say countries J and K. The game begins with country J trying to change the status quo allocation of benefits, that is, proposing a new amount of a "pie" to be allocated within each country. However, before country J can make a demand, elites in country J must agree on the demand and how the benefits will be allocated among themselves. Similarly, before country K can decide to accept or reject the demand, elites in country K must agree on how the remaining benefits are to be allocated among themselves. We model this process by having a randomly selected proposer in country J propose a demand and an allocation of benefits among her country's elites, who then vote on the proposal. If they reject the proposal, the status quo allocation prevails. If they accept it, a randomly selected proposer in country K proposes an allocation of the remaining share of the pie, and the elites in her country vote on the proposal. If they accept it, the proposed allocations of benefits are implemented. Otherwise, bargaining breaks down and the countries go to war.

Previous studies have found that war is not possible in equilibrium if we make the following assumptions within the standard bargaining framework: players have complete information, war is a one-shot costly lottery, and the distribution of power does not change within the standard bargaining framework[3] (e.g., Fearon 1995; Leventoğlu and Tarar 2008; Powell 1999). Once we relax the unitary actor assumption, however, the same conclusion no longer holds, that is, war is possible in equilibrium.[4]

When elites in country J propose a new allocation of benefits, they do not necessarily know who sets the

[3]The standard bargaining framework assumes that allocations are enforceable, players have common priors, etc. Most studies do make such assumptions.

[4]Schultz (1998) models domestic politics by allowing a domestic political competition between the ruling and opposition parties, though bargaining is not in the model.

agenda in country K. They may be uncertain about which minimum winning coalition (henceforth coalition) in country K they are dealing with. Different coalitions may expect different amounts of benefits in order to reach an agreement. Therefore, there may be uncertainty about the amount of benefits necessary to avoid war. Due to this uncertainty, it is not necessarily optimal for them to make a proposal that never leads to war. To avoid any chance of war, they would need to make an offer that satisfies the most expensive coalition in country K. However, if they are dealing with a cheaper coalition, making such an offer would mean forgoing a larger share of benefits. If they make an offer that barely satisfies the cheapest coalition, they can potentially gain a large share of benefits, but only at great risk that bargaining fails if they are dealing with a more expensive coalition. It may be optimal for some elites in country J to take the risk of war.

Private information and incentives to misrepresent it constitute the most prominent rationalist explanation for war (Fearon 1995). In such models, players often have private information about their resolve, which is often conceptualized as the cost of fighting. In equilibrium, a player optimally chooses the risk of bargaining breakdown given the distribution of the costs of fighting. Unfortunately, we almost never observe private information, and even if we could, we cannot explain why a country has a certain type. However, the uncertainty and trade-off in our model is regarding the individual who is actually in charge of policy-making, that is, whoever happens to be the proposer or the agenda setter. We can observe potential proposers, and we may be able to learn who is actually in charge of policy-making. Therefore, we can explain causes of war based on what we can observe rather than what we can never observe. In fact, incentives that uncertainty about decision-making processes at the domestic level can create are similar to incentives that models with private information generate. This political uncertainty plays an important role in the occurrence of a bargaining breakdown. War is not possible in a large class of games with unitary actors due to the lack of this type of uncertainty. However, this uncertainty is not sufficient for a bargaining breakdown. There must be a sufficiently powerful group of elites in country J who are willing to take the risk of war. That is, elites' incentives and logrolling among them also play important roles for war to occur.[5]

We also demonstrate that the type of institution and the distribution of power at the domestic level affect the degree of uncertainty players may face. Autocratic regimes tend not to have such uncertainty because they have highly centralized political systems, and it is easy for opponents to see whom they are dealing

[5]This is consistent with the argument that empires tend to be aggressive because of logrolling (Snyder 1991).

with. However, countries with unstable regimes, such as democratizing regimes, are more likely to have uncertainty about who sets the agenda. In other words, the uncertainty is essentially is about how power is distributed within the opposing country. Moreover, the size of a coalition depends heavily on how the power is distributed among elites. Hence, the distribution of power at the domestic level affects elites' incentives for taking the risk of a bargaining breakdown. The incentives of elites, the type of institution, and the distribution of power at the domestic level are important elements of rational non-unitary-actor explanations for war.

The remainder of the paper is organized as follows. Section 2 reviews related literature. Section 3 presents the model, and section 4 presents the main results. Section 5 presents numerical examples to illustrate our argument, and section 6 discusses the results and assumptions of the model. In section 7, the process leading to the outbreak of the Iran-Iraq War provides an illustration of our argument. We close with concluding remarks in Section 8.

2 Related Literature

Private information plays an important role in crisis bargaining games (Banks 1990). The most prominent private information argument is "risk-return," which states that war can occur because players have private information about their resolve and incentives to misrepresent it (Fearon 1995; Powell 1999). However, these alone are not sufficient as a cause of war since the possibility of war depends on particular forms of bargaining protocols as well as the kinds of private information that players have (e.g., Leventoğlu and Tarar 2008; Fey and Ramsay 2008). Although we do not have private information, the mechanism leading to war is similar to a risk-return tradeoff. With private information, a player has a risk-return tradeoff when she is uncertain about her opponent's resolve. Unfortunately, we can almost never observe private information, and we cannot explain why a country has a certain type. However, the uncertainty and trade-offs in our model concern the individual who is actually in charge of policy-making, that is, who happens to be the proposer. We can observe potential proposers, and we may be able to learn who is actually in charge of policy-making in many cases.

Another important rationalist explanation for war is commitment problems (e.g., Fearon 1995, 1996; Powell 2004, 2006). Powell (2004, 2006) shows the possibility of inefficient conflict by allowing the distribution of power to change rapidly in his models. Previous studies have found that there does not exist an equilibrium in which war is possible if players have complete information, war is modeled as a one-shot costly lottery, the distribution of power does not change, and the issue is divisible (e.g., Fearon 1995; Leventoğlu and Tarar 2008; Powell 1999). Slantchev (2003) shows that war is possible in equilibrium under these conditions by modeling war as a bargaining process. Smith (1998), focusing on war termination, also models war as a stochastic process, and Smith and Stam (2004) analyze the effect of non-common priors by modeling war a stochastic process.

Recently scholars in international relations have started paying attention to leaders of countries as the unit of analysis. Leaders have incentives to stay in power, and war can be an instrument to improve their chances of staying in office (e.g., Bueno de Mesquita et al. 1999; Chiozza and Goemans 2004; Downs and Rocke 1994; Fey and Goemans 2008; Goemans 2000). Also, leaders may go to war because of their political bias (Jackson and Morelli 2007). These studies implicitly assume that leaders are able to implement any policy. How domestic politics affects the outcome of international bargaining is an important question in international relations. Two-level games demonstrate that domestic constraints may benefit executives of countries (Iida 1993; Mo 1995; Putnam 1988; Tarar 2005). These studies aim to show how domestic political factors constrain leaders, but they do not attempt to explain why war occurs. Another important concept for the role of domestic politics in international relations is audience costs (Fearon 1994; Leventoğlu and Tarar 2005). While these studies focus on the incentives and behavior of constituencies, we focus on the incentives and behavior of elites.

The most robust empirical regularity in international relations is the democratic peace (Russet and Oneal 2001). Democracies do not fight with each other because of the accountability of democratic institutions and the electoral incentives of leaders (e.g., Bueno de Mesquita et al. 1999; Schultz 1998, 2001). Although this argument is motivated by domestic politics, the focus is on electoral incentives. Whereas democracies do not fight with each other, democratizing states are war-prone toward regimes of all types (Mansfield and Snyder 2005). Elites are insufficiently accountable in democratizing states, and they can exploit the chance to evade accountability and get what they want. However, such studies do not consider bargaining, therefore they do not analyze how domestic politics can lead to a bargaining breakdown. The argument that a small group of elites in a country goes to war by imposing costs on others is not entirely new. Empires had tendencies to expand because of logrolling in domestic politics (e.g., Snyder 1991). Moreover, within the international mediation literature, it has been presumed that leaders of internally noncohesive groups are more aggressive, and they are more likely and willing to escalate conflict (e.g., Fisher 1989; Kleiboer 1996; Rabbie and Visser 1972).

3 The Model

In this section, we specify the extensive form of a model in which elites in countries J and K bargain over a pie, we discuss strategies and the solution concept, and we illustrate voting rules.

3.1 Extensive Form

The set of players is $I = J \bigcup K$, where $J = \{1, 2, ..., |J|\}$ and $K = \{|J| + 1, |J| + 2, ..., |J| + |K|\}$ are the sets of elites in countries J and K, respectively, and there are $n = |J| + |K|$ players. Let j and k denote generic proposers in countries J and K, respectively. Also, let superscripts J and K denote countries, and L denote a generic country. The size of the pie is normalized to one.

First, player $j \in J$ is recognized with probability p^J_j, where $p^J \in \Delta^{|J|-1}$. Then proposer j proposes an allocation of the pie to players in country J from the set of feasible allocations,

$$X = \left\{ x \in \mathbb{R}^{|J|}_{+} \;\middle|\; \sum_{i=1}^{|J|} x_i \leq 1 \right\}.$$

Let $x = (x_1, x_2, ..., x_{|J|}) \in X$ denote a generic proposal for country J. Then players in country J simultaneously vote on proposal x. The outcome of the votes depends on the voting rule $\mathcal{D}^J$, the details of which are discussed later. If country J rejects proposal x, then the game ends with the status quo, and player $i \in L$ receives $z^L_i > 0$, where $(z^J, z^K) \in \Delta^{n-1}$.

If country J accepts proposal x, then player $k \in K$ is recognized with probability p^K_k, where $p^K \in \Delta^{|K|-1}$. Define $\pi^K(x) = 1 - \sum_{i=1}^{|J|} x_i$, which is the remaining share of the pie available for players in country K. Then given $\pi = \pi^K(x)$, proposer k chooses a proposal from the set of feasible allocations of the remaining share π

$J = \{1, ..., \lvert J \rvert\}$	country J
$K = \{\lvert J \rvert + 1, ..., n\}$	country K
j, k	players
p_j^J, p_k^K	recognition probabilities
z_j^J, z_k^K	status quo payoffs
w^J, w^K	probabilities of winning war
b_j^J, b_k^K	values of winning
c_j^J, c_k^K	costs of fighting
r_j^J, r_k^K	reservation values
x	proposals in country J
y	proposals in country K
π	benefits remaining after demand

Table 1: Notations

to players in country K, or the feasibility correspondence,

$$Y(\pi) = \left\{ y \in \mathbb{R}_+^{\lvert K \rvert} \;\middle|\; \sum_{i=\lvert J \rvert+1}^{n} y_i \leq \pi \right\}.$$

Let $Y = Y(1)$, and $y = (y_{\lvert J \rvert+1}, y_{\lvert J \rvert+2}, ..., y_n) \in Y$ denote a generic proposal for country K. Then players in country K simultaneously vote on proposal y. The outcome of the votes depends on the voting rule $\mathcal{D}^K$. If country K accepts proposal y, then the game ends with the proposed allocations, (x, y), and player $i \in J$ receive x_i and player $i \in K$ receives y_i.

If country K rejects proposal y, then the countries go to war. We assume that war is a costly lottery, and everyone bears at least some cost, so for all $i \in L$, $c_i^L > 0$. Country L wins with probability $w^L \in (0, 1)$, where $w^J + w^K = 1$. If country L wins, then player $i \in L$ receives the benefit b_i^L, where $b^L \in \Delta^{\lvert L \rvert - 1}$. If country L loses, then player $i \in L$ receives 0, i.e., no benefit. Then the expected war payoff for player $i \in L$ is $w^L b_i^L - c_i^L$, and the expected war payoff vector for country L is $w^L b^L - c^L$. Let the reservation value of player $i \in L$ be $r_i^L = \max\left\{0, w^L b_i^L - c_i^L\right\}$. Table 1 summarizes the notations introduced above.

Figure 1 provides a graphical representation of the extensive form. Although it is not a complete game tree, it is a more concrete picture of the game than the verbal description above. Also, the following summarizes the timing of events and corresponding payoff vectors:

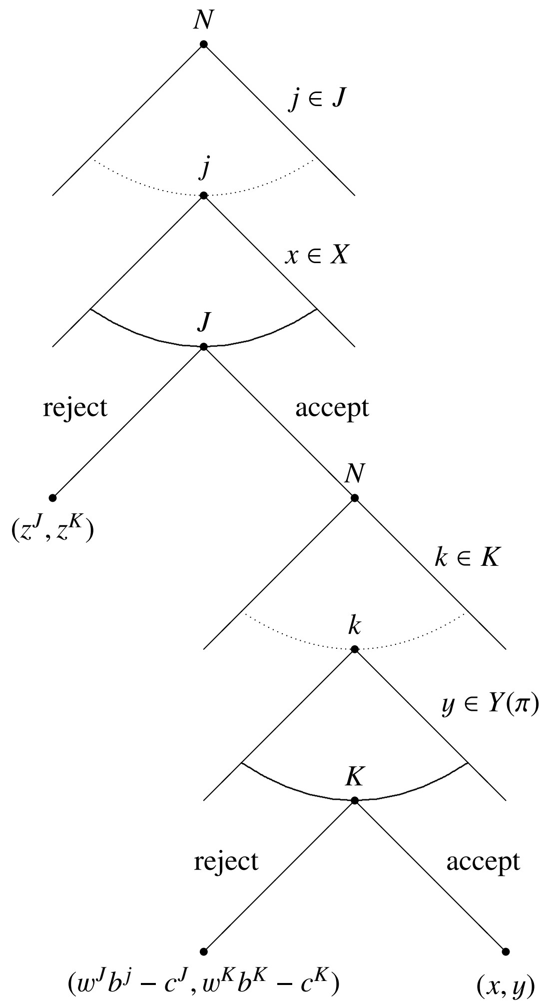

Figure 1: Graphical Representation of the Extensive Form

1. Nature chooses proposer j.
2. Proposer j proposes x.
3. Players in country J simultaneously vote on x.
   - If accepted, the game proceeds to 4 with $\pi = \pi^K(x)$.
   - If rejected, the game ends with the status quo payoffs, (z^J, z^K).
4. Nature chooses proposer k.
5. Proposer k proposes $y \in Y(\pi)$.
6. Elites in country K simultaneously vote on y.
   - If accepted, then the game ends with the payoffs as proposed, (x, y).
   - If rejected, then the game ends with the war payoffs, $(w^J b^J - c^J, w^K b^K - c^K)$.

X	allocations in country J
Y	allocations in country K
x^j	player j's proposal strategy
$\alpha_j^J : X \to \{0, 1\}$	player j's voting strategy
$y^k : [0, 1] \to Y$	player k's proposal strategy
$\alpha_k^K : [0, 1] \to \{0, 1\}$	player k's voting strategy

Table 2: Notations for Strategies

3.2 Strategies and Solution Concept

To pin down a prediction, we focus on Markovian strategies, which depend on payoff-relevant state variables rather than particular histories (Fudenberg and Tirole 1991; Maskin and Tirole 2001).[6] A Markovian strategy of player $i \in J$ is a pair $s_i^J = (x^i, a_i^J)$ of a proposal strategy, $x^i \in X$, and a voting strategy, $a_i^J : X \to \{0, 1\}$, where 0 indicates "rejection" and 1 indicates "acceptance."[7] A Markovian strategy of player $i \in K$ is a pair $s_i^K = (y^i, a_i^K)$ of a proposal strategy, $y^i : [0, 1] \to Y$ such that for all $\pi \in [0, 1]$, $y^i(\pi) \in Y(\pi)$, and a voting strategy, $a_i^K : [0, 1] \to \{0, 1\}$.[8] Table 2 summarizes the notations for strategies.

The solution concept for the analysis is Markov perfect equilibrium in pure strategies. We also impose "weak dominance" on players' voting strategies. A voting strategy of a player satisfies weak dominance if she votes for a proposal whenever she weakly prefers a proposal to the other alternative.[9] Note that a voting strategy that satisfies weak dominance is optimal for all contingencies. Therefore, a Markov perfect equilibrium satisfying weak dominance requires that for all states, assigned proposals be optimal. Whenever we say "Markov perfect equilibrium" or "equilibrium," it refers to a Markov perfect equilibrium in pure strategies that satisfy weak dominance.

[6]Focusing on Markovian strategies does not make a significant difference substantively. It just rules out the possibility that a proposer's choice of winning coalition depends on a particular history. This refinement allows us to focus on strategies with simple forms. Also, the notion of stationary strategies does not apply here because the time horizon of the game is finite.

[7]When player j makes a proposal, she is constrained only by the fact that she is the proposer, and she can choose anything in X. Also, when players in country J vote on a proposal, the only thing that would affect their payoffs is the content of proposal $x \in X$, so their payoffs depend only on the content of the proposal.

[8]When player k makes a proposal, the set of feasible allocations for country K depends only on the size of the remaining share $\pi = \pi^K(x)$, and player k's proposal depends only on π, but not on a particular history such as who was the proposer and how players voted on a proposal. When players in country K vote on proposal y, the identity of proposer k and particular proposal x do not affect their payoffs, and how players vote depends only on proposal y, in fact only on the share proposed to her.

[9]We define weak dominance formally in the appendix. For details, see Banks and Duggan (2000).

3.3 Voting Rules

The collection of decisive coalitions $\mathcal{D}^L$ represents the voting rule.[10] Country J accepts proposal x if there is a decisive coalition such that all members vote for acceptance, i.e., $\{i \in J \mid a_i^J(x) = 1\} \in \mathcal{D}^J$. We use the "collection of decisive coalitions" and the "voting rule" interchangeably. Examples of voting rules include

- dictatorial rule: there exists $\ell \in L$ such that $\mathcal{D}^L = \{C \subseteq L \mid \ell \in C\}$,
- unanimous rule: $\mathcal{D}^L = \{L\}$,
- G-rule: there exists $G^L \subseteq L$ such that $\mathcal{D}^L = \{C \subseteq L \mid G^L \subseteq C\}$,
- q-rule: $\mathcal{D}^L = \{C \subseteq L \mid q^L \leq |C|\}$.

Under dictatorial rule, the decision of the group depends only on the decision of the dictator. Under unanimous rule, acceptance of a proposal requires votes of all members of the country. Under a G-rule, acceptance of a proposal requires votes of all members of a certain group. Under a q-rule, if at least q^L players vote for acceptance, then country L accepts the proposal. Simple majority rule is a q-rule with $q^L = \frac{|L|+1}{2}$. Dictatorial rule is a G-rule with $G^L = \{\ell\}$ for some $\ell \in L$. Unanimous rule is a G-rule with $G^L = L$ as well as a q-rule with $q^L = |L|$.

Voting rules need to have some desired properties to be well-behaved. For example, if a decision rule does not produce any outcome regardless of vote profiles, such a voting rule is not very useful. It would be strange if a winning coalition becomes no longer a winning coalition after adding members to the group. Also, it is hard to make predictions if a voting rules produce multiple winners. The following properties rule out such strange outcomes. We say $\mathcal{D}^L$ is

- nonempty if $\mathcal{D}^L \neq \emptyset$,
- monotonic if $C \in \mathcal{D}^L$ and $C \subseteq C' \Rightarrow C' \in \mathcal{D}^L$,
- proper if $C \in \mathcal{D}^L \Rightarrow L \backslash C \notin \mathcal{D}^L$.

In words, nonemptiness says that there is at least one decisive coalition. Otherwise, the country would reject any proposal. Monotonicity says that if we add more members to a decisive coalition, then the new coalition is also decisive. For example, under a q-rule, a coalition with q^L members is decisive; if we add

[10] Assign an index to each decisive coalition so that $\mathcal{D}^J = \{n+1, ..., n+|\mathcal{D}^J|\}$ and $\mathcal{D}^K = \{n+|\mathcal{D}^J|+1, ..., n+|\mathcal{D}^J|+|\mathcal{D}^K|\}$. These indices are used to avoid indeterminacy for the choice of minimum winning coalition. If there are multiple minimum winning coalitions, then the coalition with the smallest index becomes the winner.

more members to this coalition, then the new coalition has more than q^L members, and therefore is decisive. Properness rules out the possibility of disjoint decisive coalitions, which leads to indeterminacy. Any q-rule with $q^L \geq \frac{|L|+1}{2}$ satisfies properness.

We assume that $\mathcal{D}^L$ is non-empty, monotonic, and proper, which implies that the set of elites in country L is decisive, $L \in \mathcal{D}^L$. With these assumptions, voting rule $\mathcal{D}^L$ is well-behaved. Also, we say $\mathcal{D}^L$ is oligarchic if there is an oligarch who is a member of all decisive coalitions, i.e.,

$$\bigcap_{C \in \mathcal{D}^L} C \in \mathcal{D}^L.$$

If $\mathcal{D}^L$ is oligarchic, then every oligarch has a veto, and the set of oligarchs has enormous power. If $\mathcal{D}^L$ is oligarchic and has the desirable properties above, then it is a G-rule. Dictatorial and unanimous rules are oligarchic as well.

4 Results

Previous studies have found that there is no equilibrium in which war is possible if two countries are unitary actors, they have complete information, war is a one-shot costly lottery, and the distribution of power does not change (Fearon 1995; Leventoğlu and Tarar 2008; Powell 1999). Our primary goal is to show that if we relax the unitary actor assumption, war can occur under the same conditions. We also analyze how domestic political institutions affect prospects of peace. However, since existence of equilibrium is not guaranteed here, we demonstrate existence first.

4.1 Equilibrium

Our primary goal here is to show that there exists an equilibrium in our model. Our model is in the class of stochastic games with continuous state and action spaces such that some of the transitions are deterministic; therefore, the existence of Markov perfect equilibria is not guaranteed (Dutta and Sundaram 1998). Moreover, we are looking for a particular equilibrium, i.e., a pure strategy equilibrium that satisfies weak dominance, and applications of fixed point theorems usually do not guarantee the existence of such an equilibrium. Therefore, we demonstrate the existence of equilibria by constructing one. Proposition 1 states that there exists an equilibrium, and describes the equilibrium behavior of the players. All formal proofs are in the appendix.

Proposition 1. *There exists an equilibrium in which*

- *a proposer in country J forms a minimal winning coalition if it is worth challenging the status quo allocation; otherwise, the status quo allocation prevails, and*
- *a proposer in country K forms a minimum winning coalition if it is worth accepting country J's demand; otherwise, bargaining breaks down and war ensues.*

We provide an informal description of the equilibrium strategies here, and a formal derivation of the equilibrium strategy profile in the appendix.

We illustrate the incentives and behavior of the players in a way analogous to backward induction. The last stage of the game is the voting stage in country K. As we have discussed above, we impose weak dominance on voting strategies. A voting strategy for a player in country K satisfies weak dominance if she would vote for acceptance when her proposed benefit is at least as good as her expected benefit for going to war, and she would vote for rejection otherwise.

When a player in country K makes a proposal, she has already received the demand from country J. Her decision is essentially about whether it is worth accepting the demand or not. If it is worth accepting the demand, she would want to make a proposal that maximizes her share of benefits. In order to do so, she would choose a minimum winning coalition, i.e., she allocates the reservation value to each coalition member, and keep the remaining share of benefits. However, if the demand is too large, elites in country K cannot reach an agreement, and the proposer would make a proposal that leads to war with probability one. Let $\hat{r}_i^K$ be the total reservation value of the minimum winning coalition when player $i \in K$ is the proposer.

At the voting stage in country J, a proposer in country J has already made a proposal. At this point, players in country J can correctly predict the probability of war. Upon receiving the demand, some proposers in country K would try to form a minimum winning coalition, but others would not. If a proposer in country K does not try to form a coalition, bargaining breaks down and the countries go to war. A proposal determines the probability of having a proposer in country K who would not form a minimum winning coalition, which is also the probability of war.

If a proposal is accepted, a player in country J is facing a lottery over the proposed benefit and war.[11] A voting strategy of a player in country J satisfies weak dominance if she votes for acceptance when her expected payoff for the lottery is at least as good as her status quo allocation, and she votes for rejection otherwise.

When a player in country J makes a proposal, she can choose the probability of war. Essentially, she would choose an optimal risk of war by forming a minimum winning coalition. If it is worth challenging the status quo allocation of benefits, she would propose to allocate the expected benefit for acceptance to each coalition member, and the remaining share to herself. Otherwise, she would let the status quo allocation prevail by making a non-serious proposal. Let θ_i^* be the optimal risk of war for player $i \in J$, and let $\bar{v}_i(\theta_i^*)$ be her expected utility for taking the optimal risk.

For all $i \in J$, let

$$\mu_i^J = \begin{cases} \theta_i^* & \text{if } z_i^J \leq \bar{v}_i(\theta_i^*) \\ 0 & \text{otherwise,} \end{cases}$$

and $\mu^J = (\mu_1^J, ..., \mu_{|J|}^J)$. The *ex ante* probability of war in equilibrium is given in Lemma 1.

Lemma 1. *The* ex ante *probability of war is $p^J \cdot \mu^J$ in equilibrium.*

Each player $i \in J$ has her optimal risk of war, θ_i^*. However, if she prefers the status quo to the optimal lottery with risk θ_i^*, then she keeps the status quo, i.e., she chooses war with probability zero. Otherwise, she would choose war with probability θ_i^*. Since she is the proposer with probability p_i^J, the *ex ante* probability of war is $p^J \cdot \mu^J = \sum_{i=1}^{|J|} p_i^J \mu_i^J$.

The remaining analyses are all based on the equilibrium in Proposition 1. Although multiple equilibria might exist, the multiplicity would arise due to indifferences. This equilibrium is constructed in such a way that a player with indifference would choose an alternative with the smallest probability of war, unless the player is indifferent between the status quo and other alternatives.

[11] If a proposal is accepted, then her expected payoff is the probability of war times her expected war payoff plus the probability of peace times her proposed benefit.

4.2 Unitary Actors and the Impossibility of War

The primary goal here is to show that war is not possible in equilibrium if two countries are unitary actors. Lemma 2 states that it is not optimal for players in country J to make a proposal that leads to war with probability one. Let Θ be the set of feasible probabilities of war, and $A^J(\theta)$ be the set of proposals that lead to war with probability $\theta \in \Theta$ and country J accepts.

Lemma 2. *For all $i \in J$, $x^i \notin A^J(1)$ in equilibrium.*

In words, it is never optimal for proposer $i \in J$ to choose war with probability one in equilibrium. The intuition behind Lemma 2 is that there is always a proposal leading to war with probability zero that proposer i prefers to any proposal leading to war with probability one. Lemma 2 also yields Proposition 2, which demonstrates that the *ex ante* probability of war cannot be one.

Proposition 2. *The probability of war cannot be one in equilibrium.*

Proposition 2 directly follows from Lemma 2, since for all $i \in J$, it is not optimal to make a proposal leading to war with probability one. If there is no proposer who makes a proposal leading to war with probability one, then the *ex ante* probability of war cannot be one even if war is possible.

Proposition 3 states that war is not possible if each country has one player, they have complete information, war is a one-shot costly lottery, and the distribution of power does not change.

Proposition 3. *If $|J| = |K| = 1$, then war is not possible in equilibrium.*

The unitary-actor assumption is equivalent to having only one player in each country, therefore Proposition 3 demonstrates that war is not possible in equilibrium in this model. Since country J knows who the proposer in country K is, her choice is to go to war with probability zero or one. Since country J never goes to war with probability one by Lemma 2, it must be zero. This should not be surprising since many studies on international conflict share the same conclusion (e.g., Fearon 1995; Leventoğlu and Tarar 2008; Powell 1999).

4.3 Non-unitary Actors and the Possibility of War

However, once we relax the unitary-actor assumption, we reach different conclusions. Proposition 4 demonstrates that the incentives and power of individuals do matter by providing simple necessary and sufficient conditions for complete peace in equilibrium.

Proposition 4. *In equilibrium, war is not possible in equilibrium if and only if for all* $i \in J$ *with* $p_i^J > 0$, $\theta_i^* = 0$ *or* $z_i^J > \bar{v}_i(\theta_i^*)$.

To restate Proposition 4, war is possible in equilibrium if and only if there exists $i \in J$ with $p_i^J > 0$ such that $\theta_i^* > 0$ and $z_i^J \leq \bar{v}_i(\theta_i^*)$. Proposition 4 suggests that for war to occur, country J must have a player who has aggressive intentions and power to carry them out. This suggests that the incentives and power of certain individuals do matter.

Next we seek more concrete sufficient conditions for the possibility of war. Let $C_i^J(\theta)$ be the minimum winning coalition in country J when player $i \in J$ chooses the risk $\theta \in \Theta$. For all $i \in J$ and all $\theta \in \Theta$, let $\tilde{C}_i^J(\theta) = \{\ell \in C_i^J(\theta) | z_\ell^J > \theta(w^J b_\ell^J - c_\ell^J)\}$. For all $i \in K$ with $p_i^K > 0$, let $\theta_i = \sum_{\ell=|J|+1}^{i} p_\ell^K$, and for all $j \in J$ and $k \in K$, let

$$\begin{aligned}\bar{\theta}_{j,k} &= \frac{\hat{r}_{|J|+1}^K - \hat{r}_{k+1}^K + \sum_{\ell \in C_j^J(0) \setminus \{j\}} z_\ell^J - \sum_{\ell \in \tilde{C}_j^J(\theta_k) \setminus \{j\}} z_\ell^J}{1 - (w^J b_j^J - c_j^J) - \sum_{\ell \in \tilde{C}_j^J(\theta_k) \setminus \{j\}} (w^J b_\ell^J - c_\ell^J) - \hat{r}_{k+1}^K} \\ \hat{\theta}_{j,k} &= \frac{1 - \hat{r}_{k+1}^K - \sum_{\ell \in \tilde{C}_j^J(\theta_k) \setminus \{j\}} z_\ell^J - z_j^J}{1 - (w^J b_j^J - c_j^J) - \sum_{\ell \in \tilde{C}_j^J(\theta_k) \setminus \{j\}} (w^J b_\ell^J - c_\ell^J) - \hat{r}_{k+1}^K}.\end{aligned}$$

Proposition 5 states sufficient conditions for the possibility of war in equilibrium.

Proposition 5. *If there are player* $j \in J$ *and player* $k \in K$ *such that* $p_j^J > 0$, $p_{k+1}^K > 0$, *and* $\theta_k < \min\{\bar{\theta}_{j,k}, \hat{\theta}_{j,k}\}$, *then war is possible in equilibrium.*

For all $j \in J$ and $k \in K$, θ_k is a level of risk such that war occurs if the proposer in country K is $i \in \{|J| + 1, ..., k\}$, and $\min\{\bar{\theta}_{j,k}, \hat{\theta}_{j,k}\}$ is a threshold level such that if the risk is smaller than the threshold, then player j would have incentives to take the risk of war. In other words, Proposition 5 states that the level of risk θ_k is not optimal when it is greater than the threshold level.

The important condition in Proposition 5 is $\theta_k < \min\{\bar{\theta}_{j,k}, \hat{\theta}_{j,k}\}$. Although $\min\{\bar{\theta}_{j,k}, \hat{\theta}_{j,k}\}$ does not explicitly depend on the value of θ_k, it implicitly depends on it through $C_j^J(\theta_k)$. It would be desirable to have conditions such that $\min\{\bar{\theta}_{j,k}, \hat{\theta}_{j,k}\}$ does not depend on θ_k even implicitly.

Proposition 6. *If country J's voting rule is G-rule with the set of oligarchs $G^J \subseteq J$ and for all $\ell \in G^J$ and all $\theta \in \Theta$, $z_\ell^J > \theta(w^J b_\ell^J - c_\ell^J)$, then for all $j \in J$ and $k \in K$ such that $p_j^J > 0$ and $p_{k+1}^K > 0$,*

$$\begin{aligned}
\bar{\theta}_{j,k} &= \frac{\hat{r}_{|J|+1}^K - \hat{r}_{k+1}^K}{1 - \sum_{\ell \in G^J \bigcup \{j\}} (w^J b_\ell^J - c_\ell^J) - \hat{r}_{k+1}^K} \\
\hat{\theta}_{j,k} &= \frac{1 - \hat{r}_{k+1}^K - \sum_{\ell \in G^J \bigcup \{j\}} z_\ell^J}{1 - \sum_{\ell \in G^J \bigcup \{j\}} (w^J b_\ell^J - c_\ell^J) - \hat{r}_{k+1}^K}.
\end{aligned}$$

Under the conditions in Proposition 6, there is an easy interpretation of the threshold levels, $\bar{\theta}_{j,k}$ and $\hat{\theta}_{j,k}$. If the threshold levels are greater, then the risk is more likely to be less than the thresholds. In other words, as the threshold levels increase, the window of bargaining breakdown expands.

As $\hat{r}_{|J|+1}^K$ increases, it becomes more expensive for proposer j to buy peace with probability one, and $\bar{\theta}_{j,k}$ increases, i.e., the window of bargaining breakdown becomes wider. As $\sum_{\ell \in G^J \bigcup \{j\}} z_\ell^J$ increases, the risk of war with probability θ_k becomes less attractive, and $\hat{\theta}_{j,k}$ decreases, i.e., the window of war becomes narrower. We can think of $\hat{r}_{k+1}^K$ as the premium of risk θ_k for proposer j. An increase in $\hat{r}_{k+1}^K$ means that the lottery with probability of war θ_k becomes less attractive for proposer j, and both $\bar{\theta}_{j,k}$ and $\hat{\theta}_{j,k}$ decrease. As $\sum_{\ell \in G^J \bigcup \{j\}} (w^J b_\ell^J - c_\ell^J)$ increases, the price of risk θ_k becomes cheaper for proposer j, and both $\bar{\theta}_{j,k}$ and $\hat{\theta}_{j,k}$ would increase. That is, the window of bargaining breakdown would expand.

4.4 Domestic Political Institutions and Prospects of Peace

Our next goal is to examine how domestic political institutions affect the outcome of international bargaining. The observation that democracies do not fight with each other is a robust empirical regularity (Russet and Oneal 2001). However, it is still puzzling why democracies do not fight with each other. Moreover, we do not have much to say about non-democratic dyads. We analyze what kind of domestic political institutions are less likely to lead to the outbreak of war.

We seek sufficient conditions for the existence of peaceful equilibria. Proposition 7 states that war is not possible if all potential proposers in country K have the same coalition building costs.

Proposition 7. *If there exists $\hat{r}^K$ such that for all $i \in K$ with $p_i^K > 0$, $\hat{r}_i^K = \hat{r}^K$, then war is not possible in equilibrium.*

The basic idea is that if all proposers in country K face equal coalition building costs, then proposer j would know exactly how much she needs to give to country K to avoid war, even if she does not know who country K's proposer actually is. In such a case, there is no uncertainty about the share of the pie that proposer j would need to give country K to avoid war, and she would also know that there is no chance of extracting a larger share of the pie from country K. In other words, war is less likely if power is distributed in an equitable manner in country K. Another implication of Proposition 7 is that for war to occur, there must be uncertainty about the decision-making process in country K. That is, such uncertainty is a necessary condition for war in the model. This uncertainty can create incentives for proposers in country J to take the risk of a bargaining breakdown.

The leadership structure may be more transparent in autocracies than in countries with other types of regimes. Let the set of oligarchs be

$$O^K = \bigcap_{C \in \mathcal{D}^K} C.$$

We say country K is an oligarchy if $\sum_{i \in O^K} p_i^K = 1$, i.e., all potential proposers are in the set of oligarchs. The proposal power and voting power are concentrated in the set of oligarchs in an oligarchy. Proposition 8 is somewhat counterintuitive. It states that if country K is an oligarchy, then war is not possible in equilibrium.

Proposition 8. *If country K is an oligarchy, then war is not possible in equilibrium.*

An important intuition of Proposition 8 is that proposer $i \in J$ knows that the total reservation value for a minimal winning coalition with proposer $k \in O^K$ is the same for all potential proposers, i.e., $\hat{r}_i^K = \sum_{\ell \in O^K} r_\ell^K$ for all $i \in O^K$. That is, proposer i can avoid war if she proposes $x \in X$ such that $\pi^K(x) \geq \sum_{\ell \in O^K} r_\ell^K$ regardless of who the actual proposer in country K is. Then the impossibility of equilibria with war immediately follows from Proposition 7.

Proposition 8 suggests that war is not possible if the leadership structure is transparent in country K. Oligarchic political systems are transparent because proposer i would know that she can avoid war if she satisfies the oligarchs and she cannot otherwise, and the transparency of oligarchic political systems makes then unlikely to be attacked. Proposition 8 also suggests that autocracies including dictatorships are less likely to be attacked. We say country K is a dictatorship if there exists $i \in K$ such that $O^K = \{i\}$ and $p_i^K = 1$. Then war is not possible if country K is a dictatorship, because a dictatorship is an oligarchy, and it is unlikely to be attacked because of its transparency.[12] Reiter and Stam (2003) find that autocracies are less likely to be attacked. Proposition 8 theoretically supports their finding that autocratic regimes are less likely to be attacked.

We argue that countries are more likely to take the risk of a bargaining breakdown against unstable regimes than against autocratic regimes. Unstable regimes tend to have more political uncertainty, and such uncertainty can create incentives for elites to take the risk of a bargaining breakdown. However, autocratic regimes have small political uncertainty, and it is easy to evaluate what autocratic leaders want. Typically, a democratizing country tends to be unstable because of political uncertainty due to fierce political competition in the process of a transition. That is, during a democratization, a country changes from an autocratic regime to an unstable regime. It has been argued that democratizing countries are war-prone (Mansfield and Snyder 2005), and our argument is consistent with their finding.[13]

5 Numerical Examples

Although we have given sufficient conditions for the possibility of war, we have not shown that these conditions can actually be satisfied. To demonstrate that sufficient conditions for the possibility of war can actually be satisfied, we look at simple numerical examples in which each country has three players and its voting rule is simple majority rule. The examples also illustrate how incentives of individuals could lead to the risk of bargaining breakdown.

Suppose that there are three players in each country, so $J = \{1, 2, 3\}$ and $K = \{4, 5, 6\}$, and the voting rule for each country is simple majority rule. For all $i \in J$, let $r_i^J = w^J b_i^J - c_i^J \geq 0$. Without loss of generality, label elites in country J to have $z_2^J - p_4^K r_2^J \geq z_3^J - p_4^K r_3^J > 0$, and label elites in country K to have $w^K b_4^K - c_4^K \geq w^K b_5^K - c_5^K \geq w^K b_6^K - c_6^K \geq 0$, so $r_4^K \geq r_5^K \geq r_6^K \geq 0$.

[12]Note that Proposition 8 does not say that oligarchies are more peaceful than countries with non-oligarchic systems. It only suggests that oligarhies are less likely to be attacked than non-oligarchies, and it does not say whether or not oligarchies are more likely to attack other countries than countries with non-oligarchic systems.

[13]Empirical analyses for our claim that regime types are left for future research.

First, $r_4^K = r_5^K \geq 0$ is a sufficient condition for the impossibility of war. If the equality holds, then $C_4^K = \{4,6\}$, and $C_5^K = C_6^K = \{5,6\}$, and $\hat{r}_4^K = \hat{r}_5^K = \hat{r}_6^K$, so war is not possible by Proposition 7. Suppose $r_4^K > r_5^K$, so the probability of war is either 0 or p_4^J, i.e., $\Theta = \{0, p_4^K\}$. Then $\theta_4 = p_4^J$, and by Proposition 5,

$$\begin{aligned}\bar{\theta}_{1,4} &= \frac{r_4^K - r_5^K + \min\{z_2^J, z_3^J\} - z_3^J}{1 - r_1^J - r_3^J - r_5^K - r_6^K} \\ \hat{\theta}_{1,4} &= \frac{1 - z_1^J - z_3^J - r_5^K - r_6^K}{1 - r_1^J - r_3^J - r_5^K - r_6^K}.\end{aligned}$$

Player $1 \in J$ would take the risk of bargaining breakdown if $p_4^K < \min\{\bar{\theta}_{1,4}, \hat{\theta}_{1,4}\}$.

If r_4^K increases, then $\bar{\theta}_{1,4}$ goes up. It reflects the price of the expensive coalition, $\{4,6\} \subseteq K$. As the expensive coalition $\{4,6\}$ becomes more expensive, peace becomes less desirable for player $1 \in J$. As r_5^K goes up, $\bar{\theta}_{1,4}$ decreases because it reflects the price of the cheap coalition $\{5,6\} \subseteq K$. In other words, the premium for taking the risk of war goes down as r_5^K increases. Also, as r_6^K goes up, both cheap and expensive coalitions become more expensive, therefore the risk of war becomes less desirable, and $\bar{\theta}_{1,4}$ increases as a result. As $\min\{z_2^J, z_3^J\}$ goes down, $\bar{\theta}_{1,4}$ increases. The intuition is that as $\min\{z_2^J, z_3^J\}$ increases, peace becomes more expensive, and a higher cost of peace would increase the room for the possibility of war.

An increase in z_1^J reduces $\hat{\theta}_{1,4}$ because it would mean that player 1 would like the status quo better. If z_3^J goes up, then it becomes more expensive to buy player $3 \in J$ as her coalition partner. Since the status quo become more desirable, $\hat{\theta}_{1,4}$ would go down. As r_1^J increases, simply war becomes more attractive, and both $\bar{\theta}_{1,4}$ and $\hat{\theta}_{1,4}$ increase. Also, as r_3^J increases, player 3 becomes cheaper as a coalition partner. Then war becomes more attractive, and both $\bar{\theta}_{1,4}$ and $\hat{\theta}_{1,4}$ increase.

The following examples illustrate how changes in parameters would lead to different outcomes. Throughout the examples, let $b^J = b^K = (0.7, 0.2, 0.1)$, $c^J = c^K = (0.05, 0.05, 0.05)$, and $z^J = z^K = (0.25, 0.2, 0.05)$. Example 1 is the baseline case. Let $w^J = 0.5$ and $p^J = p^K = (0.5, 0.3, 0.2)$. The values of peace are $\bar{v}(0) = (0.65, 0.65, 0.5)$ and the values of the risky proposal are $\bar{v}(p_4^K) = (0.575, 0.45, 0.375)$. Then all players in country J prefer peace to the risk of war because the probability of war is too high when $p_4^K = 0.5$. Therefore, peace is the unique equilibrium outcome. Table 3 shows parameter values and equilibrium outcomes for all examples.[14]

[14]In Table 1, the italicized numbers indicate changes from Example 1. The bold numbers indicate the optimal probability of war.

	$j(k)$	w	p^K_k	z^J_j	$r^J_j(p^K_4)$	r^K_k	$\bar{v}_j(0)$	$\bar{v}_j(p^K_4)$
1	1(4)	0.5	0.5	0.25	0.2	0.3	**0.65**	0.575
	2(5)		0.3	0.2	0.35	0.05	**0.65**	0.45
	3(6)		0.2	0.05	0.1	0	**0.5**	0.375
2	1(4)	0.5	*0.3*	0.25	0.229	0.3	0.65	**0.705**
	2(5)		*0.5*	0.2	0.264	0.05	**0.65**	0.63
	3(6)		*0.2*	0.05	0.071	0	0.5	**0.505**
3	1(4)	*0*	0.5	0.25	0.55	0.65	0.25	**0.3**
	2(5)		0.3	0.2	0.45	0.15	0.25	**0.3**
	3(6)		0.2	0.05	0.15	0.05	0.1	**0.15**

Table 3: Numerical Examples

In Example 2, let $p^K = (0.3, 0.5, 0.2)$ with the other parameters the same as in Example 1. Then player $4 \in K$ has a lower recognition probability than in Example 1. As a result, the risk of war is reduced. The values of peace are $\bar{v}(0) = (0.65, 0.65, 0.5)$ and the values of the risky proposal are $\bar{v}(p^K_4) = (0.705, 0.63, 0.505)$. Then, player $1 \in J$ and player $3 \in J$ would be willing to take the risk of war. Therefore, war is possible in equilibrium.

In Example 3, let $w^J = 0$ with the other parameters the same as in Example 1. Country J has *no* chance of winning. The values of peace and the risky proposal are $\bar{v}(0) = (0.25, 0.25, 0.1)$ and $\bar{v}(p^K_4) = (0.3, 0.3, 0.15)$, respectively. Then all players in country J prefer the risk of war to peace for sure. They are willing to take the risk of war even though the country has no chance of winning at all. This kind of behavior is optimal because the proposer can gain enormous benefits when war does not occur. Moreover, because country K is so strong, players in country K expect country J to concede a lot. War can occur because peace is expensive for players in country J.

This example illustrates the attack on Pearl Harbor. The puzzle is why Japan attacked Pearl Harbor even though the Japanese knew that they had an extremely small chance of winning. In fact, because the chance of winning was so small for Japan, the United States expected Japan to concede a lot, i.e., the complete withdrawal from China. Then peace for sure was extremely expensive for the Japanese. This led the Japanese leaders to take the risk of war.

6 Discussion

Private information and incentives to misrepresent it constitute the most prominent rationalist explanation for war (e.g., Fearon 1995). However, many studies assume that players have asymmetric information about their costs of fighting (e.g., Fearon 1995, Powell 1999). Though such an explanation has a desirable parsimony, a potential issue with such an approach is that costs of war are not something we can easily observe. It is very difficult, then, to tell whether private information about costs of war is playing an important role in the process leading to war. An advantage of our model is that we can rely on much more concrete information. We can observe types of institutions, potential proposers, and perhaps even actual agenda setters. We can assess the transparency of a decision-making process in a particular country relatively easily. Assuming that autocracies are less likely to have uncertainty unless their regimes are unstable, we can actually empirically assess whether this relationship holds.

We must make certain assumptions in order to derive formal statements, and some of the results do inevitably depend on those assumptions, some of which may be seemingly restrictive. For example, the assumption that a proposer in country K is randomly selected inevitably plays an important role in the decisions of players in country J. However, it is not the only assumption that is required for war to occur. In fact, how decisions are made within country K plays an important role as well. For example, suppose that country K's voting rule is oligarchic, and every potential proposer is an oligarch, that is, she is in the group of powerful elites. Then players in country J do not know who the proposer will be in country K. However, because the power is highly concentrated within a particular group, the outcome within country K does not depend on who makes an offer and how the recognition probabilities are distributed within the group of powerful elites in country K. That is, a highly concentrated distribution of power can eliminate the uncertainty that creates the incentives of elites in country J to take the risk of war. However, the possibility of war can arise when there is a potential proposer outside of the group of powerful elites.

Moreover, it is easy to imagine a situation in which players in country K can make counteroffers, but our model does not allow them to do so. If players in country K can make counteroffers and perfectly observe the decision-making process in country J, then war would not occur. However, even if players in country K can make a counteroffer, if players in K do not have perfect information about the decision-making processes in country J, then players in country K can face the same trade-off as players in country J. It is unlikely that countries' decision-making processes are completely transparent even after countries exchange offers, and war is still possible in such a situation.

We can also imagine a situation in which players in country J can revise their offers after they observe how players in country K make their decisions. However, leaders may suffer audience costs if they revise their offers in a way that suggests the country's weaknesses (e.g., Fearon 1994; Leventoğlu and Tarar 2005), though we do not model such factors. Leaders would not have incentives to change offers if such a domestic political structure exists. Moreover, players in country K would not want players in country J to know everything about their decision-making processes. Elites within countries would often be reluctant to provide such information because their opponents may take advantage of such information in the future.

One may also argue that the selection of the proposer in country J does not play an important role in explaining war. However, certain leaders can be responsible for starting war. Whether war occurs does depend on the identity of the proposer, and how countries make decisions is not always publicly available, though in some cases such as dictatorships, we can be confident about how elites' preferences are mapped into a certain outcome. The process of choosing a proposer may not generate an important theoretical insight about the causes of war in this framework, but it does affect the likelihood of conflict, as numerical examples above demonstrate. For example, some elites may be constrained by expensive coalition partners, but others may not. Therefore, the assumptions discussed here are not as restrictive as they may sound.

In fact, our framework allows us to explain the behavior of aggressive leaders within a rational choice framework without assuming that they are risk-loving agents. Some have blamed idiosyncratic personalities of leaders such as Hitler for causing major wars (e.g., Taylor 1961, 11–12), but the statement "they started war because they are crazy or risk-loving" does not sound satisfactory as an explanation. We can look at domestic politics a little more carefully, and we are able to analyze their behavior from the perspective of leaders and other elites. For example, it is plausible that leaders find it profitable to initiate war when they are not constrained by domestic political institutions and there is uncertainty about the decision-making process of their rivals. Moreover, if leaders have to satisfy expensive coalitions in order to start fighting, it may discourage them from initiating war. Had the German institutions been restraining Hilter, he might not have been able to behave as aggressively as he did despite the existence of political uncertainty in Europe. Existing models are not able to explain causes of war from the perspective of domestic politics.

Although the model we analyze is similar to a two-level game, it differs in an important respect. In two-level games, negotiators make decisions first, and elites within countries decide whether to ratify an agreement. In our model, elites in a country decide how to allocate the benefits before negotiators officially sit down at the table, and they make a demand once they agree among themselves. Elites in the other country then bring the proposal back to their country, and discuss whether they accept the demand and how they allocate the remaining benefits if they accept the demand.

7 The Outbreak of the Iran-Iraq War

Iran and Iraq have had a long history of hostile disputes, including disputes over Iranian territory such as the Shatt-al-Arab and Khuzistan (Abdulghani 1984, 106–126). More than 90 percent of Iran's oil reserves are in Khuzistan, and the Iraqis were interested in gaining the valuable piece of territory (Yergin 1992, 710). Moreover, oil price skyrochetted during the 1970s as Figure 2 shows, so the value of the territory was increasing.[15] It has been argued that oil money played an important role in the outbreak of the Iran-Iraq War (Workman 1994, 110). However, the Algiers Accord in 1975 resolved conflicts between Iran and Iraq briefly, and though few expected them to make peace because of their history, the agreement normalized their relations at least until the Iranian Revolution in 1979.[16] Interestingly, it has been argued that both sides made peace to focus on selling oil at the high prices that resulted from from the oil embargo in 1973 (Pelletiere 1992, 11–12), so oil money is not a terribly convincing explanation for the outbreak of the war.

One of the primary purposes of the Algiers Accord was to consolidate and stabilize power domestically. For example, Iran agree to stop giving aid the Kurds, who were threatening the survival of the Ba'thist regime (Yergin 1992, 707–708). Saddam Hussein used oil revenues as well as repression to curb social unrest. He gave cash donations and television sets to Kurdish families that he forced to resettle. He also created jobs in the public sector and provided wage increases periodically (Workman 1994, 104–105). As a result, Hussein had successfully consolidated power in the Iraqi government since his rise to power in the 1970s, and the accord did serve its purposes (Hilo 1991, 17–18). Hussein could implement foreign policiy

[15]The source is `http://inflationdata.com/inflation/Inflation_Rate/Historical_Oil_Prices_Table.asp`.

[16]The Algiers Accord was signed in Algiers, the capital of Algeria at a meeting in which OPEC countries participated in March 1975 (Pelletiere 1992, 9).

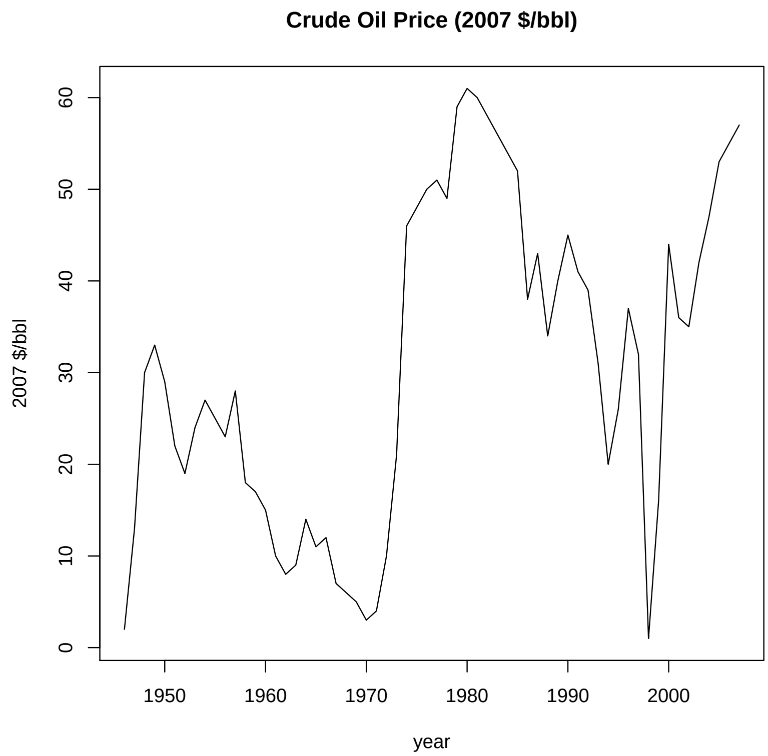

Figure 2: Crude Oil Price (2007 $/bbl), 1946–2007
(Source: `inflationdata.com`)

as he wished without much resistance because of the highly centralized decision-making process.[17]

Iranian politics became chaotic, however, as a result of the Iranian Revolution in 1979, and this destroyed the consolidated distribution of power in Iran (Khadduri 1988, 64). Iranian leaders were divided in many dimensions, such as foreign policy and ethnic issues, and the Iranians were not able to agree on their future plans. For example, liberals like Prime Minister Mehdi Bazargan and the Freedom Movement sought to establish a liberal government, while Ayatollah Ruhollah Khomeini and the Islamic Republican party tried to establish a populist theocratic republic (Workman 1994, 91–92).[18] Although these groups tried to cooperate initially, the struggle for power between the groups was intensifying.

Khomeini and Bazargan engaged in fierce domestic political competition, creating uncertainty about the

[17]The rise of Saddam Hussen had made up of significant impact on Iraq's relations with Iran, as well as its relations with Syria, which led to the war (Khadduri 1988, 64).

[18]Another important group was radical left parties, including the Communist Party of Iranian Workers and Peasants as well as the Party of Socialist Workers (Workman 1994, 91–92).

leadership structure in Iran (Malin 1997, 393–397). Khomeini and the Islamic Republican party eventually gained power, and Iran changed from a monarchy under Shah Mohammad Reza Pahlavi to a populist theocratic republic under Khomeini. However, the domestic political situation in Iran was not stable, and the type of coalition in charge of foreign policy was not obvious to outsiders. This provided an irresistible opportunity for Hussein to topple Khomeini, stop the threat of revolution by Shia, claim sovereignty over the Shatt-al-Arab waterway, and increase oil revenues (Yergin 1992, 710). Thus, Hussein's incentives to take the risk of war emerged. He started demanding pieces of territory including Khuzistan, a rich source of oil. Not surprisingly, Khomeini did not make concessions. After failing to secure a deal by other means, Hussein initiated offensive operations in Iran on September 22, 1980.

Iran and Iraq had peaceful relations when both countries had very strong leaders. When Saddam Hussein decided to attack Iranian territory, he was already firmly in control of an authoritarian regime as the President of Iraq. However, the Iranian Revolution disrupted the political stability in Iran, Hussein's incentives to take advantage of domestic disorder in Iran emerged. This story is consistent with the argument that democratizing countries are war-prone (Mansfield and Snyder 2005). Democratization of Iran created political uncertainty, which led to the outbreak of the war. The transition of Iran from a monarchy to a republic destroyed the peaceful equilibrium.

8 Conclusion

We have demonstrated that the incentives of elites and the collective decision-making processes at the domestic level provide a micro-mechanism of rational war. Previous studies have found that there does not exist an equilibrium in which war is a possible outcome if we assume that players have complete information, war is a one-shot costly lottery, and the distribution of power does not change within the standard bargaining framework. However, the same conclusion does not hold once we relax the unitary actor assumption. That is, the unitary-actor assumption is not innocuous.

Political uncertainty induced by decision-making processes at the domestic level can create incentives for elites to take the risk of a bargaining breakdown when the distribution of power within their country favors such a course. In fact, this type of uncertainty produces the same tradeoff as models with private information about the costs of fighting. However, whereas we can hardly observe private information, we are able to observe the type of institution and the distribution of power at the domestic level easily. In some situations, we can even observe proposers as well as potential proposers if we look at the organizational structure of the government carefully. Therefore, we can seek explanations for war based on observable factors.

We have also argued that countries are more likely to attack unstable regimes due to the political uncertainty prevalent in such regimes. However, they are less likely to attack autocracies because such regimes tend to have less uncertainty due to their highly centralized political system. That is, they are more likely to avoid war by finding some kind of peaceful agreement. The outbreak of the Iran-Iraq War illustrates this argument because their relationship was stable when Iran was autocratic, and war started when the Iranian regime became unstable due to the Iranian revolution in 1979.

The unitary actor assumption is an understandable simplification, and helps us get important insights about countries' bargaining behavior (Powell 1999). It is not easy to aggregate individual preferences in a consistent manner, given the negative results in social choice theory (e.g., Arrow 1951; McKelvey 1979; Plott 1967). As a result, scholars in international relations have left the mapping from individual preferences to countries' actions as a black box.

Unlike social choice theory, however, non-cooperative game theory almost always generates some prediction (Austen-Smith and Banks 2000, 2005). The recent development of non-cooperative bargaining theory has given us some hope (e.g., Banks and Duggan 2000; Baron and Ferejohn 1989; Duggan and Kalandrakis 2007; Rubinstein 1982). The dynamic and stochastic nature of bargaining models results in a stability of outcomes. Moreover, bargaining models allow us to aggregate individual preferences without dealing with problems such as the absence of equilibria and intransitive social preferences. As a result, we are able to model international bargaining and decision making processes at the domestic level in a unified framework, and we can get insights that we could not get without considering decision-making processes at the individual level. In particular, we have shown that in our model, elites in a country may have incentives to take the risk of war when there is uncertainty about the decision-making process in the opposing country. Moreover, elites in a country can take such a risk only if there is a sufficiently powerful group of elites who are willing to take the action. That is, domestic political uncertainty and logrolling among elites can cause a bargaining breakdown leading to the initiation of war. The incentives of elites, the type of institution, and the distribution of power at the domestic level are important elements of rational non-unitary-actor explanations for war.

A Equilibrium

Since action and state spaces are continuous and some of the transitions are deterministic in the model, the existence of Markov perfect equilibria is not guaranteed (Dutta and Sundaram 1998). Even if Markov perfect equilibria exist, there is no guarantee that there exists a pure strategy Markov perfect equilibrium that satisfies weak dominance. The primary goal of this section is to show that such equilibria exist.

A.1 Optimal Strategies for Players in Country K

First, we consider the voting behavior of players in country K. A voting strategy of player $i \in K$ satisfies weak dominance if she votes for a proposal whenever she weakly prefers a proposal to war.[19]

Definition 1. *For all $i \in K$, voting strategy a_i^K satisfies weak dominance if for all $y \in Y$,*

$$a_i^K(y) = \begin{cases} 1 & \textit{if } y_i \geq w^K b_i^K - c_i^K \\ 0 & \textit{otherwise.} \end{cases}$$

Weak dominance rules out unreasonable voting equilibria, such as one in which everyone votes for rejection when everyone strictly prefers the proposal.

Next we consider the proposal stage for players in country K. Let $i \in K$ be given. Let the collection of coalitions in country K containing i be $\mathcal{D}_i^K = \{C \in \mathcal{D}^K \mid i \in C\}$, and let

$$C_i^K = \min\left\{\arg\min_{C \in \mathcal{D}_i^K} \sum_{\ell \in C} r_\ell^K\right\}$$

be a decisive coalition containing i that minimizes the total reservation value. If there are multiple minimizers, then choose the one with the smallest index. Since $\mathcal{D}_i^K$ is finite, C_i^K exists, so let

$$\hat{r}_i^K = \begin{cases} \sum_{\ell \in C_i^K} r_\ell^K & \text{if } p_i^K > 0 \\ 0 & \text{otherwise.} \end{cases}$$

We also assume that every decisive coalition in country K has a player with a strictly positive expected war payoff, i.e., for all $C \in \mathcal{D}^K$, there exists $\ell \in C$ such that $w^K b_\ell^K - c_\ell^K > 0$.[20] Lemma 3 describes optimal proposals for players in country K. Formal proofs are provided in the appendix.

Lemma 3. *For all $i \in K$, the following proposal strategy y^i is optimal.*

- *If $\pi < \hat{r}_i^K$, $y_\ell^i(\pi) = \begin{cases} \pi & \textit{if } \ell = i \\ 0 & \textit{otherwise.} \end{cases}$*

[19] Following conventions, let elites vote for acceptance when they are indifferent between a proposal and war.

[20] Otherwise, there is a decisive coalition such that all members weakly prefer receiving nothing to going to war. Then, we can find only unreasonable equilibria in which country K concedes everything to country J.

- *If* $\pi \geq \hat{r}_i^K$, $y_\ell^i(\pi) = \begin{cases} r_\ell^K & \text{if } \ell \in C_i^K \setminus \{i\} \\ \pi - \sum_{\ell \in C_i^K \setminus \{i\}} r_\ell^K & \text{if } \ell = i \\ 0 & \text{otherwise}. \end{cases}$

Proof. Take any proposer $i \in K$. For all $\pi \in [0, 1]$, the largest share of the pie that proposer i can get is $\max\{\pi - \sum_{\ell \in C_i^K \setminus \{i\}} r_\ell^K, 0\}$. The only way to deviate is to go to war and receive $w^K b_i^K - c_i^K$.

If $\mathcal{P}^K \neq \emptyset$, then $\sum_{\ell \in C_i^K \setminus \{i\}} r_\ell^K = 0$ and country K would accept all $y \in Y$, so for all $\pi \in [0, 1]$, it is optimal to offer $y^i(\pi)$ such that

$$y_\ell^i(\pi) = \begin{cases} \pi & \text{if } \ell = i \\ 0 & \text{otherwise.} \end{cases}$$

If $\mathcal{P}^K = \emptyset$, country K will reject $y \in Y$ such that

$$y_\ell = \begin{cases} \pi & \text{if } \ell = i \\ 0 & \text{otherwise.} \end{cases}$$

If $\pi < \hat{r}_i^K$ and $\pi < \sum_{\ell \in C_i^K \setminus \{i\}} r_\ell^K$, then it is not possible for i to get a decisive coalition to accept any proposal; therefore it is optimal to propose any $y^i \in Y(\pi)$, which leads to war for sure. If $\pi < \hat{r}_i^K$ and $\pi \geq \sum_{\ell \in C_i^K \setminus \{i\}} r_\ell^K$, then $w^K b_i^K - c_i^K > 0$, and it is optimal for i to go to war because $\pi - \sum_{\ell \in C_i^K \setminus \{i\}} r_\ell^K < w^K b_i^K - c_i^K \Leftrightarrow \pi < \hat{r}_i^K$. If $\pi \geq \hat{r}_i^K$, then $\pi \geq \sum_{\ell \in C_i^K \setminus \{i\}} r_\ell^K$. Since $r_i^K \geq 0$, it is optimal to get $\pi - \sum_{\ell \in C_i^K \setminus \{i\}} r_i^K$ because $\pi - \sum_{\ell \in C_i^K \setminus \{i\}} r_\ell^K \geq r_i^K \Leftrightarrow \pi \geq \hat{r}_i^K$. □

If the remaining share of the pie is sufficiently small, then player i would give the reservation value to all $\ell \in C_i^K \setminus \{i\}$ and keep the rest. Otherwise, it is optimal to go to war.

A.2 Optimal Strategies for Players in Country J

We consider voting behavior of players in country J. By Lemma 3, when players in country J vote on proposal x, the probability of war depends on the remaining share of the pie, $\pi^K(x) \in [0, 1]$. That is, proposer j can essentially choose the probability of war through proposal x. Without loss of generality, re-label elites in country K to have $\hat{r}_{|J|+1}^K \geq \hat{r}_{|J|+2}^K \geq ... \geq \hat{r}_n^K$ for convenience. Define a function that maps country J's feasible allocation to a probability of war $\phi : X \to [0, 1]$ as

$$\phi(x) = \begin{cases} 0 & \text{if } \pi^K(x) \geq \hat{r}_{|J|+1}^K \\ \sum_{i=|J|+1}^{\ell} p_i^K & \text{if } \pi^K(x) \in [\hat{r}_{\ell+1}^K, \hat{r}_\ell^K),\ \ell \in \{|J|+1, ..., n-1\} \\ 1 & \text{if } \pi^K(x) < \hat{r}_n^K. \end{cases}$$

If $\pi^K(x) \geq \hat{r}_{|J|+1}^K$, then any proposer in country K would make a proposal acceptable to a decisive coalition, and the probability of war is zero. If $\pi^K(x) \in [\hat{r}_{|J|+2}^K, \hat{r}_{|J|+1}^K)$, then only player $|J| + 1$ would make a proposal that would be rejected, and the probability of war is $p_{|J|+1}^K$. If $\pi^K(x) < \hat{r}_n^K$, then nobody in country K would make a proposal acceptable to a decisive coalition, so the probability of war is one. Let the set of feasible probabilities of war be $\Theta = \text{supp}(\phi)$, which is finite.

A voting strategy for player $i \in J$ satisfies weak dominance if she votes for acceptance of the proposal whenever she weakly prefers the lottery over the proposal and war to the status quo.[21]

Definition 2. *For all $i \in J$, voting strategy a_i^J satisfies weak dominance if for all $x \in X$,*

$$a_i^J(x) = \begin{cases} 1 & \textit{if } z_i^J \leq \phi(x)[w^J b_i^J - c_i^J] + [1 - \phi(x)]x_i \\ 0 & \textit{otherwise.} \end{cases}$$

Note that players in country J can anticipate the probability of war $\phi(x)$ through proposal x.

Let $\theta \in \Theta$ and $i \in J$ be given, and $X(\theta) = \{x \in X | \phi(x) = \theta\}$ be the set of feasible allocations such that $\phi(x) = \theta$. Player i would vote for proposal $x \in X(\theta)$ if it is in her acceptance set for θ,

$$A_i^J(\theta) = \left\{ x \in X(\theta) \;\middle|\; x_i \geq \frac{z_i^J - \theta(w^J b_i^J - c_i^J)}{1 - \theta} \right\},$$

and let her reservation value for θ be

$$r_i^J(\theta) = \max \left\{ 0, \frac{z_i^J - \theta(w^J b_i^J - c_i^J)}{1 - \theta} \right\}.$$

For all $C \in \mathcal{D}^J$, let the acceptance set of coalition C for θ be

$$A_C^J(\theta) = \bigcap_{\ell \in C} A_\ell^J(\theta),$$

and the acceptance set of country J for θ be

$$A^J(\theta) = \bigcup_{C \in \mathcal{D}^J} A_C^J(\theta).$$

If $x \in A^J(\theta)$, then country J accepts x and the probability of war is θ.

If player i would want θ as the probability of war, then she would choose a minimizer $\pi^K(x)$ in $A^J(\theta)$, so let $\underline{\pi}^K(\theta) = \min_{x \in A^J(\theta)} \pi^K(x)$. Then $\underline{\pi}^K(\theta)$ exists because

$$\underline{\pi}^K(\theta) = \begin{cases} \hat{r}_{|J|+1}^K & \text{if } \theta = 0 \\ \hat{r}_{\ell+1}^K & \text{if } \theta = \sum_{i=|J|+1}^{\ell} p_i^K, \; \ell \in \{|J|+1, ..., n-1\}. \end{cases}$$

Then her offer to player $\ell \in J \backslash \{i\}$ would be either nothing or $r_\ell^J(\theta)$. Let the collection of decisive coalitions in country J such that player i is a member be $\mathcal{D}_i^J = \left\{ C \in \mathcal{D}^J | i \in C \right\}$, and let

$$C_i^J(\theta) = \min \left\{ \arg \min_{C \in \mathcal{D}_i^J} \sum_{\ell \in C} r_\ell^J(\theta) \right\}$$

[21] Let players vote for the lottery when they are indifferent between the lottery and the status quo.

be a decisive coalition that has player i and minimizes the total reservation value for θ. Since $\mathcal{D}_i^J$ is finite, $C_i^J(\theta)$ exists. If multiple minimizers exist, then choose the one with the smallest index.

Let the smallest total reservation value of i's coalition partners for θ be

$$\hat{r}_i^J(\theta) = \sum_{\ell \in C_i^J(\theta)\setminus\{i\}} r_\ell^J(\theta).$$

Note that $\hat{r}_i^J(\theta)$ does not include player i's own reservation value $r_i^J(\theta)$. Player i's value of proposing $x \in X$ is $v_i(x) = \phi(x)[w^J b_i^J - c_i^J] + [1 - \phi(x)]x_i$, and since $\max_{x \in A^J(\theta)} x_i = 1 - \underline{\pi}^K(\theta) - \hat{r}_i^J(\theta)$,

$$\begin{aligned} \bar{v}_i(\theta) &= \max_{x \in A^J(\theta)} \theta(w^J b_i^J - c_i^J) + (1-\theta)x_i \\ &= \theta(w^J b_i^J - c_i^J) + (1-\theta)[1 - \underline{\pi}^K(\theta) - \hat{r}_i^J(\theta)] \end{aligned}$$

is her value of choosing θ. Since $\underline{\pi}^K(\theta)$ is the lowest share available for country K and $\hat{r}_i^J(\theta)$ is the smallest total reservation value of player i's coalition members for θ, $\bar{v}_i(\theta)$ exists. Moreover, since Θ is finite, a maximizer of $\bar{v}_i(\theta)$ exists, so let player i's optimal risk of war be

$$\theta_i^* = \min\left\{\arg\max_{\theta \in \Theta} \bar{v}_i(\theta)\right\}.$$

If there are multiple maximizers, then choose the smallest one. Lemma 4 describes optimal proposals for players in country J.

Lemma 4. *For all $i \in J$, the following proposal strategy x^i is optimal.*

- *If $z_i^J \le \bar{v}_i(\theta_i^*)$,*

$$x_\ell^i = \begin{cases} r_\ell^J(\theta_i^*) & \text{if } \ell \in C_i^J(\theta_i^*)\setminus\{i\} \\ 1 - \underline{\pi}^K(\theta_i^*) - \hat{r}_i^J(\theta_i^*) & \text{if } \ell = i \\ 0 & \text{otherwise.} \end{cases}$$

- *If $z_i^J > \bar{v}_i(\theta_i^*)$, $x_\ell^i = 0$ for all $\ell \in J$.*

Proof. If $z_i^J \le \bar{v}_i(\theta_i^*)$, then player $i \in J$ would propose $x^i \in X$ such that

$$x_\ell^i = \begin{cases} r_\ell^J(\theta_i^*) & \text{if } \ell \in C_i^J(\theta_i^*)\setminus\{i\} \\ 1 - \underline{\pi}^K(\theta_i^*) - \hat{r}_i^J(\theta_i^*) & \text{if } \ell = i \\ 0 & \text{otherwise.} \end{cases}$$

However, if $z_i^J > \bar{v}_i(\theta_i^*)$, then $i \in J$ would try to keep the status quo. Suppose i proposers $x^i \in X$ such that $x_\ell^j = 0$ for all $\ell \in J$. Then $\pi^K(x^i) = 1$, so $\phi(x^i) = 0$. If country J accepts x^i, then all $\ell \in J$ would receive 0. If country J rejects x^i, then all $\ell \in J$ would receive $z_\ell^J > 0$. Therefore, all ℓ would vote for rejection of x^i, and the status quo would survive, which is the outcome i desires. □

Player i has a choice between the status quo and the optimal lottery with risk θ_i^*. If she prefers the lottery, then she would make an optimal proposal corresponding to θ_i^*. Otherwise, she would maintain the status quo by making a proposal that would be rejected. Let player i choose the optimal lottery when she is indifferent between the status quo and the optimal lottery.

A.3 Existence

We have shown the existence of pure strategy Markov perfect equilibria that satisfy weak dominance by demonstrating the existence of optimal proposal strategies for all players.

Proposition 9. *The following strategy profile $s \in S$ is an equilibrium.*

- *For all $i \in J$, $s_i^J = (x^i, a_i^J)$ such that*

  – *if $z_i^J \leq \bar{v}_i(\theta_i^*)$,* $x_\ell^i = \begin{cases} r_\ell^J(\theta_i^*) & \text{if } \ell \in C_i^J(\theta_i^*) \backslash \{i\} \\ 1 - \underline{\pi}^K(\theta_i^*) - \hat{r}_i^J(\theta_i^*) & \text{if } \ell = i \\ 0 & \text{otherwise,} \end{cases}$

  – *if $z_i^J > \bar{v}_i(\theta_i^*)$, $x_\ell^i = 0$ for all $\ell \in J$,*

  – *for all $x \in X$,* $a_i^J(x) = \begin{cases} 1 & \text{if } z_i^J \leq \phi(x)[w^J b_i^J - c_i^J] + [1 - \phi(x)]x_i \\ 0 & \text{otherwise.} \end{cases}$

- *For all $i \in K$, $s_i^K = (y^i, a_i^K)$ such that*

  – *if $\pi < \hat{r}_i^K$, then* $y_\ell^i(\pi) = \begin{cases} \pi & \text{if } \ell = i \\ 0 & \text{otherwise,} \end{cases}$

  – *if $\pi \geq \hat{r}_i^K$, then* $y_\ell^i(\pi) = \begin{cases} r_\ell^K & \text{if } \ell \in C_i^K \backslash \{i\} \\ \pi - \sum_{\ell \in C_i^K \backslash \{i\}} r_\ell^K & \text{if } \ell = i \\ 0 & \text{otherwise,} \end{cases}$

  – *for all $y \in Y$,* $a_i^K(y) = \begin{cases} 1 & \text{if } y_i \geq w^K b_i^K - c_i^K \\ 0 & \text{otherwise.} \end{cases}$

Proof. Players' voting strategies are optimal by weak dominance. Lemmas 3 and 4 have shown that players' proposal strategies are optimal. □

Since the strategy profile in Proposition 9 is an equilibrium, there exists a pure strategy Markov perfect equilibrium that satisfies weak dominance, completing the proof of Proposition 1.

B Proofs

Lemma 1.

Proof. Each player $i \in J$ has optimal risk of war, θ_i^*. However, if she prefers the status quo to the optimal lottery with probability of war θ_i^*, then she would keep the status quo, i.e., she would choose war with probability zero. Otherwise, she would choose war with probability θ_i^*. Then player i' choice of the probability of war is μ_i^J. Since she is the proposer with probability p_i^J, the *ex ante* probability of war is $p^J \cdot \mu^J = \sum_{\ell=1}^{|J|} p_\ell^J \mu_\ell^J$. □

Lemma 2.

Proof. Suppose that there is a player $i \in J$ who plays proposal strategy $x^i \in A^J(1)$ in equilibrium. Then $\phi(x^i) = 1$, so $\pi^K(x^i) < \hat{r}^K_n$, and there exists coalition $C \in \mathcal{D}^J$ such that for all $\ell \in C$, $w^J b^J_\ell - c^J_\ell \geq z^J_\ell$ by weak dominance. Then i's equilibrium payoff would be $w^J b^J_i - c^J_i$.

Note that for all $\ell \in J$, $r^J_\ell(0) = z^J_\ell$. Suppose player i proposes $x \in X$ such that

$$x_\ell = \begin{cases} z^J_\ell & \text{if } \ell \in C\backslash\{i\} \\ 1 - \hat{r}^K_{|J|+1} - \sum_{\ell \in C\backslash\{i\}} z^J_\ell & \text{if } \ell = i \\ 0 & \text{otherwise,} \end{cases}$$

so $\pi^K(x) = \hat{r}^K_{|J|+1}$, and $\phi(x) = 0$. Then all members of coalition C vote for acceptance by weak dominance, and country K will accept it as well. So player i's payoff is $1 - \hat{r}^K_{|J|+1} - \sum_{\ell \in C\backslash\{i\}} z^J_\ell$. Since x^i is an equilibrium proposal, $1 - \hat{r}^K_{|J|+1} - \sum_{\ell \in C\backslash\{i\}} z^J_\ell \leq w^J b^J_i - c^J_i$. Recall that $b^L \in \Delta^{|L|-1}$, so $\sum_{\ell \in L} b^L_\ell = 1$. Then,

$$\begin{aligned} 1 &\leq w^J b^J_i - c^J_i + \hat{r}^K_{|J|+1} + \sum_{\ell \in C\backslash\{i\}} z^J_\ell \leq w^J b^J_i - c^J_i + \sum_{\ell \in K} r^K_\ell + \sum_{\ell \in C\backslash\{i\}} w^J b^J_\ell - c^J_\ell \\ &< w^J b^J_j + \sum_{\ell \in K} r^K_\ell + \sum_{\ell \in C\backslash\{i\}} w^J b^J_\ell \leq \sum_{\ell \in J} w^J b^J_\ell + \sum_{\ell \in K} w^K b^K_\ell \\ &\leq w^J \sum_{\ell \in J} b^J_\ell + w^K \sum_{\ell \in K} b^K_\ell \leq w^J + w^K \leq 1, \end{aligned}$$

so $1 < 1$, a contradiction. □

Proposition 2.

Proof. Take any $i \in J$ such that $p^J_i > 0$. In equilibrium, $x^i \notin A^J(1)$ by Lemma 2. If player i is the proposer, then $\theta^*_i \neq 1$, otherwise she would choose the status quo. The probability of war cannot be one when player i is the proposer, and the *ex ante* probability of war cannot be one, either. □

Proposition 3

Proof. Suppose $J = \{1\}$ and $K = \{2\}$. Since $p^K_2 = 1$, $\text{supp}(\phi) = \{0, 1\}$. Then $\Theta = \text{supp}(\phi)\backslash\{1\} = \{0\}$. If $z^J_1 \leq 1 - r^K_2$, then 1 would propose $x^1 \in X$ with $x^1_1 = 1 - r^K_2$ and accept it, and 2 would propose $1 - r^K_2$ to herself and accept it as well. If $z^J_1 > 1 - r^K_2$, then 1 would propose $x^1 \in X$ with $x^1_1 = 0$ and reject it to keep the status quo. Therefore, 1 would never make a proposal leading to war with a strictly positive probability. □

Proposition 4.

Proof. It is immediate that $p^J \cdot \mu^J = 0$ if and only if for all $i \in J$ with $p^J_i > 0$, $\mu^J_i = 0$. Also, for all $i \in J$, $\mu^J_i = 0$ if and only if $\theta^*_i = 0$ or $z^J_i > \bar{v}_i(\theta^*_i)$. □

Proposition 5.

Proof. Suppose that there are player $j \in J$ and player $k \in K$ such that $p_j^J > 0$, $p_{k+1}^K > 0$, and $\theta_k < \min\{\bar{\theta}_{j,k}, \hat{\theta}_{j,k}\}$. Since $p_{k+1}^K > 0$, $\theta_k \in (0,1)$. Note that $\bar{v}_j(0) = 1 - \hat{r}_{|J|+1}^K - \sum_{\ell \in C_j^J(0)\setminus\{j\}} z_\ell^J$,

$$\begin{aligned}
\bar{v}_j(\theta_k) &= \theta_k(w^J b_j^J - c_j^J) + (1-\theta_k)\left[1 - \sum_{\ell \in \tilde{C}_j^J(\theta_k)\setminus\{j\}} \frac{z_\ell^J - \theta_k(w^J b_\ell^J - c_\ell^J)}{1-\theta_k} - \hat{r}_{k+1}^K\right] \\
&= 1 - \hat{r}_{k+1}^K - \sum_{\ell \in \tilde{C}_j^J(\theta_k)\setminus\{j\}} z_\ell^J - \theta_k\left[1 - (w^J b_j^J - c_j^J) - \sum_{\ell \in \tilde{C}_j^J(\theta_k)\setminus\{j\}} (w^J b_\ell^J - c_\ell^J) - \hat{r}_{k+1}^K\right],
\end{aligned}$$

$\bar{v}_j(0) < \bar{v}_j(\theta_k) \Leftrightarrow \theta_k < \bar{\theta}_{j,k}$, and $z_j^J < \bar{v}_j(\theta_k) \Leftrightarrow \theta_k < \hat{\theta}_{j,k}$. Since $\theta_k < \min\{\bar{\theta}_{j,k}, \hat{\theta}_{j,k}\}$, $\bar{v}_j(0) < \bar{v}_j(\theta_k)$ and $z_j^J < \bar{v}_j(\theta_k)$. That is, player j strictly prefers θ_k to 0 and the status quo, so $\mu_j^J > 0$. Since $p_j^J > 0$, $p_j^J \mu_j^J > 0$ must be true, hence $p^J \cdot \mu^J > 0$. □

Proposition 6.

Proof. Suppose country J's voting rule is G-rule with the set of oligarchs $G^J \subseteq J$ and for all $\ell \in G^J$ and all $\theta \in \Theta$, $z_\ell^J > \theta(w^J b_\ell^J - c_\ell^J)$. We want to show that for all $j \in J$ such that $p_j^J > 0$ and all $\theta \in \Theta$, $G^J\setminus\{j\} = \tilde{C}_j^J(\theta)\setminus\{j\}$. Then for all $j \in J$ such that $p_j^J > 0$ and all $\theta \in \Theta$, $C_j^J(\theta) = G^J \bigcup \{j\}$. Since for all $\ell \in G^J = C_j^J(\theta)\setminus\{j\}$, $z_\ell^J > \theta(w^J b_\ell^J - c_\ell^J)$, $G^J\setminus\{j\} = C_j^J(\theta)\setminus\{j\} = \tilde{C}_j^J(\theta)\setminus\{j\}$. □

Proposition 7.

Proof. Let $\hat{r}_i^K = \hat{r}^K$ for all $i \in K$ such that $p_i^K > 0$. By weak dominance, country K will accept $y \in Y(\pi^K(x))$ if $\pi^K(x) \geq \hat{r}^K$, and rejects it otherwise. Then every proposer $j \in J$ can choose either zero or one as the probability of war. Nobody would choose one by Lemma 3, so the probability war must be zero for all proposers. □

Proposition 8.

Proof. Suppose country K is an oligarchy. Then $\hat{r}_i^K = \hat{r}^K$ for all $i \in K$ such that $p_i^K > 0$. Then war is not possible by Proposition 5. □

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