Gunboat Diplomacy

Political Bias, Trade Policy, and War

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Abstract

Countries with deep trading relationships rarely fight wars with one another. Here, I develop a theory of trade, war, and political bias, in which both trade and war are endogenous objects. Governments can rectify poor market access conditions abroad through war and subsequent regime change, in which the victorious country installs a liberal "puppet" government abroad. Trade policy bargaining is therefore conducted "in the shadow of power," with counterfactual wars shaping the policy choices that prevail in times of peace. When peace prevails, militarily weak countries are more open to trade than powerful ones, all else equal. Equilibrium trade policies balance domestic interests against military threats from abroad. War is less likely between liberal governments because they prefer less protectionist trade policies. As a result, trade flows and the probability of peace are positively correlated in equilibrium, even though trade does not cause peace.

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Introduction

Countries with deep trading relationships rarely fight wars with one another. Some argue this "commercial peace" is due to the pacifying effect of trade — trade causes peace.[1] Others say amicable political relations cause trade.[2] Trade is usually considered exogenous to conflicts of interest in international relations. Governments fight wars over territorial, ideological, or other non-economic conflicts. Trade intervenes to make these conflicts more costly.

Yet, trade policy is itself a central object of contention in international relations. Governments are mercantilist to some extent (Gawande, Krishna, and Olarreaga 2009). They desire some degree of protection at home and "open doors" abroad. Sometimes, governments are willing to fight wars to achieve these objectives.[3] In the 1850s, the U.S. gunboats compelled an autarkic Japanese government to open its markets. Britain and France prosecuted the Opium Wars (1839-1842; 1856-1860) to compel a recalcitrant Chinese government to reform its trade policies. Recently, a proposal to integrate the economies of Ukraine and the European Union led to war between Ukraine and Russia.[4] These episodes highlight linkages between trade policy and war. But such linkages may be more common, as the absence of war need not imply the absence of coercive bargaining (Fearon 1995).

Here, I develop a theory of trade policy bargaining in the shadow of military power, or "gunboat diplomacy." Trade flows and the probability of peace are positively correlated in equilibrium. This correlation emerges not because trade causes peace. Rather, liberal trade policy preferences generate incentives for both trade and peace. When peace prevails, latent military threats influence equilibrium trade policies. These balance domestic political-economic interests against military threats from abroad. Militarily weak countries are more open to trade than powerful ones, all else equal.

The model considers the interaction between two governments (home and foreign). The governments value consumers' welfare, firms' profits, and tariff revenue. These components of government utility depend on an underlying "new trade" international economy (Krugman 1980; Venables 1987). Governments differ in how much influence consumers have over policymaking.[5] I refer to this variation as the governments' degree of political *bias*.[6] Tariffs help firms by shielding them from competition, but raise prices for consumers.

[1] This literature is vast. See Gartzke and Zhang (2015) for a complete survey. Angell (1911), Polachek (1980), and Philippe, Mayer, and Thoenig (2008) are representative of this view.

[2] See, for example, Pollins (1989), Barbieri and Levy (1999), Benson and Niou (2007)

[3] See Findlay and O'Rourke (2007) for a chronicle of trade conflicts over the past millennium.

[4] In this case, Moscow conditioned its coercion on the trade policy choices of Kiev, see James Marson and Naftali Bendavid, "Ukraine to Delay Part of EU Pact Opposed by Russia," *The Wall Street Journal*, 12 September 2014.

[5] This setup mirrors Grossman and Helpman (1994).

[6] This phraseology borrows from Jackson and Morelli (2007). In their model, political bias determines the extent to which the pivotal decision maker internalizes the costs of war. Conceptually, bias is similar to the size of the selectorate in the model of Bueno De Mesquita et al. (2003).

Low bias or *liberal* governments prefer lower tariffs.

Governments care about trade policy choices abroad because of market access externalities (Ossa 2011, 2012). Firms' profits depend on their ability to access foreign markets. High tariffs shift profits from foreign to home firms. Therefore, firms on opposite sides of a border experience a conflict of interest over trade policy. Firms desire protection at home and liberalization abroad. The greater their bias, the more the governments internalize these interests.

As a consequence, governments themselves experience conflicts of interest over trade policy. The magnitudes of these conflicts of interest vary as a function of the governments' bias. When governments value consumer welfare, they prefer to adopt low barriers to trade. In doing so, they impose small market access externalities on their trading partners. Governments' relations are harmonious when they both hold liberal trade policy preferences. There is no incentive for conflict, militarized or otherwise. As governments become less liberal, conflicts of interest become more severe.

If a government wins a war, it earns the right to impose regime change and install a "puppet" government abroad.[7] Puppets open their markets to foreign firms, allowing victorious governments impose their trade policy preferences by force. This is the threat point governments leverage in bilateral trade policy negotiations. War sometimes occurs due to information frictions.

Two primary insights emerge from this environment. First, governments' degree of bias affects their propensity to trade and fight wars. When both governments are liberal, the costs of regime change never exceed its policy benefits. As a result, highly liberal governments never fight wars with one another. Their liberal preferences also result in liberal equilibrium trade policies. Naturally, lowering barriers to trade increases trade itself. The governments' preference compatibility produces a relationship between trade and peace. But this relationship is spurious — trade itself has no pacifying effect.

Second, even when governments avoid conflict, trade policies reflect the balance of power. Powerful countries can credibly threaten to impose regime change. They leverage this power to extract trade policy concessions and resist liberalization. After bargaining, powerful countries are more protectionist than weaker ones.

The model also rationalizes several well-established empirical facts in international relations. Bilateral trade tends to decrease before wars and rebound thereafter.[8] In the model, protectionist preference shocks decrease trade, but also increase the likelihood of war. As a consequence, periods of depressed trade correlate with war onset. Conversely, regime change following war causes a liberal preference shock to the losing country's government. Trade increases after wars, as in the data.

[7] See Owen IV (2002) for an empirical study of regime change.

[8] This relationship is shown in Figure 5 in the Appendix.

Some argue democracies have more liberal trade policy preferences than autocracies (Milner and Kubota 2005). Because consumers (voters) prefer free trade, they punish protectionist politicians (Mayer 1984; Grossman and Helpman 1996).[9] This provides a check on the protectionist influence of special interest groups. Translated into this framework, these theories deem democracies less biased than autocracies. If this "liberal democracy" hypothesis is true, the analysis of low bias governments extends to democratic dyads. The model then jointly rationalizes the democratic peace and democracies' propensity for trade openness.[10]

The theory's implications about power and protectionism are, as far as I know, novel. Of course, power and latent preferences interact to produce trade policy and conflict outcomes. An unconditional correlation may not uncover this relationship. I consider these empirical implications in more detail in the Discussion section. There, I also relate the theory to militarism, imperialism, and territorial conflict.

Antràs and Padró i Miquel (2011) and Carroll (2018) are two closely related papers that merit some discussion. Antràs and Padró i Miquel (2011) consider a similar model, in which foreign governments can interfere in the domestic political economy of trade. As in this model, foreign influence has a liberalizing effect. In the anarchy of world politics, however such influence can always -– in principle -– take the form of threats, displays, or uses of military force (Fearon 1997). Analyzing this form of influence allows me to relate the domestic political economy of trade to military power and conflict propensity. Carroll (2018) unifies militarized competition and economic exchange in a more general setting. There, countries' convert commodities into military power, which can in turn be employed to seize others' commodities. Military power is endogenous to the general equilibrium of the international economy. I take power as exogenous and focus on competition over trade *policy*. This more narrow focus allows me to incorporate domestic political economy considerations and make empirical predictions about power, trade policy, and war.

Others have considered policy competition in the shadow of power more generally. Bils and Spaniel (2017) study a model of coercive bargaining over the location of a spatial policy. Like the model studied here, governments vary in the location of their ideal points. They study how uncertainty over the states' ideal points affects conflict propensity. Here, I microfound governments' preferences with a political economy of trade policy and explore how domestic political economic shocks affect the international bargaining environment. This generates unique comparative statics and empirical implications.

[9] For a skeptical take on this mechanism, see Guisinger (2009) and Betz and Pond (2019).

[10] These facts are depicted in Figure 6 in the Appendix. For a recent review on the relationship between democracy and peace, see Reiter (2017). Milner and Kubota (2005) show democratization tends to lead to decreased protectionism.

Environment

Here and in the Analysis section, I relegate proofs and derivations of key quantities to the Appendix, in order to ease exposition. I first present the context in which governments bargain, followed by the international economy. The general equilibrium of the economy determines how trade policies affect prices, wages, and trade flows and the welfare of consumers, firms, and the governments that represent them. Proposition 1, presented in this section, states that given our assumptions, an *economic equilibrium* (Definition 2) will exist for any trade policy choices. Lemma 1 states that within this environment, government preferences over their own trade policies are well-behaved and admit interior optima. These serve as the governments ideal points' in the coercive bargaining game that determines equilibrium policies.

International Bargaining

Two governments, home (i) and foreign (j) bargain over their joint trade policies $\boldsymbol{\tau} = \{\tau_i, \tau_j\} \in [1, \bar{\tau}]^2$.[11] By controlling the degree of market access afforded to foreign firms, governments' trade policies impose externalities on one another. Government preferences depend on an exogenous parameter $a_i \in [0, \bar{a}]$, which controls the value these governments place on consumer welfare, relative to firm profits.[12] Government utility is denoted $G_i(\boldsymbol{\tau}|a_i)$.[13] Higher tariffs increase firm profits by shifting market share to local firms. This comes at the expense of consumers, however, who benefit from having access to a variety of products, home and foreign. Higher tariffs also harm foreign firms and the foreign government. This is the model's core conflict of interest. Each government would like to implement some degree of protectionism at home, while maintaining access to markets abroad.

Bargaining occurs in the shadow of power. Government i makes a take-it-or-leave-it offer $\tilde{\boldsymbol{\tau}} = \{\tilde{\tau}_i, \tilde{\tau}_j\}$ to Government j. Government j can either accept the offer or declare war, a choice denoted with $\omega \in \{\text{accept}, \text{war}\}$. This is a simple coercive bargaining framework following Fearon (1995). Here, however, war results in *regime change*, rather than a simple costly division of a fixed surplus. Regime change is modeled as a change in a vanquished government's *preferences*. If government i wins a war, it replaces the government of its counterpart, fixing its preference parameter at $\tilde{a}_j$. ρ denotes the probability that Government i is successful in a war for regime change.[14] c_i is the cost that government i must pay if a war occurs. $c_j > 0$ is held as private information. Government i believes c_j

[11] Here, $\bar{\tau}$ is an aribitrary prohibitively high tariff that shuts down bilateral trade.

[12] $\bar{a}$ is defined below.

[13] I develop the international economy from the home country's perspective, but analagous primitives exist for the foreign country.

[14] With complementary probability, the initiating government is overthrown. A more realistic formulation might allow for the possibility that no regime change occurs, with $\rho_i + \rho_j \leq 1$. While this "all or nothing" conception of war is stark, it simplifies the analysis and highlights the forces at play.

is distributed according to F where F is the uniform c.d.f. on $[\underline{c}_j, \bar{c}_j]$.

As is standard in bargaining models of war, the costs of war must be bounded, or the proposing country will never risk conflict. Assumption 1 formalizes this intuition.

Assumption 1: $\bar{c}_j \leq \kappa_j$ and $c_i < \kappa_i(\bar{c}_j)$ where κ_j and $\kappa_i(\bar{c}_j)$ are positive constants defined in the Appendix.

A strategy for Government i is an offer, $\tilde{\boldsymbol{\tau}}(a_i, c_i, \rho)$. A strategy for Government j, denoted $\omega(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho)$ is a mapping between this offer and a choice of whether or not to attempt regime change

$$\omega : \tilde{\boldsymbol{\tau}} \rightarrow \{\text{accept}, \text{war}\}$$

Let $\tilde{G}_k(\tilde{\boldsymbol{\tau}}, \omega | a_k, c_k, \rho)$ denote government k's utility as a function of these choice. From these objects we can define a subgame perfect bargaining equilibrium.

Definition 1: A subgame perfect *bargaining equilibrium* is pair of strategies, $\tilde{\boldsymbol{\tau}}^{\star}(a_i, c_i)$ and $\omega^{\star}(\tilde{\boldsymbol{\tau}}; a_j, c_j)$ such that

$$\omega^{\star}(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho) = \underset{\omega \in \{\text{accept,war}\}}{\arg\max} \ \tilde{G}_j\left(\tilde{\boldsymbol{\tau}}, \omega; a_j, c_j, \rho\right)$$

and

$$\tilde{\boldsymbol{\tau}}^{\star}(a_i, c_i, \rho) \in \underset{\boldsymbol{\tau} \in [1, \bar{\tau}]^2}{\arg\max} \mathbb{E}_{f(c_j)}\left[\tilde{G}_i\left(\tilde{\boldsymbol{\tau}}, \omega^{\star}(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho); a_i, c_i, \rho\right)\right]$$

International Economy

Government preferences in the game described above depend on the mechanics of the international economy. To simply the presentation and focus on the dynamics of coercive bargaining in this political economy, I consider the special case in which countries are mirror images of one another in terms of their economic primitives. Each country is inhabited by a representative consumer with labor endowment $L_i = L_j = L$. Consumers value varieties of manufactured goods and goods from an undifferentiated outside sector, which I'll call agriculture. By providing their labor to local producers of these goods, they earn an endogenous wage w_i. Consumers' income inclusive of tariff revenues $r_i(\tau_i)$ is $I_i(\tau_i) = w_i L_i + r_i(\tau_i)$. A unit of labor can produce one unit of both differentiated goods and agricultural goods. There is a mass of firms of measure 1 in each economy which produce differentiated manufactured goods, indexed ν_i.[15] Agricultural goods are produced competitively. The setup borrows from Venables (1987) and Ossa (2012).

[15]In a completely general equilibrium, this quantity would also be an endogenous object. Fixing the number of firms allows each firm to derive positive profits, providing biased governments with an incentive to implement a positive tariff. In this sense, the model is in a "short run" equilibrium in which profits have not yet been competed away.

Tariffs and Prices

Firms engage in monopolistic competition, setting prices in each market to maximize profits, given the preferences of consumers. Governments can shift the prices that consumers pay for foreign goods by charging a uniform import tariff on manufactured goods, $\tau_i - 1$. This drives a wedge between the price set by foreign firms, $p_j(\nu_j)$, and the price paid by consumers for foreign goods. The price of foreign goods in the home market is $p_{ij}(\nu_j) = \tau_i p_j(\nu_j)$. The price in the agricultural sector serves as the numeraire, $p_i^y = 1$. The government collects the revenue raised from tariffs.

Consumption

Consumer preferences over agricultural goods Y_i and aggregated differentiated varieties X_i are Cobb-Douglas, where an exogenous parameter $\alpha \in [0, 1]$ controls the consumers' relative preference for differentiated varieties. Consumers therefore solve the following problem

$$\begin{aligned} \max_{X_i, Y_i} \quad & X_i^{\alpha} Y_i^{1-\alpha} \\ \text{subject to} \quad & P_i X_i + Y_i \leq w_i L \end{aligned} \tag{1}$$

where X_i is a CES aggregate of manufactured goods x, à la Dixit and Stiglitz (1977). Consumers value each differentiated good equally. Home and foreign goods are distinguished only by their price. Let $x_{ij}(\nu)$ denote the quantity of differentiated goods produced in country j that are consumed in country i. Consumer's utility over differentiated goods is

$$X_i = \left(\int_{\nu_i} x_{ii}(\nu_i)^{\frac{\sigma-1}{\sigma}} d\nu_i + \int_{\nu_j} x_{ij}(\nu_j)^{\frac{\sigma-1}{\sigma}} d\nu_j \right)^{\frac{\sigma}{\sigma-1}} \tag{2}$$

where $\sigma > 1$ is the elasticity of substitution between varieties. The real price level of differentiated goods in each country is described by the CES exact price index

$$P_i(\tau_i) = \left(\int_{\nu_i} p_{ii}(\nu_i)^{1-\sigma} d\nu_i + \int_{\nu_j} p_{ij}(\nu_j)^{1-\sigma} d\nu_j \right)^{\frac{1}{1-\sigma}} \tag{3}$$

Equilibrium demand for manufactured goods from j in i is

$$x_{ij}^{\star}(\nu_j) = p_{ij}(\nu_j)^{-\sigma} P_i^{\sigma-1} \alpha I_i \tag{4}$$

With prices of agricultural goods serving as numeraire, $Y_i = (1-\alpha) I_i(\tau_i)$ and consumer indirect utility is

$$V_i(\tau_i) = \alpha^{\alpha} (1-\alpha)^{1-\alpha} \frac{I_i(\tau_i)}{P_i(\tau_i)^{\alpha}} \tag{5}$$

Production

Firms set prices to maximize profits across home and foreign markets, given consumer demand. Because all firms in country i face the same demand curves at home and abroad, they all set the same factory-gate price. The quantity that each firm i produces for market j is equal to the demand for i's goods in j, $x^\star_{ij}(\nu_j)$. It takes one unit of labor to produce each unit of a manufactured good. The firms' problem is given by

$$\begin{aligned} \max_{p_i(\nu_i)} \quad & \Pi_i\left(p_i(\nu_i)\right) = \left(p_i(\nu_i) - w_i\right)\left(x^\star_{ii}(\nu_i) + x^\star_{ji}(\nu_i)\right) \\ \text{subject to} \quad & x^\star_{ii}(\nu_i) = p_i(\nu_i)^{-\sigma} P_i(\tau_i)^{\sigma-1}\alpha I_i(\tau_i) \\ & x^\star_{ji}(\nu_i) = \left(\tau_j p_i(\nu_i)\right)^{-\sigma} P_j(\tau_j)^{\sigma-1}\alpha I_i(\tau_j) \end{aligned} \tag{6}$$

This problem yields equilibrium prices

$$p^\star_i(\nu_i) = \frac{\sigma}{\sigma - 1} w_i \tag{7}$$

Since prices are constant across firms, I suppress the variety indices and write $p^\star_i(\nu_i) = p^\star_i$. Total consumption of manufactured goods from i in j is

$$x^\star_{ji}(\tau_j) = \int_{\nu_i} x^\star_{ji}(\nu_i) d\nu_i$$

Total profits for all firms in country i can then be computed as

$$\Pi_i(\tau_i, \tau_j) = \int_{v_i} \Pi_i(p_i(\nu_i)) = \left(p^\star_i - w_i\right)\left(x^\star_{ii}(\tau_i) + x^\star_{ji}(\tau_j)\right) \tag{8}$$

By raising the price of foreign varieties, tariffs shift profits from foreign to home producers. As tariffs get large ($\tau_j \to \bar{\tau}$), demand for foreign manufactured goods contracts ($x^\star_{ji}(\tau_j) \to 0$). Consumers substitute toward home varieties ($p^\star_j x^\star_{jj}(\tau_j) \to \alpha I_j(\tau_j)$), increasing local profits. While consumers are harmed by the imposition of tariffs ($\frac{\partial V_j}{\partial \tau_j} < 0$), local producers benefit. The preferences of home consumers are aligned with those of *foreign* firms, both of which desire liberal trade policies from the home government.

I assume that firms' welfare is dependent only on their profits, and not influenced by the aggregate price level ($P_i(\tau_i)$) within the economy. This is consistent with the special case of Grossman and Helpman (1994) in which firm owners are "small" in the broader population. A more complex preference structure would emerge if this assumption were violated, or if firms employed intermediate goods in production.

Tariff Revenue

For every unit of manufactured goods imported, the government collects $(\tau_i - 1)p^\star_j$ in tariff revenue. Total tariff revenue can be written

$$r_i(\tau_i) = (\tau_i - 1)p^\star_j x^\star_{ij}(\tau_i p^\star_j) \tag{9}$$

Economic Equilibrium

Consumers lend their labor endowment to the manufacturing and agricultural sectors in order to maximize their income. If both sectors are active, then $w_i = 1$ because the agricultural sector is competitive and serves as numeraire. Let L_i^x denote the amount of labor i allocates toward manufacturing and L_i^y the amount of labor i allocates toward agriculture. Let $\boldsymbol{w} = \{w_i, w_j\}$ and $\boldsymbol{L} = \{L_i^x, L_i^y\}_{i \in \{i,j\}}$.

Definition 2: An *economic equilibrium* is a function $h : \{\boldsymbol{\tau}\} \rightarrow \{\boldsymbol{w}, \boldsymbol{L}\}$ mapping trade policy choices to endogenous wages and labor allocations such that goods and factor markets clear given equilibrium prices and corresponding demands.

There is a natural conflict of interest between consumers and producers within the economy. Producers prefer higher prices and consumers prefer lower prices. If the agricultural sector is active, it pins down wages and nullifies incentives for governments to employ tariffs for purposes of manipulating the terms of trade. Assumption 2 guarantees that the agricultural sector will remain active regardless of the governments' choices of trade policies. Substantively, it requires that consumers spend a large enough proportion of their income on agricultural goods to prevent the specialization of either country in the production of manufactured goods. This allows me to focus analysis on profit shifting incentives for trade policy, as in Ossa (2012).

Assumption 2:

$$\alpha < \frac{2}{3}\frac{\sigma}{\sigma - 1}$$

Proposition 1: If Assumption 2 is satisfied, then a unique economic equilibrium exists with $L_i^x, L_i^y, L_j^x, L_j^y > 0$ and $w_i = w_j = 1$ for all $\boldsymbol{\tau} \in [1, \bar{\tau}]^2$.[16]

Government Preferences

Governments value a combination of consumer welfare and producer profits. With these quantities derived, we can write

$$G_i(\boldsymbol{\tau}|a_i) = a_i V_i(\tau_i) + \Pi_i(\tau_i, \tau_j) \tag{10}$$

The exogenous parameter a_i controls the relative weight the government places on consumer welfare, relative to profits and revenue. This conception of government preferences follows Grossman and Helpman (1994), in which a_i represents the value the government places on campaign contributions relative to consumer welfare.[17]

[16] These conditions are enumerated in Appendix B.

[17] In their model, firms lobby for protective tariffs (or export subsidies), promising campaign contributions in exchange for policy deviations from the consumer welfare-maximizing ideal. Grossman and Helpman (1996) provide additional microfoundations for this objective function in a model of electoral competition, in which the government can employ campaign contributions to influence the vote choice of "uneducated" voters.

I take a_i as a measure of the representativeness of i's government. When a_i is small (high bias), the government privileges the narrow interests of firms and its own revenue. As a_i gets larger (low bias), the welfare of consumers plays a larger role in determining the governments' preferences. If democracies are more sensitive to the interests of consumers, then we would expect them to have higher values of a_i than autocracies.

I focus the analysis on the interesting case in which these mixed motives cause the government to prefer some degree of protection. Assumption 3 guarantees that the government would adopt a positive tariff in a world in which coercive bargaining did not occur. This requires that the government's weight on consumer welfare be sufficiently small.[18]

Assumption 3: $a_i \in (\underline{a}, \bar{a}]$ for all i where $\underline{a}$ is a positive constant defined in Appendix C and $\bar{a}$ is an arbitrarily large but finite number.

Notably, $\underline{a}$ depends positively on the consumers' elasticity of substitution, σ. As σ increases, manufactured varieties become more substitutable, and foreign varieties become less valuable to consumers. Governments therefore prefer higher tariffs, all else equal. $\underline{a}$ increases with σ in order to ensure that no government prefers prohibitive tariffs.

Lemma 1: If Assumption 3 is satisfied, then for all $a_i \in (\underline{a}, \bar{a}]$, there exists a unique $\tau_i^\star(a_i) \in [1, \bar{\tau})$ satisfying

$$\tau_i^\star(a_i) = \underset{\tau_i \in [1, \bar{\tau}]}{\arg\max}\, G_i(\tau_i; a_i)$$

where $\tau_i^\star(a_i)$ does not depend on τ_j.

Analysis

Recall from Definition 1 that a bargaining equilibrium is a trade policy offer from the home country, and a decision of whether or not to declare war, given this offer, from the foreign country. This section analyzes how these equilibrium choices vary as a function of the governments' bias types.

The results can be summarized as follows. Because they internalize the welfare of consumers, liberal governments prefer to adopt lower tariffs (Lemma 2). If governments were unable to bargain, a non-cooperative equilibrium (Definition 3) would emerge in which governments simply implemented their ideal tariffs. This non-cooperative equilibrium serves as a baseline from which governments compare offers in a bargaining equilibrium (Definition 1). As governments' degree of bias increases, they impose larger and larger externalities on one another in a non-cooperative equilibrium. This increases the degree of conflict of interest between the governments (Definition 4), and makes regime change

[18] Even in today's relatively open international economy, it is rare to observe governments dismantling all barriers to trade. Those governments that adopt low tariff barriers often substitute with higher non-tariff barriers to trade. See Kono (2006).

relatively more appealing. Liberal governments experience smaller conflicts of interest with one another (Proposition 3) which makes them unwilling to initiate wars (Proposition 4). Because they prefer lower trade barriers, liberal governments also trade more in any bargaining equilibrium (Proposition 6). Finally, militarily powerful governments adopt higher barriers to trade in equilibrium (Proposition 5)

Preferences

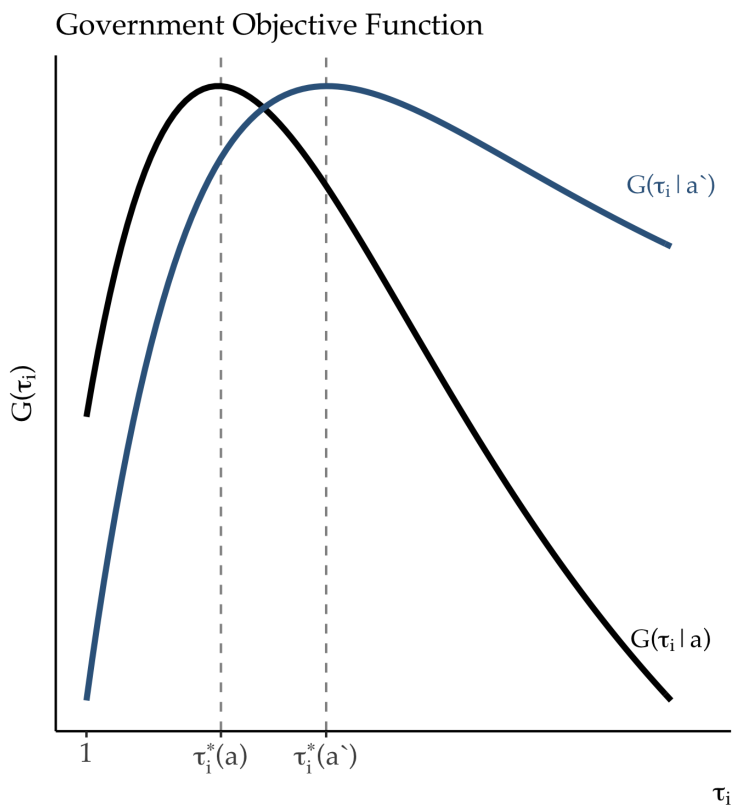


Figure 1: Government preferences over own tariff rates with $a > a'$

Figure 1 depicts the governments' objective functions as a function of their own tariff choice, τ_i. As the government becomes more representative, the peak of the curve shifts to the left, indicating that the government prefers a lower tariff. This is a natural result. As the government becomes more representative, it values the welfare of the consumer more and more. This pushes the government to adopt a policy that is closer to the consumer's ideal.

Figure 2 depicts the government's welfare in $\{\tau_i, \tau_j\}$ space. By decreasing the market access afforded to firms in i, non-zero tariffs in j strictly decrease the government's welfare. For any given τ_i, the government's welfare is increasing as τ_j decreases.

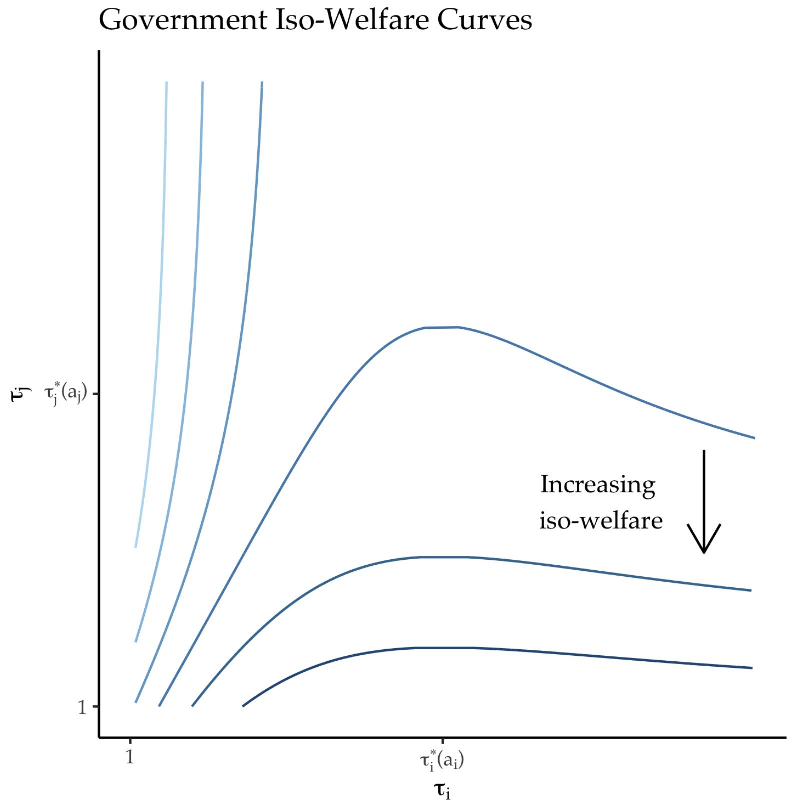


Figure 2: Government iso-welfare curve over home and foreign tariff rates

Lemma 2: $G_i(\tau_j)$ is strictly decreasing in τ_j.

If the governments were prohibited from bargaining, they would each simply choose the policy that maximized their utility, taking the other country's policy choice as given.

Definition 3: A *noncooperative equilibrium* is a pair of policies $\left\{\tau_i^\star(a_i), \tau_j^\star(a_j)\right\}$ such that

$$\tau_i^\star(a_i) = \underset{\tau_i \in [1, \bar{\tau}]}{\arg\max}\, G_i(\tau_i; a_i)$$

and

$$\tau_j^\star(a_j) = \underset{\tau_j \in [1, \bar{\tau}]}{\arg\max}\, G_j(\tau_j; a_j)$$

Lemma 1 ensures that these optimal policies do not depend on the other government's policy choice. Our next result shows that as governments become more liberal, their optimal tariffs fall.

Lemma 3: $\tau_i^\star(a_i)$ is strictly decreasing in a_i.

Figure 3 depicts each governments' best response curves through the policy space. Because the governments' optimal choices do not depend on one another's policy choice, their

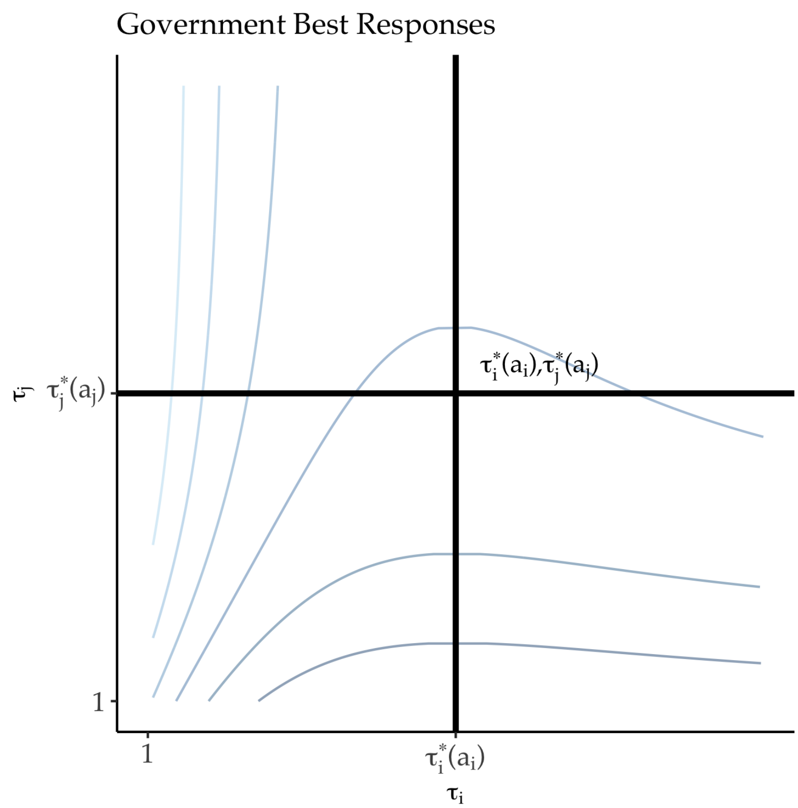


Figure 3: Government best response functions

best response curves are straight lines. Their intersection constitutes the noncooperative equilibrium. As the governments preferences become more biased, these curves shift outward, resulting in a more autarkic noncooperative equilibrium.

Regime Change

It is clear that each government cares indirectly about the preferences of its bargaining partner. More welfare-concious governments adopt lower barriers to trade (Lemma 3) in a non-cooperative equilibrium, which benefits governments abroad by providing greater market access to their firms. If each government were able to choose the preferences of their negotiating partner, they would do so in order to minimize trade barriers. This is the purpose of regime change in this model. If a government wins a war, it earns the right to replace the government with a puppet with more "dovish" preferences. Regime change is therefore used instrumentally to pry open international markets. Let $a^\star \in (\underline{a}, \bar{a}]$ denote the type of the optimal puppet government.

The optimal puppet's type solves

$$\max_{a_j \in (\underline{a}, \bar{a}]} G_i(\tau_i^\star(a_i), \tau_j^\star(a_j); a_i)$$

Proposition 2: $a^\star = \bar{a}$

If a government wins a war, it will replace the vanquished government with a maximimally-responsive puppet. This government will adopt no trade barriers, providing maximal market access for the victorious country's firms. This is the threat point that governments leverage in international coercive bargaining.

Conflicts of Interest

If a government wins a war it adopts its optimal policy and enjoys complete access to the markets of its trading partner. This best case scenario yields the government utility

$$\bar{G}_i(a_i) = G_i(\tau_i^\star(a_i), \tau_j^\star(\bar{a}); a_i)$$

If a government loses a war, it is replaced by a puppet and must suffer under the policies implemented by the puppet regime. This is consistent with a notion of the government as a particular amalgamation of social actors that continues to exist at the conclusion of a war. The vanquished government yields utility

$$\underline{G}_i(a_i, a_j) = G_i(\tau_i^\star(\bar{a}), \tau_j^\star(a_j); a_i)$$

These outcomes represent upper and lower utility bounds on the outcome of any coercive negotiation. Each government can be made no worse off than if it were to lose a war. And each government can secure no better bargaining outcome than if they were to (costlessly) win a war for regime change. The welfare difference between these two scenarios is taken to be i's *conflict of interest* with j. Note that this conflict of interest, unlike standard models of bargaining and war, need not be symmetric. The "pie" at stake in the negotiation over trade policies may be valued differently by each government — i's preference intensity may be stronger than j's or vice versa. This variation in preference intensity, combined with variable military power, determines bargaining outcomes.

Definition 4: The magnitude of government i's *conflict of interest* with government j is

$$\Gamma_i(a_i, a_j) = \bar{G}_i(a_i) - \underline{G}_i(a_i, a_j) \tag{11}$$

Proposition 3: $\Gamma_i(a_i, a_j)$ is decreasing in a_i, a_j

Proposition 3 states that as government i becomes more welfare-concious, the magnitude of its conflict of interest decreases. Likewise, as government j becomes more welfare-concious, i's conflict of interest with it decreases. As government i becomes more welfare-concious, it prefers less protectionism. This decreases the difference between i's ideal policy and the (free trading) policy that will be imposed upon it if j is victorious in a war. As j becomes more welfare-concious, it imposes smaller market access externalities on i. Regime change becomes relatively less appealing, because the distance between j's preferred policy and the policy that a puppet would impose shrinks. In the corner case where $a_i = a_j = \bar{a}$, the conflict of interest evaporates – puppets would implement the exact same policies as the sitting governments.

Bargaining

These conflicts of interest structure what sets of policies i will offer and what offers j will prefer to war. Working backward, recall from Definition 1 that $\omega^\star(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho)$ is a function that takes an offer from i and returns a choice of whether or not to declare war. j's utility for war is given by

$$\hat{G}_j(a_j, a_i) = \underbrace{(1-\rho)\bar{G}_j(a_j) + \rho \underline{G}_j(a_j, a_i)}_{W_j(a_j, a_i)} - c_j = (1-\rho)\Gamma_j(a_j, a_i) + \underline{G}_j(a_j, a_i) - c_j$$

Note that j's utility can be written in terms of it's conflict of interest with i. j will prefer war to i's offer whenever

$$\hat{G}_j(a_j, a_i) \geq G_j(\tilde{\boldsymbol{\tau}}; a_j)$$

This condition allows us to characterize $\omega^\star(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho)$.

Lemma 4:

$$\omega^\star(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho) = \begin{cases} \text{war} & \text{if } \hat{G}_j(a_j, a_i) \geq G_j(\tilde{\boldsymbol{\tau}}; a_j) \\ \text{accept} & \text{otherwise} \end{cases}$$

If j's conflict of interest with i is small enough, then i can simply offer its ideal point and all cost types of j will accept.

Lemma 5: If

$$W_j(a_j, a_i) - G_j(\tau_j^\star(\bar{a}), \tau_i^\star(a_i); a_j) = \Gamma_j(a_j, a_i) \leq \underline{c}_j$$

then

$$\tilde{\boldsymbol{\tau}}^\star = \{\tau_i^\star(a_i), \tau_i^\star(\bar{a})\}$$

and

$$\omega^\star(\tau_i^\star(a_i), \tau_j^\star(\bar{a}); a_j, c_j, \rho) = \text{accept}$$

for all $c_j \in [\underline{c}_j, \bar{c}_j]$.

Given our assumptions on the costs of war, we can always find a cutpoint bias type for the foreign country such that all types more liberal than the cutpoint accept i's ideal point.

Lemma 6 (Zone of Peace): For every $\underline{c}_j \in [0, \bar{c}_j)$ there exists a $a_j(\underline{c}_j, a_i)$ such that for all $a_j \in [a_j(\underline{c}_j, a_i), \bar{a})$ the probability of war is 0.

Lemma 6 proves the existence of a "Zone of Peace" – a set of foreign bias types that never fight in equilibrium. Combining this observation with the fact that j's conflict of interest with i is decreasing in i's bias type yields our first core result. Namely, that the size of this zone of peace is increasing as i becomes more liberal in its policy preferences.

Proposition 4 (Liberal Peace): $a_j(\underline{c}_j, a_i)$ is weakly decreasing in a_i.

Whenever $a_j \geq a_j(\underline{c}_j, a_i)$, i offers its ideal point which is accepted by j. This guarantees peace. j is more willing to accept i's ideal point as it becomes more liberal, because i's ideal policy imposes smaller and smaller externalities on j. This generates a "Liberal Peace."

If $a_j < a_j(\underline{c}_j, a_i)$, however, then i faces a risk-return tradeoff (Powell 1999). Offers closer to i's ideal point yield higher utility conditional on acceptance, but also generate a higher risk of war. Here, the shadow of power affects equilibrium policies.

For any offer, the probability that j will declare war is given by

$$\Pr\left\{c_j \leq W_j(a_j, a_i) - G_j(\tilde{\boldsymbol{\tau}}; a_j) | \tilde{\boldsymbol{\tau}}, a_i, a_j\right\} = F\left(W_j(a_j, a_i) - G_j(\tilde{\boldsymbol{\tau}}; a_j)\right) \tag{12}$$

With this quantity known, we can work to characterize i's offer function, $\tilde{\boldsymbol{\tau}}^\star(a_i)$. If war occurs, i receives utility

$$\hat{G}_i(a_i, a_j) = \rho \Gamma_i(a_i, a_j) + \underline{G}_i(a_i, a_j) - c_i$$

With the probability of war given in Equation 12, we can write i's utility for any offer as

$$\begin{aligned} \tilde{G}_i\left(\tilde{\boldsymbol{\tau}}, \omega^\star(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho); a_i, c_i, \rho\right) = &\underbrace{\left(1 - F\left(W_j(a_j, a_i) - G_j(\tilde{\boldsymbol{\tau}}; a_j)\right)\right)\left(G_i(\tilde{\boldsymbol{\tau}}; a_i)\right)}_{\neg \text{war}} + \\ &\underbrace{F\left(W_j(a_j, a_i) - G_j(\tilde{\boldsymbol{\tau}}; a_j)\right)\left(\hat{G}_i(a_i, a_j)\right)}_{\text{war}} \end{aligned} \tag{13}$$

By Definition 1, i's equilibrium offer will maximize this objective function. Lemmas 7 and 8 state that an offer will lie inside the pareto set and that proposed trade policies will be weakly more liberal than those in a noncooperative equilibrium (Definition 3).

Definition 5: The *pareto set* is given by

$$\mathcal{P} = \left\{\tilde{\boldsymbol{\tau}} \in [1, \bar{\tau}]^2 | \tilde{\boldsymbol{\tau}} \in \underset{\tilde{\boldsymbol{\tau}} \in [1, \bar{\tau}]^2}{\arg\max}\, \lambda G_i(\tilde{\boldsymbol{\tau}}; a_i) + (1 - \lambda) G_j(\tilde{\boldsymbol{\tau}}; a_j)\right\}$$

for some $\lambda \in [0, 1]$.

Lemma 7: $\tilde{\boldsymbol{\tau}}^\star(a_i, c_i, \rho) \in \mathcal{P}$

Lemma 8: $\tilde{\boldsymbol{\tau}} = \left\{\tilde{\tau}_i^\star, \tilde{\tau}_j^\star\right\} \leq \left\{\tau_i^\star(a_i, c_i, \rho), \tau_j^\star(a_i, c_i, \rho)\right\}$ with $\leq$ the natural vector order.

The bargaining enviroment is depicted in Figure 4. Government i's ideal point lies in the bottom right corner of the bargaining space, in which j opens its markets completely

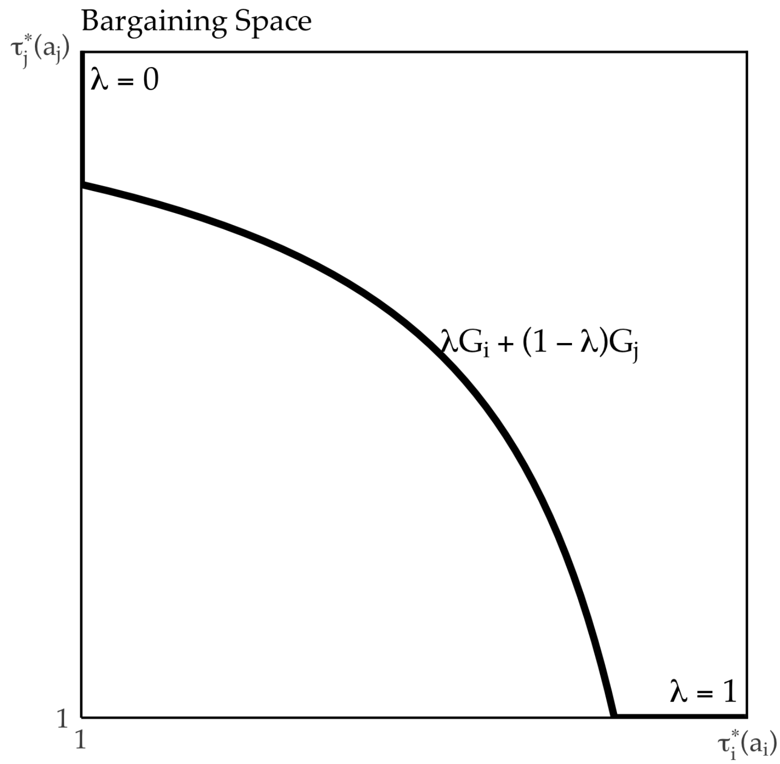


Figure 4: Bargaining space and pareto set

and i implements $\tau_i^\star(a_i, c_i, \rho)$. Government j's ideal point, conversely, lies in the top left corner. By Lemma 7, i's offer will lie along the dark line connecting these ideal points. Government i's utility is strictly decreasing as it moves along the pareto set toward j's ideal point.[19]

How i chooses to resolve the risk-return tradeoff depends on its military power. Relatively powerful governments can implement their ideal point with high probability through war. They run little risk that the foreign government would reject an offer close to their ideal point. Conversely, weak governments are likely to lose a war over market access, and therefore must concede more to their counterpart. Military power therefore affects trade policy. Because i's ideal point features more protection of its own market than j's ideal point, as i becomes more powerful, it proposes higher levels of protection for itself. If this offer is accepted and peace prevails, powerful countries will be more closed to international trade.

Proposition 5 (Power and Protection): If $a_j < a_j(\underline{c}_j, a_i)$ and peace prevails, government i's trade barriers are increasing in its military strength. $\tilde{\tau}_i^\star(a_i, c_i, \rho)$ is increasing in

[19]This observation follows from Lemmas 1 and 2.

ρ.

When peace prevails, liberal governments also settle on more open trade policy regimes overall. Naturally, reducing trade costs increases trade between the governments.

Proposition 6 (Liberal Trade): In a peaceful bargaining equilibrium (Definition 1), trade is weakly increasing in a_i and a_j.

Discussion

Jointly, Propositions 4 and 6 establish that the most liberal governments never fight and also trade more than illiberal governments. Trade policy determines trade flows and generates conflicts between governments. Economic integration is not exogenously given. Participation in the international economy is a choice. Trade policy generates large trade frictions, even in today's globalized era (Anderson and Van Wincoop 2004).

These policy choices are the object of contention between governments. Protectionist barriers cause conflicts of interest between market access-motivated governments. McDonald (2004) shows that measures of protection are better predictors of conflict than trade.[20] Trade can persist in the presence of trade barriers. For example, World War I broke out during an era of rapid globalization. McDonald and Sweeney (2007) show that the great powers maintained high protective tariffs during this era. These tariffs provided a rationale for conflict over market access conditions, despite high trade volumes. Chatagnier and Kavakli (2015) examine governments whose firms compete in the same export markets. They show these governments are more likely to experience international conflicts.

Firms are the source of belligerent foreign policies in the theory. In Imperial Germany, "iron and rye" advocated for protectionism and expansionist foreign policies (Gerschenkron 1943). Similar domestic political coalitions emerged in the United States. Fordham (2019) traces the development of the United States as a naval power in the 19th century. He finds protectionist interests were the strongest advocates for the nascent U.S. fleet. At the time, U.S. trade policy was protectionist. Washington also sought preferential market access in developing countries, particularly in Latin America. The fleet served to protect these objectives against military interference from Europe. Commercial objectives also motivated Washington at the dawn of the Cold War (Fordham 1998). Under Soviet influence, Eastern Europe became closed to trade with the United States. Congressmen representing export-oriented districts tended to support an aggressive military posture toward the Soviet Union. The goal of export-oriented firms, argues Fordham, was to secure market access in Europe and Japan. In the post-Cold War era, Congressmen representing import-exposed districts have tended to support hostile foreign policies toward China, whose exports (plausibly) harm their constituent firms (Kleinberg and Fordham 2013).

[20] His analysis covers the years 1960-2000.

Domestic political institutions connect these underlying economic interests to government preferences. I treat these institutions in reduced form, focusing on variation in consumers' ability to influence policy. Consumers pacify foreign policy preferences. If democratic political institutions privilege the interests of consumers, then Propositions 4 and 6 support a commercial-democratic peace. Observational analyses uncover positive correlations between democracy, trade, and peace because of the trade policy preferences of democracies.[21] Liberal preferences increase trade and reduce conflict.

Observed trade policies are not a sufficient statistic for government preferences, however. Proposition 5 states that relative military power effects trade policy in peacetime. Governments' trade policies reflect their preferences only up to a war constraint. Liberal *policies* do not imply liberal *preferences*. Several studies have employed Grossman and Helpman (1994) and Grossman and Helpman (1995) to structurally estimate governments' welfare-consciousness (Goldberg and Maggi 1999; Mitra, Thomakos, and Ulubasoglu 2006; Gawande, Krishna, and Olarreaga 2009, 2012, 2015; Ossa 2014). International strategic considerations are effectively absent from these models. The domestic political economy determines outcomes. Therefore, a simple inversion on the policy function recovers preferences. My model highlights the importance of the war constraint. Militarily weak, illiberal governments adopt the same policies as liberal governments.

Territory plays a central role in theories and empirical studies of interstate conflict.[22] Wars often redraw international borders. In doing so, they also relocate customs barriers and modify the trade policies of captured regions. Gunboat diplomacy and territorial conflict are plausibly substitutes for one another. Governments can acquire foreign market access through territorial annexation or regime change. Territory and trade policy are not exclusive realms of international conflict.

Conclusion

The model envisions a stylized world. Two governments preside over identical economies exogenous military capacities and political bias types. If the countries were heterogeneous in market size (L_i), the economically larger country would possess an additional source of bargaining power. Whether this outside option affects bargaining outcomes would depend on the distribution of economic and military strength. This analysis might shed light the substitutability of economic and military coercion (Hirschman 1945).

Military power (ρ) is also treated as exogenous here. If military investment was possible, ρ

[21] See Oneal and Russett (1999) for a representative study.

[22] The "pie" at stake in bargaining models of war is often motivated as the distribution of territory between the countries. Empirical studies of territorial conflict often conceptualize territorial control as a consumption good, rather than a means to implement policy. See, for example, Caselli, Morelli, and Rohner (2015). For a review of this literature, see Schultz (2015).

would depend on economic and political primitives.[23] Because they have more at stake in bargaining, illiberal governments might invest more in their militaries. This results would hold especially if the costs of militarization are borne by consumers (Jackson and Morelli 2007; Chapman, McDonald, and Moser 2015). This variant might explain why democracies spend less on their militaries (Fordham and Walker 2005).

If the game developed here was dynamic, regime type itself would be an endogenous object. Wars impose puppet governments more liberal than those that preceded them. The world would democratize over time, as conquering powers installed liberal governments abroad. (McDonald 2015).

While imperial powers sometimes seek to democratize defeated countries, they often instead install allied strongmen or colonial administrations. If the liberal democracy hypothesis holds, these actions are puzzling. Controlling these governments presents agency problem absent in relations with liberal regimes. Liberal regimes adopt liberal trade policies of their own accord. Conquerers must incentivize their agents to adopt these policies.

A multi-country variant of this framework might provide a rationale for this behavior. Consider a world populated with three countries — A, B, and C. For firms in A, an ideal policy for B is one that is open to trade with A but closed to trade from C. This allows A's firms to maximize their share of B's market.[24] In other words, firms seek *preferential* access to foreign markets. It is immediate that a low bias government would not provide such preferential access. Coercing governments might be willing to suffer the agency costs of obtaining preferential access to B if B's market was valuable enough. This framework might be profitably applied to the study of imperialism (Gallagher and Robinson 1953).

Finally, the theory highlights an underappreciated prerequisite for international conflict. For governments to war with one another, they must both 1) possess conflicts of interest large enough to justify the costs of conflict and 2) be unable to resolve these conflicts peacefully (Jackson and Morelli 2009b). Theoretical research on international conflict has focused on the latter. In abstracting away from the exact nature of the dispute at hand, these models direct our attention away from the question of why international disputes emerge in the first place. What do governments want, and why do their objectives bring them into conflict with one another (Moravcsik 1997; Coe, n.d.)? While war is rare in international politics, antagonistic and militarized political relations are common. Focusing attention on the conflicts of interest underlying these antagonisms might help explain their emergence and termination.

[23]See, for example, Jackson and Morelli (2009a).

[24]This assumes, of course, that B cannot tax its own firms.

Appendix

A: Trade, War, and Democracy: Empirical Facts

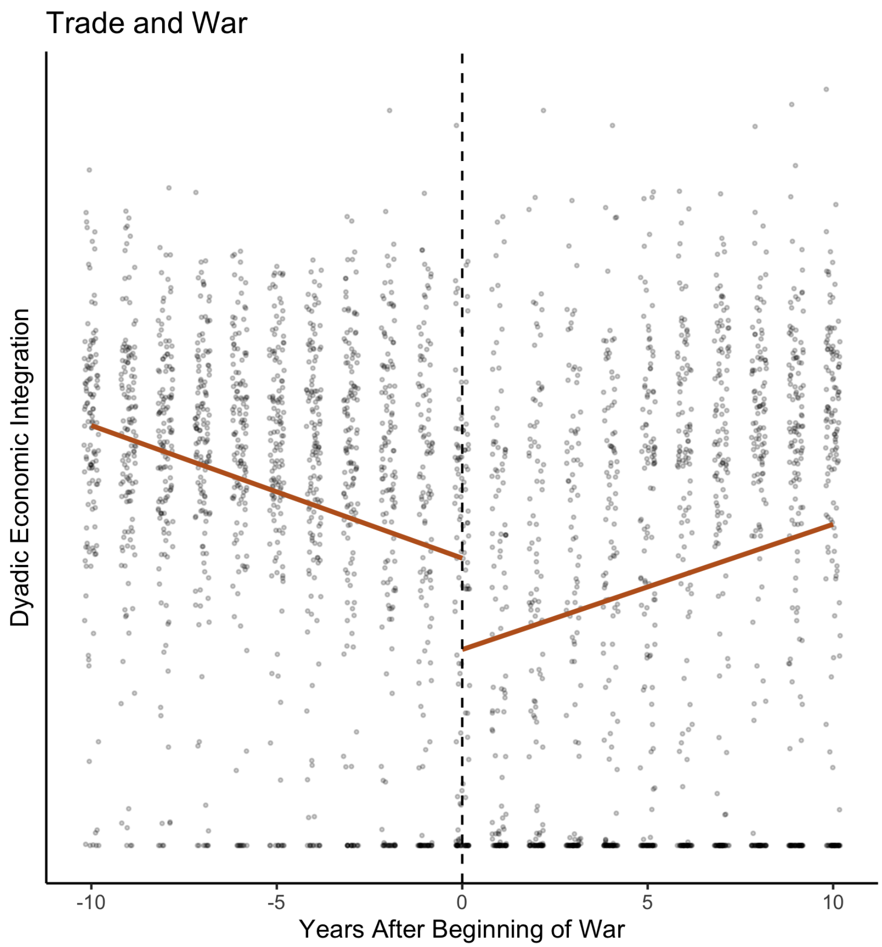
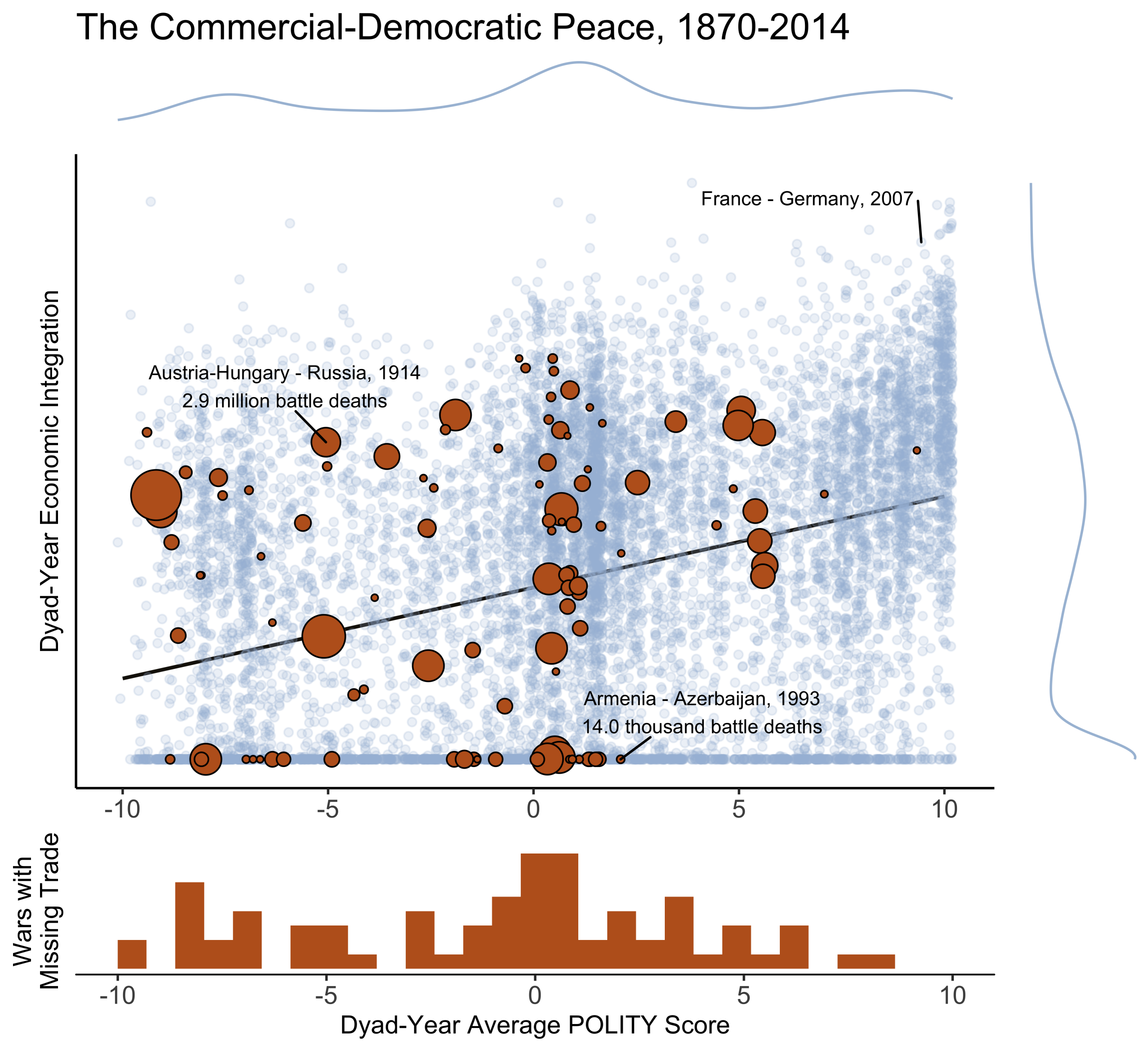


Figure 5: Plot depicts trade relations between dyads that experienced wars, 10 years prior to and 10 years following the outbreak of hostilities. Economic integration is measured as the average of the countries' directed imports to gdp ratio. An inverse hyperbolic sine transformation was applied to normalize this measure. Data from Barbieri, Keshk, and Pollins (2008), Barbieri, Keshk, and Pollins (2009), Sarkees and Wayman (2010), Bolt et al. (2018).



Notes: Each point is one dyad-year. Red-orange points are dyad-years in which a war began, sized by the number of battle deaths each side incurred during that war. Light blue points are a sample of 10,000 dyad-years in which no wars occured. Economic integration is measured as the average of the countries' directed imports to gdp ratio. An inverse hyperbolic sine transformation was applied to normalize the economic integration measure. Economic Integration score lagged by one year. Margin plots show the density of the transformed economic integration measure and the average POLITY score. A trend line shows the correlation between economic integration and average POLITY score in the sample of peaceful dyads. The distribution of average POLITY scores for war dyads for which trade or gdp data were not available is plotted in a histogram below the scatterplot.

Figure 6: Data from Marshall, Jaggers, and Gurr (2002), Barbieri, Keshk, and Pollins (2008), Barbieri, Keshk, and Pollins (2009), Sarkees and Wayman (2010), Bolt et al. (2018).

B: International Economy

Demand for Manufactured Goods: Total expenditure on manufactured goods is $\alpha I_i = P_i X_i$. Cobb Douglas preferences ensure that consumers will spend an α-share of their income on manufactured goods. We can derive Equation 4 by solving Equation 2 subject to the constraint

$$\int_{\nu_i} p_{ii}(\nu_i)x_{ii}(\nu_i)d\nu_i + \int_{\nu_j} p_{ij}(\nu_j)x_{ij}(\nu_j) \leq \alpha w_i L \tag{14}$$

For any two domestic varieties, ν_i and ν_i', we must have

$$x^\star_{ii}(\nu_i)p_{ii}(\nu_i)^\sigma p_{ii}(\nu_i')^{1-\sigma} = p_{ii}(\nu_i')x^\star_{ii}(\nu_i')$$
$$x^\star_{ii}(\nu_i)p_{ii}(\nu_i)^\sigma \int_{\nu_i'} p_{ii}(\nu_i')^{1-\sigma}d\nu_i' = \int_{\nu_i'} p_{ii}(\nu_i')x^\star_{ii}(\nu_i')d\nu_i'$$

The same must hold for foreign varieties:

$$x^\star_{ij}(\nu_j)p_{ij}(\nu_j)^\sigma \int_{\nu_j'} p_{ij}(\nu_j')^{1-\sigma}d\nu_j' = \int_{\nu_j'} p_{ij}(\nu_j')x^\star_{ij}(\nu_j')d\nu_j'$$

Summing these conditions and noting $x^\star_{ij}(\nu_j)p_{ij}(\nu_j)^\sigma = x^\star_{ii}(\nu_i)p_{ii}(\nu_i)^\sigma$ at equilibrium consumption gives

$$\begin{aligned} x^\star_{ii}(\nu_i)p_{ii}(\nu_i)^\sigma \left(\int_{\nu_i'} p_{ii}(\nu_i')^{1-\sigma}d\nu_i' + \int_{\nu_j'} p_{ij}(\nu_j')^{1-\sigma}d\nu_j'\right) &= \int_{\nu_i'} p_{ii}(\nu_i')x^\star_{ii}(\nu_i')d\nu_i' + \int_{\nu_j'} p_{ij}(\nu_j')x^\star_{ij}(\nu_j')d\nu_j' \\ x^\star_{ii}(\nu_i)p_{ii}(\nu_i)^\sigma P_i(\tau_i)^{1-\sigma} &= \alpha I_i(\tau_i) \\ x^\star_{ii}(\nu_i) &= p_{ii}(\nu_i)^{-\sigma}P_i(\tau_i)^{\sigma-1}\alpha I_i(\tau_i) \end{aligned}$$

Indirect Utility: Indirect utility is $X_i^\alpha Y_i^\alpha$ evaluated at equilibrium consumption. Substituting our demand equations 4 into Equation 2 gives

$$\begin{aligned} X_i^\star &= \left(\int_{\nu_i} x^\star_{ii}(\nu_i)^{\frac{\sigma-1}{\sigma}}d\nu_i + \int_{\nu_j} x^\star_{ij}(\nu_j)^{\frac{\sigma-1}{\sigma}}d\nu_j\right)^{\frac{\sigma}{\sigma-1}} \\ &= P_i(\tau_i)^{\sigma-1}I_i(\tau_i)\left(\int_{\nu_i} p_{ii}(\nu_i)^{1-\sigma} + p_{ij}(\nu_j)^{1-\sigma}\right)^{\frac{\sigma}{\sigma-1}} \\ &= \alpha\frac{I_i(\tau_i)}{P_i(\tau_i)} \end{aligned}$$

Because they serve as numeraire, equilibrium consumption of agricultural goods is equivalent to expenditure: $Y_i^\star = (1-\alpha)I_i(\tau_i)$. Substituting these into the consumer's utility function yields Equation 5.

Prices: The firms' first order condition is

$$\frac{\partial \Pi\left(p_i^\star(\nu_i)\right)}{\partial p_i^\star(\nu_i)} = \left(p_i^\star(\nu_i) - w_i\right)\left(\frac{\partial x_{ii}^\star(\nu_i)}{\partial p_i^\star(\nu_i)} + \frac{\partial x_{ji}(\nu_i)}{\partial p_i^\star(\nu_i)}\right) + x_{ii}^\star(\nu_i) + x_{ji}^\star(\nu_i) = 0$$

where

$$\frac{\partial x_{ii}(\nu_i)}{\partial p_i(\nu_i)} = -\sigma p_i^(\nu_i)^{-\sigma-1} P_i^{\sigma-1} \alpha I_i$$

and

$$\frac{\partial x_{ji}(\nu_i)}{\partial p_i(\nu_i)} = -\sigma \tau_j^{-\sigma} p_i^(\nu_i)^{-\sigma-1} P_j^{\sigma-1} \alpha I_i$$

Note that

$$-\frac{\sigma}{p_i^\star(\nu_i)}\left(x_{ii}^\star(\nu_i) + x_{ji}^\star(\nu_i)\right) = \frac{\partial x_{ii}(\nu_i)}{\partial p_i^\star(\nu_i)} + \frac{\partial x_{ji}(\nu_i)}{\partial p_i^\star(\nu_i)}$$

The first order condition then becomes

$$\begin{aligned}
\sigma \frac{w_i}{p_i^\star(\nu_i)}\left(x_{ii}^\star(\nu_i) + x_{ji}^\star(\nu_i)\right) - \sigma\left(x_{ii}^\star(\nu_i) + x_{ji}^\star(\nu_i)\right) + \left(x_{ii}^\star(\nu_i) + x_{ji}^\star(\nu_i)\right) &= 0 \\
\sigma \frac{w_i}{p_i^\star(\nu_i)} - \sigma + 1 &= 0 \\
\frac{\sigma}{\sigma - 1} w_i &= p_i^\star(\nu_i)
\end{aligned}$$

Economic Equilibrium:

With unit costs of production in manufacturing and agriculture, goods market clearing requires

$$\begin{aligned}
L_i^y + L_j^y &= (1-\alpha)\left(I_i(\tau_i) + I_j(\tau_j)\right) \\
L_i^x &= \left(x_{ii}^\star(\tau_i) + x_{ji}^\star(\tau_j)\right) \\
L_j^x &= \left(x_{ij}^\star(\tau_i) + x_{jj}^\star(\tau_j)\right) \\
L_i^x + L_j^x + \Pi_i(p_i^\star) + \Pi_j(p_j^\star) &= \alpha\left(I_i(\tau_i) + I_j(\tau_j)\right)
\end{aligned}$$

Domestic factor market clearing requires

$$\begin{aligned}
L_i^x + L_i^y &= L \\
L_j^x + L_j^y &= L
\end{aligned}$$

C: Constant Definitions

Assumption 1

I restrict j's costs of war such that there exists some government j with $a_j \in (\underline{a}, \bar{a}]$ that would be willing to fight if victory were certain and i offered its ideal point. Formally, this requires

$$\kappa_j = \Gamma_j(\underline{a}, a_i)$$

I then restrict i's costs of war to ensure that it never offers j's ideal point – an interior solution exists outside of the zone of peace. Formally, this requires

$$\kappa_i(\bar{c}_j, a_i) = \min_{\tilde{\boldsymbol{\tau}} \in \mathcal{P}} -\bar{c}_j \left(1 - F\left(W_j(\underline{a}, a_i) - G_j(\cdot, \tilde{\tau}_i; a_j)\right)\right) \frac{\frac{\partial G_i(\tau_i, \cdot; a_i)}{\partial \tau_i}}{\frac{\partial G_j(\cdot, \tau_i; a_i)}{\partial \tau_i}}$$

Because $\frac{\partial G_j(\cdot,\tau_i;a_i)}{\partial \tau_i} < 0$, this quantity is guaranteed to be positive.

Assumption 3

$$\underline{a} = (\sigma - 1)k(\alpha)^{-1}(p^\star)^\alpha(1 - (p^\star)^{-1})$$

where

$$k(\alpha) = \alpha^\alpha(1 - \alpha)^{1-\alpha}$$

This quantity is derived by letting

$$\underline{a} = \left\{ a_i \,\middle|\, \lim_{\tau_i \to \infty} \left(V_i'(\tau_i) - r_i'(\tau_i)P_i(\tau_i)^{-\alpha}\right) + \left(\Pi_i'(\tau_i) - \frac{x_{ii}^\star(\tau_i)}{I(\tau_i)} r_i'(\tau_i)\right) = 0 \right\}$$

where this quantity features in the proof of Lemma 1. Note that it is strictly positive.

D: Proofs

Restatements of results from the main text proceed all proofs. Lemmas 1, 2, and 3 exploit the following definitions:

$$A(\tau_i) = p^\star x_{ij}^\star(\tau_i)(\alpha I(\tau_i))^{-1} = \left(1 + \tau_i^{1-\sigma}\right)^{-1} \tau_i^{-\sigma}$$

$$B(\tau_i) = (\sigma - 1)A(\tau_i) - \sigma\tau_i^{-1}$$

$$C(\tau_i) = (\tau_i - 1)B(\tau_i) + 1$$

and

$$\lambda(\tau_i) = \frac{r_i(\tau_i)}{I_i(\tau_i)}$$

with

$$A'(\tau_i) = A(\tau_i)B(\tau_i)$$

and

$$B'(\tau_i) = (\sigma - 1)A(\tau_i)B(\tau_i) + \sigma\tau_i^{-2}$$

Proposition 1: If Assumption 2 is satisfied, then a unique economic equilibrium exists with $L_i^x, L_i^y, L_j^x, L_j^y > 0$ and $w_i = w_j = 1$ for all $\boldsymbol{\tau} \in [1, \bar{\tau}]^2$.

Proof: A competitive agricultural sector guarantees that agricultural producers make zero profits. This zero profit condition implies

$$(1 - w_i) Y_i = 0$$

which implies $w_i = 1$ whenever the agricultural sector is active, $Y_i > 0$. From Equation 7, this implies $p_i^\star = p_j^\star = p^\star = \frac{\sigma}{\sigma-1}$. Suppose for now that the agricultural sector is active in both countries, implying wages are equalized across countries and sectors. Below, we verify that this is the case if Assumption 2 is satisfied.

Labor allocations to each sector depend on tariff levels. The labor allocation in country i to sector $k \in \{x, y\}$ can then be written $L_i^k(\boldsymbol{\tau})$. The total labor allocation to the manufacturing sector in country i is

$$L_i^x(\boldsymbol{\tau}) = x_{ii}^\star(\tau_i) + x_{ji}^\star(\tau_j)$$

Because $x_{ii}^\star(\tau_i)$ is increasing in τ_i and $x_{ji}^\star(\tau_j)$ is decreasing in τ_j (see Lemma 2.), $L_i^x(\boldsymbol{\tau})$ is monotone increasing in τ_i and monotone decreasing in τ_j. This implies $L_i^x(\boldsymbol{\tau})$ attains its maximum at $\{\bar{\tau}, 1\}$[25]

$$\begin{aligned}
L_i^x(\bar{\tau}, 1) &= p^{-\sigma} P_i(\bar{\tau})^{\sigma-1} \alpha L + (1p)^{-\sigma} P_j(1)^{\sigma-1} \alpha L \\
&= \frac{p^{-\sigma} \alpha L}{p^{1-\sigma}} + \frac{p^{-\sigma} \alpha L}{2p^{1-\sigma}} \\
&= \frac{\alpha L}{p} + \frac{1}{2} \frac{\alpha L}{p} \\
&= \frac{3}{2} \frac{\sigma - 1}{\sigma} \alpha L
\end{aligned}$$

Allocation to the agricultural sector is then, by the labor market clearing condition,

$$L_i^y(\bar{\tau}, 1) = L - L_i^x(\bar{\tau}, 1)$$

If $\alpha < \frac{2}{3} \frac{\sigma}{\sigma-1}$, then $L_i^y(\bar{\tau}, 1) > 0$. Because total labor allocation to the manufacturing sector achieves its maximum at $\{\bar{\tau}, 1\}$, $L_i^y(\boldsymbol{\tau}) > 0$ for all $\boldsymbol{\tau} \in [1, \bar{\tau}]^2$. Moreover, $L_i^x(\boldsymbol{\tau}) > 0$ for all $\boldsymbol{\tau} \in [1, \bar{\tau}]^2$.[26] This demonstrates the proposition. ■

Lemma 1: If Assumption 3 is satisfied, then for all $a_i \in (\underline{a}, \bar{a}]$, there exists a unique $\tau_i^\star(a_i) \in [1, \bar{\tau})$ satisfying

$$\tau_i^\star(a_i) = \underset{\tau_i \in [1, \bar{\tau}]}{\arg\max}\, G_i(\tau_i; a_i)$$

where $\tau_i^\star(a_i)$ does not depend on τ_j.

Proof: The result follows from a series of Lemmas.

Lemma 1.1: $r_i'(\tau_i) > 0 \implies r_i''(\tau_i) < 0$

[25] Here we note the dependence of the price index on the home tariff $P_i(\tau_i)$.

[26] This follows from the fact that $L_i^x(1, \bar{\tau}) > 0$ and the monotonicities established above.

Proof: Using the above quantities, we can write

$$x_{ij}^{\star\prime}(\tau_i) = B(\tau_i)x_{ij}^\star(\tau_i) + \frac{x_{ij}^\star(\tau_i)}{I_i(\tau_i)}r_i'(\tau_i)$$

and

$$\begin{aligned}
r_i'(\tau_i) &= (\tau_i - 1)p^\star x_{ij}^{\star\prime}(\tau_i) + p^\star x_{ij}^\star(\tau_i) \\
r_i'(\tau_i) &= B(\tau_i)r_i(\tau_i) + \lambda(\tau_i)r_i'(\tau_i) + p^\star x_{ij}^\star(\tau_i) \\
(1-\lambda(\tau_i))r_i'(\tau_i) &= B(\tau_i)r_i(\tau_i) + p^\star x_{ij}^\star(\tau_i) \\
(\tau_i - 1)(1-\lambda(\tau_i))r_i'(\tau_i) &= (\tau_i - 1)B(\tau_i)r_i(\tau_i) + r_i(\tau_i) \\
(\tau_i - 1)(1-\lambda(\tau_i))r_i'(\tau_i) &= r_i(\tau_i)\left((\tau_i - 1)B(\tau_i) + 1\right) \\
(\tau_i - 1)(1-\lambda(\tau_i))r_i'(\tau_i) &= r_i(\tau_i)C(\tau_i)
\end{aligned}$$

Note that because $\lambda(\tau_i) < 1$ and $B(\tau_i) < 0$, then $C(\tau_i) \in (0,1)$ whenever $r_i'(\tau_i) > 0$. Also, the definition of $r_i(\tau_i)$ implies

$$\tau_i - 1 = \frac{r_i(\tau_i)}{p^\star x_{ij}^\star(\tau_i)}$$

Taking the second derivative, we have

$$\begin{aligned}
(\tau_i - 1)(1-\lambda(\tau_i))r_i''(\tau_i) =& - \left((1-\lambda(\tau_i))r_i'(\tau_i) - (\tau_i - 1)\lambda'(\tau_i)r_i'(\tau_i)\right) + C(\tau_i)r_i'(\tau_i) + C'(\tau_i)r_i(\tau_i) \\
=& - \Big((1-\lambda(\tau_i))r_i'(\tau_i) - (\tau_i - 1)(1-\lambda(\tau_i))r_i'(\tau_i)^2 I_i(\tau_i)^{-1}\Big) + C(\tau_i)r_i'(\tau_i) + \\
& C'(\tau_i)r_i(\tau_i) \\
=& - (1-\lambda(\tau_i))r_i'(\tau_i)\left(1 - (\tau_i - 1)I_i(\tau_i)^{-1}r_i'(\tau_i)\right) + C(\tau_i)r_i'(\tau_i) + C'(\tau_i)r_i(\tau_i) \\
=& - (1-\lambda(\tau_i))r_i'(\tau_i)\left(1 - \lambda(\tau_i)\frac{r_i'(\tau_i)}{p^\star x_{ij}^\star(\tau_i)}\right) + C(\tau_i)r_i'(\tau_i) + C'(\tau_i)r_i(\tau_i) \\
=& - (1-\lambda(\tau_i))r_i'(\tau_i)\left(1 - \lambda(\tau_i)\frac{C(\tau_i)}{(1-\lambda(\tau_i))}\right) + C(\tau_i)r_i'(\tau_i) + C'(\tau_i)r_i(\tau_i) \\
=& - r_i'(\tau_i)\left(1 - (1 - C(\tau_i))\lambda(\tau_i)\right) + C(\tau_i)r_i'(\tau_i) + C'(\tau_i)r_i(\tau_i) \\
=& \underbrace{-r_i'(\tau_i)\left(1 - (1 - C(\tau_i))\lambda(\tau_i)\right) + C(\tau_i)r_i'(\tau_i)}_{<0\ \text{(I)}} + \underbrace{C'(\tau_i)r_i(\tau_i)}_{<0\ \text{(II)}}
\end{aligned}$$

Inequality (I) holds because $\lambda(\tau_i) < 1$. To see why (II) holds, note

$$\begin{aligned}
\tau_i C'(\tau_i) &= \tau_i(\tau_i - 1)B'(\tau_i) + \tau_i B(\tau_i) \\
&= (\tau_i - 1)\tau_i\left((\sigma - 1)A(\tau_i)B(\tau_i) + \sigma\tau_i^{-2}\right) + \tau_i\left((\sigma - 1)A(\tau_i) - \sigma\tau_i^{-1}\right) \\
&= (\sigma - 1)\tau_i A(\tau_i)\tau_i B(\tau_i) + \sigma - \tau_i B'(\tau_i) + (\sigma - 1)\tau_i A(\tau_i) - \sigma \\
&= (\sigma - 1)\tau_i A(\tau_i)\underbrace{(\tau_i B(\tau_i) + 1)}_{<0} - \tau_i B'(\tau_i)
\end{aligned}$$

where the inequality follows from the fact that $\tau_i B(\tau_i) < -1$. ■

Lemma 1.2: $G_i'(\tau_i; a_i) = 0 \implies r_i'(\tau_i) > 0$ for all $a_i > \underline{a}$

Proof: The first order condition is

$$0 = -\alpha a_i V_i(\tau_i) A(\tau_i) + a_i r_i'(\tau_i) P_i(\tau_i)^{-\alpha} + \Pi_i'(\tau_i) \tag{15}$$

. Rearranging,

$$\begin{aligned} \alpha a_i V_i(\tau_i) A(\tau_i) - \Pi_i'(\tau_i) &= a_i r_i'(\tau_i) P_i(\tau_i)^{-\alpha} \\ \underbrace{\frac{P_i(\tau_i)^\alpha}{a_i} \left(\alpha a_i V_i(\tau_i) A(\tau_i) - \Pi_i'(\tau_i)\right)}_{>0} &= r_i'(\tau_i) \end{aligned}$$

By construction, the left hand side is zero (as $\tau_i \to \infty$) when $a_i = \underline{a}$. It is therefore strictly positive for all $a_i > \underline{a}$. ■

Lemma 1.3: $G_i'(\tau_i; \underline{a}) = 0$ and $G_i'(\tau_i; a_i) = 0 \implies G_i''(\tau_i; \underline{a}) > G_i''(\tau_i; a_i)$ for all $a_i > \underline{a}$.

Proof: Note first that when $G_i'(\tau_i; a_i) = 0$, $V_i''(\tau_i) < 0$ for all $a_i > \underline{a}$.

$$\begin{aligned} k(\alpha)^{-1} V_i''(\tau_i) &= P_i(\tau_i)^{-\alpha} r_i''(\tau_i) - \alpha A(\tau_i) \left(V_i'(\tau_i) + V_i(\tau_i) B(\tau_i) + r_i'(\tau_i) P_i(\tau_i)^{-\alpha}\right) \\ &= P_i(\tau_i)^{-\alpha} r_i''(\tau_i) - \alpha A(\tau_i) \left(2 r_i'(\tau_i) P_i(\tau_i)^{-\alpha} - \alpha V_i(\tau_i) A(\tau_i) + V_i(\tau_i) B(\tau_i)\right) \end{aligned}$$

When $G_i'(\tau_i; a_i) = 0$, $P_i(\tau_i)^{-\alpha} r_i'(\tau_i) = \alpha V_i(\tau_i) A_i(\tau_i) - \frac{1}{a_i} \Pi_i'(\tau_i)$. Then,

$$k(\alpha)^{-1} V_i''(\tau_i) = P_i(\tau_i)^{-\alpha} r_i''(\tau_i) - \alpha A(\tau_i) \underbrace{\left(\alpha V_i(\tau_i) A(\tau_i) - \frac{2}{a_i} \Pi_i'(\tau_i) + V_i(\tau_i) B(\tau_i)\right)}_{\phi(\tau_i)}$$

Because $B(\tau_i) < 0$, $\phi_i(\tau_i) < 0$ when $a_i = \underline{a}$. As $a_i \to \infty$,

$$\begin{aligned} \phi(\tau_i) \to & \alpha V_i(\tau_i) A(\tau_i) + V_i(\tau_i) B(\tau_i) \\ = & \alpha V_i(\tau_i) A(\tau_i) + V_i(\tau_i) \left((\sigma - 1) A(\tau_i) - \sigma \tau_i^{-1}\right) \\ < & V_i(\tau_i) \left(\sigma A(\tau_i) - \sigma \tau_i^{-1}\right) < 0 \end{aligned}$$

So $\phi_i(\tau_i) < 0$ whenever $a_i \in (\underline{a}, \infty)$. Additionally, $G_i'(\tau_i; a_i) = 0 \implies r_i(\tau_i) > 0 \implies r_i''(\tau_i) < 0$ by the preceding Lemmas. So $G_i'(\tau_i; a_i) = 0 \implies V_i''(\tau_i) < 0$. Now, note

$$G_i''(\tau_i; a_i) = a_i V_i''(\tau_i) + \Pi_i''(\tau_i)$$

Because $\underline{a} < a_i$, the result follows immediately.

Lemma 1.4: $G_i'(\tau_i; \underline{a}) = 0 \implies G_i''(\tau_i; \underline{a}) < 0$

Proof: Note that

$$\Pi_i''(\tau_i) = (\sigma-1)\Pi_i'(\tau_i)A(\tau_i) + (\sigma-1)\Pi_i(\tau_i)A(\tau_i)B(\tau_i) + D(\tau_i)$$

with

$$\Pi_i'(\tau_i) = (\sigma-1)\Pi(\tau_i)A(\tau_i) + \frac{\Pi_i(\tau_i)}{I_i(\tau_i)}r_i'(\tau_i)$$

and

$$D(\tau_i) = \frac{\Pi_i(\tau_i)}{I_i(\tau_i)}r_i''(\tau_i) + r_i'(\tau_i)\frac{\Pi_i(\tau_i)}{I_i(\tau_i)}\left((\sigma-1)A(\tau_i)\frac{r_i'(\tau_i)}{I_i(\tau_i)}\right)$$

Applying the derivations from the previous result,

$$\begin{aligned}
G_i''(\tau_i;\underline{a}) =& \underline{a}V_i''(\tau_i) + \Pi_i''(\tau_i) \\
=& \underline{a}k(\alpha)\left(P_i(\tau_i)^{-\alpha}r_i''(\tau_i) - \alpha A(\tau_i)\left(V_i(\tau_i)B(\tau_i) - \alpha V_i(\tau_i)A(\tau_i)\right)\right) + \\
& (\sigma-1)\Pi_i'(\tau_i)A(\tau_i) + (\sigma-1)\Pi_i(\tau_i)A(\tau_i)B(\tau_i) + D(\tau_i) \\
=& \underline{a}k(\alpha)\left(P_i(\tau_i)^{-\alpha}r_i''(\tau_i) - \Pi_i'(\tau_i)B(\tau_i) + \alpha A(\tau_i)\Pi_i'(\tau_i)\right) + \\
& (\sigma-1)\Pi_i'(\tau_i)A(\tau_i) + \Pi_i'(\tau_i)B(\tau_i) + D(\tau_i) \\
=& \underline{a}k(\alpha)P_i(\tau_i)^{-\alpha}r_i''(\tau_i) + \underline{a}k(\alpha)\Pi_i'(\tau_i)\left(\alpha A(\tau_i) - B(\tau_i)\right) + \\
& \Pi_i'(\tau_i)\left((\sigma-1)A(\tau_i) + B(\tau_i)\right) + D(\tau_i) \\
=& \underline{a}k(\alpha)P_i(\tau_i)^{-\alpha}r_i''(\tau_i) + \underbrace{(\sigma-1)(p^{\alpha}(1-p^{-1}))}_{=\beta<1}\left(\alpha A(\tau_i) - B(\tau_i)\right) + \\
& \Pi_i'(\tau_i)\left((\sigma-1)A(\tau_i) + B(\tau_i)\right) + D(\tau_i) \\
<& \underline{a}k(\alpha)P_i(\tau_i)^{-\alpha}r_i''(\tau_i) + \left(A(\tau_i) - B(\tau_i)\right) + \Pi_i'(\tau_i)\left((\sigma-1)A(\tau_i) + B(\tau_i)\right) \\
=& \underline{a}k(\alpha)P_i(\tau_i)^{-\alpha}r_i''(\tau_i) + \Pi_i'(\tau_i)\left(\sigma A(\tau_i) + B(\tau_i)\right) < 0
\end{aligned}$$

■

Lemma 1.5: For all $a_i > \underline{a}$,

$$\left.\frac{\partial G_i(\tau_i;a_i)}{\partial \tau_i}\right|_{\tau_i=1} > 0$$

and

$$\lim_{\tau_i\to\infty}\frac{\partial G_i(\tau_i;a_i)}{\partial \tau_i} < 0$$

Proof: Recall the first order condition in 15. By construction,

$$\lim_{\tau_i\to\infty}\frac{\partial G_i}{\partial \tau_i} < 0$$

for all $a_i > \underline{a}$. To see the second claim, note

$$\left.\frac{\partial G_i}{\partial \tau_i}\right|_{\tau_i=1} = \Pi_i'(\tau_i) > 0$$

■

Lemmas 1.3 and 1.4 imply that

$$0 > G_i''(\tau_i, \underline{a}) > G_i''(\tau_i; a_i)$$

whenever $G_i'(\tau_i; a_i) = 0$. This guarantees that $G_i(\tau_i; a_i)$ is strictly quasiconcave for all $a_i > \underline{a}$, ensuring that $\tau_i^\star(a_i)$ is unique. Lemma 1.5 ensures that $\tau_i^\star(a_i)$ is interior to $[1, \bar{\tau}]$. Note that the first order condition (15) does not depend on τ_j, verifying the latter part of the claim. ■

Lemma 2: $G_i(\tau_j)$ is strictly decreasing in τ_j.

Proof: It is sufficient to show that

$$\frac{\partial G_i(\tau_j)}{\partial \tau_j} < 0$$

Note that

$$\frac{\partial G_i(\tau_j)}{\partial \tau_j} = \frac{\partial \Pi_i(\tau_i, \tau_j)}{\partial \tau_j} = (p^\star - 1) x_{ji}^{\star\prime}(\tau_j)$$

From the proof of Lemma 1, we have

$$\begin{aligned}
x_{ji}^{\star\prime}(\tau_j) &= B(\tau_j) x_{ji}^\star(\tau_j) + \frac{x_{ji}^\star(\tau_j)}{I(\tau_j)} r_j'(\tau_j) \\
&= B(\tau_j) x_{ji}^\star(\tau_j) + \frac{x_{ji}^\star(\tau_j)}{I(\tau_j)} \left((\tau_j - 1) p^\star x_{ji}^{\star\prime}(\tau_j) + p^\star x_{ji}^\star(\tau_j) \right) \\
&= B(\tau_j) x_{ji}^\star(\tau_j) + \frac{x_{ji}^\star(\tau_j)}{I(\tau_j)} \left(\frac{r_j(\tau_j)}{x_{ji}^\star(\tau_j)} x_{ji}^{\star\prime}(\tau_j) + p^\star x_{ji}^\star(\tau_j) \right) \\
&= B(\tau_j) x_{ji}^\star(\tau_j) + \lambda(\tau_j) x_{ji}^{\star\prime}(\tau_j) + p^\star x_{ji}^\star(\tau_j) + \frac{x_{ji}^\star(\tau_j)}{I(\tau_j)} \\
(1 - \lambda(\tau_j)) x_{ji}^{\star\prime}(\tau_j) &= x_{ji}^\star(\tau_j) \left(B(\tau_j) + p^\star x_{ji}^\star(\tau_j) I(\tau_j)^{-1} \right) \\
&= x_{ji}^\star(\tau_j) \left(B(\tau_j) + \alpha A(\tau_j) \right) \\
&< x_{ji}^\star(\tau_j) \left(B(\tau_j) + A(\tau_j) \right) \\
&= \sigma \tau^{-1} \underbrace{\left(\left(1 + \tau_j^{1-\sigma} \right)^{-1} \tau_j^{-\sigma-1} - 1 \right)}_{<0}
\end{aligned}$$

■

Lemma 3: $\tau_i^\star(a_i)$ is strictly decreasing in a_i.

Proof: Government i's optimal policy does not depend on the policy choice of j. As such, it is sufficient to show that the government's objective function has a negative cross partial with respect to τ_i, a_i,

$$\frac{\partial^2 G_i}{\partial a_i \partial \tau_i} < 0$$

Applying derivations from the proof of Lemma 1,

$$
\begin{aligned}
\frac{\partial^2 G_i}{\partial a_i \partial \tau_{ij}} &= V_i'(\tau_i) \\
&= r'(\tau_i) P_i(\tau_i)^\alpha - \alpha P_i(\tau_i)^\alpha I(\tau_i) A(\tau_i) \\
&= \alpha P_i(\tau_i)^\alpha I(\tau_i) \left((\alpha I(\tau_i))^{-1} r'(\tau_i) - A(\tau_i) \right) \\
&= \alpha P_i(\tau_i)^\alpha I(\tau_i) \left((\alpha I(\tau_i))^{-1} \left((\tau_i - 1) p^\star x_{ij}^{\star\prime}(\tau_i) + p^\star x_{ij}^\star(\tau_i) \right) - A(\tau_i) \right) \\
&= P_i(\tau_i)^\alpha I(\tau_i) \left((\alpha I(\tau_i))^{-1} (\tau_i - 1) p^\star x_{ij}^{\star\prime}(\tau_i) + A(\tau)_i - A(\tau_i) \right) \\
&= P_i(\tau_i)^\alpha \alpha^{-1} (\tau_i - 1) p^\star \underbrace{x_{ij}^{\star\prime}(\tau_i)}_{<0}
\end{aligned}
$$

where the final inequality follows from Lemma 2. ■

Proposition 2: $a^\star = \bar{a}$

Proof: Follows immediately from Lemma 2 and Lemma 3 ■

Proposition 3: $\Gamma_i(a_i, a_j)$ is decreasing in a_i, a_j

Proof: To establish that $\Gamma_i(a_i, a_j)$ is decreasing in a_i, note that derivative of $\Gamma_i(a_i, a_j)$ taken with respect to a_i is

$$
\begin{aligned}
\frac{\partial \Gamma_i(a_i, a_j)}{\partial a_i} = & \left. \frac{\partial G_i(\tau_i^\star(a_i), \tau_i^\star(\bar{a}); a_i)}{\partial a_i} \right|_{\left\{\tau_i^\star(a_i), \tau_j^\star(\bar{a})\right\}} + \underbrace{\frac{\partial G_i(\tau_i^\star(a_i), \tau_j^\star(\bar{a}); a_i)}{\partial \tau_i^\star(a_i)}}_{=0} \frac{\partial \tau_i^\star(a_i)}{\partial a_i} - \\
& \left. \frac{\partial G_i(\tau_i^\star(\bar{a}), \tau_j^\star(a_j); a_i)}{\partial a_i} \right|_{\left\{\tau_i^\star(\bar{a}), \tau_j^\star(a_j)\right\}} \\
= & \underbrace{V_i(\tau_i^\star(a_i)) - V_i(\tau_i^\star(\bar{a}))}_{<0}
\end{aligned}
$$

where the final inequality holds because $\tau_i^\star(a_i) > \tau_i^\star(\bar{a})$ for all $a_i < \bar{a}$. To see that $\Gamma_i(a_i, a_j)$ is decreasing in a_j, note

$$
\frac{\partial \Gamma_i(a_i, a_j)}{\partial a_j} = - \underbrace{\frac{\partial G_i(\tau_i^\star(\bar{a}), \tau_j^\star(a_j); a_i)}{\partial \tau_j^\star(a_j)}}_{<0} \underbrace{\frac{\partial \tau_j^\star(a_j)}{\partial a_j}}_{<0}
$$

where the inequalities follow from Lemmas 2 and 3. ■

Lemma 5: If

$$
W_j(a_j, a_i) - G_j(\tau_j^\star(\bar{a}), \tau_i^\star(a_i); a_j) = \Gamma_j(a_j, a_i) \leq \underline{c}_j
$$

then

$$
\tilde{\boldsymbol{\tau}}^\star = \{\tau_i^\star(a_i), \tau_i^\star(\bar{a})\}
$$

and

$$\omega^\star(\tau_i^\star(a_i), \tau_j^\star(\bar{a}); a_j, c_j, \rho) = \text{accept}$$

for all $c_j \in [\underline{c}_j, \bar{c}_j]$.

Proof: By Lemma 4, $\tilde{\boldsymbol{\tau}} = \{\tau_i^\star(a_i), 1\}$ will be accepted for all cost types $c_j \in [\underline{c}_j, \bar{c}_j]$. Since this offer maximizes i's utility conditional on peace,

$$\tilde{\boldsymbol{\tau}}^\star = \left\{\tau_i^\star(a_i), \tau_j^\star(\bar{a})\right\}$$

■

Lemma 6: For every $\underline{c}_j \in [0, \bar{c}_j)$ there exists a $a_j(\underline{c}_j, a_i)$ such that for all $a_j \in [a_j(\underline{c}_j, a_i), \bar{a})$ the probability of war is 0.

Proof: Government j will accept i's ideal point so long as

$$W_j(a_j, a_i) - G_j(\tau_j^\star(\bar{a}), \tau_i^\star(a_i); a_j) \leq \underline{c}_j$$

Note that this condition can be rewritten as

$$\Gamma_j(a_j, a_i) \leq \underline{c}_j$$

If $\Gamma_j(a_j, a_i) \leq \underline{\epsilon}$ for all $a_j \in [0, \bar{a})$, set $a_j(\underline{\epsilon}, a_i) = 0$. Otherwise, let $a_j(\underline{\epsilon}, a_i)$ solve

$$\Gamma_j(a_j(\underline{\epsilon}, a_i), a_i) = \underline{c}_j$$

Recall from Proposition 3 that $\Gamma_j(a_j, a_i)$ is decreasing in both arguments. By Assumption 1,

$$\underline{c}_j < \bar{c}_j \leq \kappa_j = \Gamma_j(\underline{a}, a_i)$$

Since $\Gamma_j(a_j, a_i)$ is continuous and decreasing in a_j, a solution exists for $\underline{c}_j$ large enough. Then, by construction,

$$\Gamma_j(a_j, a_i) \leq \underline{\epsilon}$$

for all $a_j \geq a_j(\underline{c}_j, a_i)$ and j accepts i's ideal point. By Lemma 5, this guarantees peace. ■

Proposition 4: $a_j(\underline{c}_j, a_i)$ is weakly decreasing in a_i.

Proof: We have two cases, either $a_j(\underline{c}, a_i) = \underline{a}$ or

$$a_j(\underline{c}, a_i) = \Gamma_j^{-1}(\underline{c}; a_i)$$

Since $\Gamma_j(a_j, a_i)$ is decreasing in a_i (Proposition 3), so is its inverse. This is sufficient to guarantee that $a_j(\underline{c}_j, a_i)$ is decreasing in a_i. ■

Lemma 7: $\tilde{\boldsymbol{\tau}}^\star(a_i, c_i, \rho) \in \mathcal{P}$

Proof: Suppose $\tilde{\boldsymbol{\tau}}^\star(a_i) \notin \mathcal{P}$. It is straightforward to show that this produces a contradiction, namely

$$\tilde{\boldsymbol{\tau}}^\star(a_i, c_i, \rho) \notin \underset{\tilde{\boldsymbol{\tau}} \in [1, \bar{\tau}^2]}{\arg\max}\, \tilde{G}_i\left(\tilde{\boldsymbol{\tau}}, \omega^\star(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho); a_i, c_i, \rho\right)$$

First, if $\tilde{\boldsymbol{\tau}}^\star \notin \mathcal{P}$, then there exists $\tilde{\boldsymbol{\tau}}' \in [1, \bar{\tau}]^2$ such that either 1) $G_i(\tilde{\boldsymbol{\tau}}') > G_i(\tilde{\boldsymbol{\tau}}^\star)$ and $G_j(\tilde{\boldsymbol{\tau}}') \geq G_j(\tilde{\boldsymbol{\tau}}^\star)$ or 2) $G_j(\tilde{\boldsymbol{\tau}}') > G_j(\tilde{\boldsymbol{\tau}}^\star)$ and $G_i(\tilde{\boldsymbol{\tau}}') \geq G_i(\tilde{\boldsymbol{\tau}}^\star)$.

Take the first case and recall

$$\begin{aligned}\tilde{G}_i\left(\tilde{\boldsymbol{\tau}}, \omega^\star(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho); a_i, c_i, \rho\right) = \left(1 - F\left(W_j(a_j, a_i) - G_j(\tilde{\boldsymbol{\tau}}; a_j)\right)\right)\left(G_i(\tilde{\boldsymbol{\tau}}; a_i)\right) + \\ F\left(W_j(a_j, a_i) - G_j(\tilde{\boldsymbol{\tau}}; a_j)\right)\left(\hat{G}_i(a_i, a_j)\right)\end{aligned}$$

In the proof of Proposition 5 (below), I show $G_i(\tilde{\boldsymbol{\tau}}^\star) > W_i(a_i, a_j) \geq \hat{G}_i(a_i, a_j)$. Also, $F(\tilde{\boldsymbol{\tau}}^\star) \leq F(\tilde{\boldsymbol{\tau}}')$. Then, if 1) or 2), then $\tilde{G}_i\left(\tilde{\boldsymbol{\tau}}', \omega^\star(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho)|a_i, c_i, \rho\right) > \tilde{G}_i\left(\tilde{\boldsymbol{\tau}}^\star, \omega^\star(\tilde{\boldsymbol{\tau}}; a_j, c_j, \rho); a_i, c_i, \rho\right)$, producing the desired contradiction. ■

Lemma 8: $\tilde{\boldsymbol{\tau}} = \left\{\tilde{\tau}_i^\star, \tilde{\tau}_j^\star\right\} \leq \left\{\tau_i^\star(a_i, c_i, \rho), \tau_j^\star(a_i, c_i, \rho)\right\}$ with $\leq$ the natural vector order.

Proof: Suppose, for sake of contradiction, that for some $\tilde{\boldsymbol{\tau}}^\star$, $\tilde{\tau}_i^\star > \tau_i^\star(a_i)$. By Lemma 7, $\tilde{\boldsymbol{\tau}}^\star$ must lie in the pareto set. By the definition of $\tau_i^\star(a_i)$, $G_i(\tilde{\tau}_i^\star, \cdot; a_i) < G_i(\tau_i^\star(a_i), \cdot; a_i)$. By Lemma 2, $G_j(\cdot, \tilde{\tau}_i^\star; a_j) < G_j(\cdot, \tau_i^\star(a_i); a_i)$. Thus, a pareto improvement exists, contradicting the hypothesis that $\tilde{\boldsymbol{\tau}}^\star$ is an equilibrium offer. ■

Proposition 5: If $a_j < a_j(\underline{c}_j, a_i)$ and peace prevails, government i's trade barriers are increasing in its military strength. $\tilde{\tau}_i^\star(a_i, c_i, \rho)$ is increasing in ρ.

Proof: By Assumption 1, i's first order condition must characterize $\tilde{\tau}_i^\star$ when $a_j < a_j(\underline{c}_j, a_i)$. Here, we have

$$\frac{\partial \tilde{G}_i(\tilde{\tau}_i)}{\partial \tilde{\tau}_i} = \left(1 - F\left(W_j(a_j, a_i) - G_j(\cdot, \tilde{\tau}_i | a_j)\right)\right)\frac{\partial G_i(\tilde{\tau}_i)}{\partial \tau_i} + \frac{1}{\bar{c}_j - \underline{c}_j}\frac{\partial G_j(\tilde{\tau}_i)}{\partial \tilde{\tau}_i}\left(G_i(\tilde{\tau}_i) - \hat{G}_i(a_i, a_j)\right) = 0$$

Rearranging,

$$\begin{aligned}\left(1 - F\left(W_j(a_j, a_i) - G_j(\cdot, \tilde{\tau}_i; a_j)\right)\right)\frac{\partial G_i(\tilde{\tau}_i)}{\partial \tau_i} &= \frac{1}{\bar{c}_j - \underline{c}_j}\frac{\partial G_j(\tilde{\tau}_i)}{\partial \tilde{\tau}_i}\left(\hat{G}_i(a_i, a_j) - G_i(\tilde{\tau}_i)\right) \\ \left(1 - F\left(W_j(a_j, a_i) - G_j(\cdot, \tilde{\tau}_i; a_j)\right)\right)\frac{\partial G_i(\tilde{\tau}_i)}{\partial \tau_i} &= \frac{1}{\bar{c}_j - \underline{c}_j}\frac{\partial G_j(\tilde{\tau}_i)}{\partial \tilde{\tau}_i}\left(W_i(a_i, a_j) - c_i - G_i(\tilde{\tau}_i)\right) \\ \left(1 - F\left(W_j(a_j, a_i) - G_j(\cdot, \tilde{\tau}_i; a_j)\right)\right)\frac{\partial G_i(\tilde{\tau}_i)}{\partial \tau_i} &= \frac{1}{\bar{c}_j - \underline{c}_j}\frac{\partial G_j(\tilde{\tau}_i)}{\partial \tilde{\tau}_i}\left(W_i(a_i, a_j) - c_i - G_i(\tilde{\tau}_i)\right)\end{aligned}$$

$$(\bar{c}_j - \underline{c}_j)\left(1 - F\left(W_j(0, a_i) - G_j(\cdot, \tilde{\tau}_i; a_j)\right)\right)\frac{\frac{\partial G_i(\tau_i, \cdot; a_i)}{\partial \tau_i}}{\frac{\partial G_j(\cdot, \tau_i; a_i)}{\partial \tau_i}} + c_i = W_i(a_i, a_j) - G_i(\tilde{\tau}_i)$$

By Assumption 1, the LHS of this expression must be negative, this ensures that i's payoff at the solution is higher than its war value,

$$W_i(a_i, a_j) < G_i(\tilde{\tau}_i)$$

Now note that

$$\frac{\partial W_j}{\partial \rho} = \underline{G}_j - \bar{G}_j < 0$$

and

$$\frac{\partial \hat{G}_i}{\partial \rho} = \Gamma_i > 0$$

We have

$$\frac{\partial^2 \tilde{G}_i(\tilde{\tau}_i)}{\partial \tilde{\tau}_i \partial \rho} = -\frac{1}{\bar{c}_j - \underline{c}_j} \underbrace{\frac{\partial G_i(\tilde{\tau}_i)}{\partial \tilde{\tau}_i}}_{>0} \underbrace{\frac{\partial W_j}{\partial \rho}}_{<0} - \frac{1}{\bar{c}_j - \underline{c}_j} \underbrace{\frac{\partial G_j(\tilde{\tau}_i)}{\partial \tilde{\tau}_i}}_{<0} \underbrace{\frac{\partial \hat{G}_i}{\partial \rho}}_{>0} > 0$$

which implies

$$\frac{\partial \tilde{\tau}_i^\star(a_i)}{\partial \rho} > 0$$

as desired. ■

Proposition 6: In a peaceful bargaining equilibrium (Definition 1), trade is weakly increasing in a_i and a_j.

Proof: Equilibrium trade in manufactured goods is

$$x_{ij}^\star(\tau_i) + x_{ji}^\star(\tau_j)$$

where both $x_{ij}^\star(\tau_i)$ and $x_{ji}^\star(\tau_j)$ are decreasing in each country's tariff rate. The bounds of the pareto set are decreasing in a_i, a_j by Lemma 3. Otherwise, the strategic situation is unchanged. Thus, $\tilde{\tau}_i^\star(a_i)$ and $\tilde{\tau}_j^\star(a_i)$ are weakly decreasing in a_i. Thus, equilibrium trade is also weakly increasing. ■

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