Trading for Peace?
Disaggregated Bilateral Trade and Interstate Military Conflict Initiation*

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Abstract

The effect of bilateral trade on interstate military conflict is the subject of a large and growing body of literature. But most theories on the effect of trade on conflict ignore both the composition of trade across economic sectors and trade flow directions in terms of export and import. Almost all statistical studies focus on total bilateral trade, implicitly or explicitly assuming the effect of trade on interstate conflict is constant across economic sectors and between trade flow directions. Challenging these premises, we provide an innovative analysis that studies the effects of exports and imports in different sectors on the initiation of militarized interstate disputes (MID). Our theory generates *ex ante* predictions of the effects of changes in imports and exports in different economic sectors on the likelihood of MID initiation. We test these predictions statistically in a large N sample of directed dyads. We find that rises in agriculture-fishery imports and energy imports reduce the probability of MID initiation, rises in energy exports, manufacturing imports, and manufacturing exports increase this probability, and changes in agriculture-fishery export, chemical-mineral trade, and miscellaneous consumption products trade generally do not affect MID initiation. This research has both theoretical and policy implications. Our theory subsumes the liberal logic as one special case, and offers a plausible explanation alternative to the bargaining, neo-Marxist, neo-mercantilist realist, and classical realist arguments. Our findings inform leaders about how to manage bilateral trade in order to improve interstate relations.

The idea that trade promotes peace, offered by the liberal school of thought, dates from at least two-hundred fifty years ago.[1] The antithesis that trade generates conflict, argued by the neo-Marxist and neo-mercantilist realist schools of thought, also has a long intellectual history.[2] But most theories on the effect of trade on conflict ignore both the composition of trade across economic sectors and trade flow directions in terms of export and import. Almost all recent statistical studies of the effect of trade on conflict employ dyad-year as the unit of analysis and rely on total bilateral trade data.

We challenge the prevalent theoretical and empirical reliance on the notion of total bilateral trade. Indeed, it does not seem likely that international exchanges of heterogeneous commodities and services, say, oil, bananas, corn, machinery, fish, computers, to name just a few, should have identical effects on conflict. As one renown scholar has repeatedly warned, "unduly extensive aggregation of trade data" is likely to produce "biased estimates of the ability of bilateral trade to diminish conflict" (Polachek, 1992:113; Polachek, 2000:10).[3]

We suggest that the theoretical and empirical focus on total trade results in two aggregation biases: one from aggregation across economic sectors or goods, and the other from aggregation across trade flow directions (import and export).[4] To be sure, some studies do look at the effect of trade in different sectors on military conflict, but without formally providing a micro-foundation, and almost all the existing statistical studies of this subject except Dorussen (2006) have used very limited samples. Meanwhile, to the best of our knowledge, the possibility that the effect of trade on military conflict may differ between export and import has not received attention in the literature.

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[1] See, for example, Montesquieu, 1748; Smith, 1776; Kant, 1795; and Angell, 1912.

[2] See, for example, Hobson, 1902; Lenin, 1916; Hirschman, 1945; and Waltz, 1970.

[3] Polachek is not alone. Russett and Oneal (2001: 141) also note that "dyadic [total] trade, even when adjusted for the size of the overall economy, is an imperfect indicator of economic interdependence. For one thing, the composition of trade is not considered." Surveys of the trade and conflict literature conclude that researchers should consider disaggregating total trade. See Sayrs (1990: 22), McMillan (1997: 53), and Reuveny (2000: 37).

[4] We use the terms "goods," "economic sectors," and "sectors" interchangeably.

In this article, we offer a theoretical formal model to explain how export and import flows in specific economic sectors influence the decision to initiate dyadic military conflict, a question almost all previous theories have ignored. Like virtually any formal model, our model also relies on simplifying assumptions. As in neoclassical economics, we model trade as performed by economic agents in the marketplace. As in international relations, we model conflict as a choice made by leaders. We believe that in general, these assumptions are reasonable. They allow us to model and anticipate the individual effects on military dispute initiation of bilateral imports and exports in different sectors.

Simply put, our theory suggests that leaders think about the opportunity costs of conflict and are less likely to initiate conflicts that lead to losses to their trade. This idea is not new. Our contribution here is to show that this consideration could vary across import, export, and traded sectors. However, our theory goes beyond this argument. It predicts that leaders also think about the opportunity gains of conflict and are more likely to initiate conflicts that bring about profits to their trade.

We present these ideas formally. Our model shows that the costs and the benefits of conflict can vary across trade sectors, exports and imports, and they work through the expected effect of conflict on trade prices. In our model, leaders initiate conflict if they conclude this will be beneficial economically by reducing the price of their import and increasing the price of their export, and vice versa. The decision depends on certain estimable parameters identified by our model, which may vary across trade sectors, imports and exports. Using these estimates, we predict whether a rise in export or import in a specific sector will lead to conflict or peace. In sum, our model subsumes the argument on the pacifying effect of trade, but also shows leaders may initiate conflict because they deem it to be beneficial for their trade.

Based on our model, we derive expectations of the effects on military conflict initiation of changes in exports and imports in the agriculture-fishery, energy, chemical-mineral, manufactured products, and miscellaneous consumption products sectors. We test these predictions using a large N

sample of all the directed dyads from 1970 to 1997 for which the sectoral bilateral trade data are available. Conflict is measured as the initiation of militarized interstate dispute (MID). We find that rises in agriculture-fishery imports and energy imports reduce the probability of MID initiation, rises in energy exports, manufacturing imports, and manufacturing exports increase this probability, and changes in agriculture-fishery export, chemical-mineral trade, and miscellaneous consumption products trade generally do not affect MID initiation.

We believe that knowing which types of traded goods increase or decrease the likelihood of military conflict is important for both academics and policymakers. As we explain in detail in the conclusion section, our article sheds new light on a long-standing debate in international relations, offers an opportunity to rethink the logic of how trade affects conflict, and has various important policy implications.

The remainder of this article is organized as follows. Section 2 presents motivations of our analysis and discusses previous studies. Section 3 develops the theoretical model, section 4 discusses its implications, and section 5 formulates hypotheses. Section 6 presents the empirical model and section 7 discusses the results. Section 8 summarizes, discusses implications, and suggests future research.

2. Disaggregated Trade in the Conflict Literature

The contemporary literature on the effect of trade on conflict is too large to fully review here.[5] Generally speaking, this body of work offers five main theoretical explanations. The classical liberal view argues trade promotes peace because military conflict reduces trade that countries value (e.g., Rosecrance, 1986; Polachek, 1992, 2000; Oneal and Russett, 2001). A game theoretic approach considers trade as a tool that facilitates bargaining over some political issue, expecting trade reduces the

[5] For extensive reviews of the literature, see, for example, Sayrs (1990), McMillan (1997), Reuveny (2000), Mansfield and Pollins (2003), and Schneider et al. (2003).

likelihood of military conflict over the issue (e.g., Gartzke et al., 2001). A neo-Marxist view (e.g., dos Santos, 1970; Choucri and North, 1975; Rubinson, 1976; and Ashley, 1980) and a neo-mercantilist derivative of realism (e.g., Waltz, 1970; 1979; Gilpin, 1981; Borrus and Zysman, 1992; Kroll, 1993; and Barbieri, 2002) envision trade as a tool of influence and exploitation, which can lead to conflict if countries resent it, or to peace if they comply. A classical derivative of realism expects that trade has no systematic effect on military conflict, the causes of which lie in political and strategic forces instead (e.g., Buzan, 1984; Gilpin, 1987; Ripsman and Blanchard, 1997; and Keshk et al., 2004). Most existing empirical evidence supports the expectation of the first two explanations that bilateral trade reduces interstate militarized disputes; but evidence to the contrary also exists, which the classical liberal view and the game theoretic explanations can not explain.

Attempts to apply some, but not all, of the five explanations to account for the effects of trade in different sectors on peace, have produced conflicting conjectures. One argument expects that trade in sectors in which nations have a decisive comparative advantage facilitate peace, since such trade brings more economic benefits that would be lost to conflict. Another channel to peace is said to involve imported goods (e.g., oil, machinery, minerals) a country considers important, the loss of which hinders economic growth. A third channel argues that since imported consumer goods benefit consumers, they support leaders that promote peace with the exporter. [6]

Other studies focus on strategic goods, including minerals, chemicals, steel, fuels, and high-tech goods. When strategic goods have no readily available substitutes, their trade may generate conflict,[7] because countries may feel threatened by their vulnerability and resort to conflict in order to mitigate the scarcity. Countries also may be tempted to use trade as a political tool to exploit vulnerabilities of and

[6] Gasiorowski and Polachek (1982), Arad et al. (1983), Domke (1988), Polachek (1980, 1992).

[7] See Hirschman (1945), Baldwin (1985), Gasiorowski (1986), Sayrs (1989) and Forland (1991).

exercise influence on others, causing resentment and conflict.[8] Yet trade in strategic goods may also generate friendliness, as one country supports another in order to protect its trade. A related expectation is that trade in goods with fewer substitutes may generate peace because countries tend to cooperate to secure the continuing flows of such goods.[9]

Some scholars debate the usefulness of the concept of strategic goods. Forland (1991: 197) quotes President Eisenhower saying, "if our opponent needs something badly, then that something is strategic." Schelling (1958: 500) notes that *any* good will be strategic to a country if it plans to consume it but does not produce it. Baldwin (1985: 214-215) explains that the strategic good can be "[any good] that is needed to pursue a given strategy and that is relatively inefficient to produce at home." He warns that it is hard to identify a priori the "strategic quality of a good" since it depends on the extent that the good has substitutes and on whether the good is important for a certain case.

Studies on international competitiveness argue that trade in high-tech goods creates positive externalities for economic growth and the production of weaponry. International competition over trade shares in these goods can lead to conflict. Moreover, states wishing to excel in economic growth, or states suspecting that others may translate growth into military power in the future, will maximize relative gains from trade in high-tech goods. The attempt of one country to gain more from trade than their trade partner can, in turn, lead to tension and ultimately conflict.[10]

Only a few empirical studies attempt to evaluate the effect of disaggregated trade on conflict, and all of them, with one exception, do not focus on military conflict and their samples include only a few dyads. Bennett et al. (1992) study the effect of US-Japan trade on political relations from 1948 to 1978

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[8] Reuveny (1999a, 1999b) shows Israel uses its trade with the Palestinians to affect their actions. For general discussions, see Gilpin (1984), Borrus and Zysman (1992), Sen (1984), and Vogel (1992).

[9] On the possibility of trade in strategic goods leading to cooperation due to compliance, see Hirschman (1945), Baldwin (1985), Reuveny and Kang (1998), and Reuveny (2001b).

[10] This view often traces back to List (1856). See also Tyson (1992) and Mastanduno (1992).

and conclude that trade in steel, textiles, and electronics generates conflict. Polachek (1980) finds that as oil exports rise, oil exporting countries become more hostile toward oil importers. Gasiorowski and Polachek (1982) conclude that trade in agriculture and manufactured goods induces cooperation by the Warsaw Pact toward the US. Polachek and McDonald (1992: 277) study the effect of disaggregated trade in raw materials and manufactured goods on conflict for 14 OECD countries in 1973. They report that trade reduces conflict, but caution that these results are preliminary due to limited data coverage. Using a large N sample, Dorussen (2006) finds that disaggregated trade reduces the likelihood of threats and use of force but not in all sectors; the effects of non-manufactured goods, chemicals, metal products, building supplies, and electronics are not statistically significant.

In sum, the literature presents conflicting theoretical conjectures and mixed findings. In the following sections, we attempt to add clarity to the trade and conflict literature through a model of the effects of trade, disaggregated across sectors and flow directions, on the initiation of military conflict.

3. Theoretical Model

To study the effects on conflict initiation of bilateral trade broken down across goods and between flow directions, we need to model the attributes of traded goods such as sensitivities to conflict and price changes, and market forces such as import demand, export supply, and equilibrium. Stated broadly, our model considers two countries that trade in various goods with one another and maintain some political relations. We conceptualize conflict initiation (or the lack thereof) as a change in bilateral relations. A change in trade affects conflict initiation because conflict is expected to affect the price of a bilaterally traded good. When the price rises, the exporter's profit and the importer's cost rise. A country initiates conflict to increase export profit or reduce import cost, *ceteris paribus*. In our model, trade provides the incentive or disincentive for one state to initiate conflict toward another.

Our logic, attributing the effect of trade on conflict to considerations of profit and cost, resembles the classical liberal argument, whose micro-foundation is best demonstrated in the decision

theoretic model of Polachek (1980, 1992, 2000). We employ the approach of Polachek, but our model differs from his in two major ways. First, Polachek assumes that an exporter country that initiates conflict against a target will be paid less for its export to that country, and that an importer country that initiates conflict against a target will have to pay more for its import from that target. We do not make such assumptions, but rather explicitly allow import and export prices to be determined by demand and supply in the market. Second, Polachek's model predicts that a rise in trade always brings peace, regardless of its composition or pattern. Our model predicts that the effect of a rise in bilateral trade on conflict initiation changes across traded sectors and between trade flow directions, generating *ex ante* sector- and flow-specific hypotheses.

Our model includes two countries, A and B. As in Polachek's model, we conceptualize political leaders of A and B as unitary rational actors whose utility functions rise with national consumption and military conflict they initiate toward each other. The unitary actor assumption is a simplification intended to keep the model tractable. The assumption that utility rises with conflict, *ceteris paribus*, may seem counter-intuitive, but in fact it is implicit or explicit in all conflict models. While conflict is costly, leaders may conclude its benefits outweigh its costs. Assuming leaders are rational, when A is observed to initiate conflict toward B, it must be the case that A's leader believes this action increases utility.[11]

As usual, consumption equals national output, plus import, minus export. When leaders choose conflict, they take consumption, import, export and national output as given, as in Polachek's model. A's leader chooses the level of conflict against its trade partner B in order to maximize utility, constrained by the need to maintain some trade balance. As the conflict A initiates against B rises, the prices of A's imports from B and its exports to B change. These price changes are determined endogenously in a manner to which we will return. For now, we note that these price changes are a function of conflict.

[11] For example, when President Bush decided to attack Iraq, he must have believed this was beneficial for the US. For an exposition of the unitary actor model and the expected utility approach to military conflict, see Bueno de Mesquita (1981).

The quantity of trade in good i that A exports to B is X^i and its price is PX^i. The volume of trade in good j that B exports to A is M^j and its price is PM^j. The number of goods A exports to B is N_X. The number of goods A imports from B is N_M. The utility of A's leader is denoted by U (EC, C). EC is economic consumption of nation A. C is the conflict A initiates against B, defined as a positive number.

The signs of the partial derivatives of utility are assumed to be as in Polachek: $U_{EC} > 0$ (the marginal utility of economic consumption is positive, or utility rises with consumption), $U_{EC\,EC} < 0$ (the marginal utility of consumption falls with more consumption), $U_C > 0$ (the marginal utility of conflict is positive), and $U_{CC} < 0$ (the marginal utility of conflict falls with more conflict).

The partial derivative of the price of good i (A exports to B) with respect to conflict is PX^i_C, i = 1, 2, ... N_X. The partial derivative of the price of good j (A imports from B) with respect to conflict is PM^j_C, j = 1, 2, ... N_M. Their second order derivatives are PX^i_{CC} and PM^j_{CC}. In our model, prices and their derivatives are set endogenously in the marketplace, which is one of our key innovations.[12]

A chooses the level of conflict (C) against B, taking consumption, import, and export as given, in order to maximize utility, subject to the need to maintain a zero trade balance.[13]

$$(1) \quad \max U(EC, C) \quad \textit{by chooing } C, \quad \textit{subject to} \quad 0 = \sum_{i=1}^{N_X} X^i \cdot PX^i(C) - \sum_{j=1}^{N_M} M^j \cdot PM^j(C)$$

The solution of this problem involves maximizing the following Lagrangian with respect to conflict (C) and the Lagrange multiplier (λ). The first order condition for C gives:

$$(2) \quad U_C(EC, C) + \lambda \left[\sum_{i=1}^{N_X} X_i \cdot PX^i_z(C) - \sum_{j=1}^{N_M} M^j \cdot PM^j_z(C) \right] = 0$$

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[12] As noted, Polachek (1980, 1992, 2000) assumes an exporter initiating conflict is paid by the target at a lower price for its export ($PX^i_C < 0$), and an importer initiating conflict pays the target at a higher price for its import ($PM^j_C > 0$).

[13] Using a non-zero trade balance does not change any of the theoretical results we derive.

The effects of changes in A's export of good i and import of good j on the conflict A sends toward B are given by computing the comparative statics of (2) with respect to X^i and M^j.

$$(3)\quad \frac{\partial C}{\partial X^i} = \frac{-\lambda \cdot PX_C^i}{U_{CC} + \lambda \cdot \sum_{i=1}^{N_X} X^i \cdot PX_{CC}^i - \lambda \cdot \sum_{j=1}^{N_M} M^i \cdot PM_{CC}^i}; \quad i = 1, 2, \ldots N_X$$

$$(4)\quad \frac{\partial C}{\partial M^j} = \frac{\lambda \cdot PM_C^j}{U_{CC} + \lambda \cdot \sum_{i=1}^{N_X} X^i \cdot PX_{CC}^i - \lambda \cdot \sum_{j=1}^{N_M} M^j \cdot PM_{CC}^j}; \quad j = 1, 2, \ldots N_M$$

Economic logic suggests that supply and demand determine the prices and quantities of traded goods i (i= 1, 2, 3... N_X) and j (j = 1, 2, 3..., N_M) between A and B. Each good involves a supply side and a demand side. The demand of an importer defines how much of a good to import at different prices, while the supply of an exporter defines how much to export at different prices. As the price of a good rises, the demand for this good falls and the supply of this good rises. The equilibrium condition defines the price of each traded good in the dyad.

More specifically, suppose in dyad A-B, A exports to B in sector i (i.e., B imports from A), and A imports from B in sector j (i.e., B exports to A). In equilibrium, A's demand for good j equals B's supply of good j to A. If B does not send enough of good j to A, A's demand for good j becomes larger than B's supply. In this case, the price of good j rises, prompting B to increase the supply to A. Sometimes, B's supply of good j is larger than A's demand. In this case, the price of good j declines due to the lack of demand in A, and B will reduce the supply of that good. In equilibrium, the demand for bilateral import of good j equals the supply of bilateral export of that good. The same logic applies to the export flow in sector i from A to B.

How do trade prices change in response to conflict? Demand and supply are often modeled as linear functions.[14] We model A's import demand for good j from B (M_A^D) by:

(5) $M_A^D = \beta_0 - \beta_1 PM + \beta_2 Y_A - \beta_3 C,$

where the superscript j denoting the good is dropped hereafter to simplify notation. We define all the β parameters in (5) to be positive. Y_A is A's income, and PM is the price A pays for imports from B. Equation (5) embeds the usual economic expectations that A's import demand for products from B rise with A's income and fall with the good's price. The effect of conflict on import demand of A in (5) is negative (C is defined as positive), a point to which we return shortly.

B's export supply of good j to A is modeled as follows:

(6) $M_B^S = \alpha_1 PM + \alpha_2 Y_B - \alpha_3 C$

All the α parameters in (6) are positive. Y_B is the exporter B's income. PM and C are defined as in (5). As usual in economics, export supply rises with the good's price and with the exporter's income. Equation (6) also indicates that the supply of goods by B to A falls with conflict (C).

There are several reasons why import and export fall with conflict in (5) and (6). Importers and exporters may want to punish hostile partners by reducing trade. The importer may seek to reduce dependence on a hostile supplier, which may stop selling, while the exporter may seek to reduce dependence on a hostile importer, which may stop buying. Additionally, conflict often raises costs to both sides (e.g., higher risk insurance premium, delays in transportation, damages to goods), reducing trade. Furthermore, governments often restrict trade with foes, seeking to influence their opponents and weaken their economic and military capabilities. Various empirical examples and statistical studies

[14] See, e.g., Leamer and Ster (1970), Bond (1985), and Nicholson (2005) for similar formulations that do not include conflict.

support this assumption.[15]

In equilibrium, bilateral import demand for good j equals its bilateral export supply. The equation $M_A^D = M_B^S$ is solved for PM, the equilibrium price of good j, as follows:

$$(7) \quad PM = \frac{\beta_0}{\alpha_1 + \beta_1} + \frac{\beta_2}{\alpha_1 + \beta_1} Y_A - \frac{\alpha_2}{\alpha_1 + \beta_1} Y_B + \frac{\alpha_3 - \beta_3}{\alpha_1 + \beta_1} C$$

As usual in bilateral trade models, (7) indicates the price of good j from B to A rises with A's income and falls with B's income. The denominator of the expression multiplying C in (7) is positive. Hence the effect of C on PM depends on β_3 (effect of conflict on A's import demand for good j from B) and α_3 (effect of conflict on B's export supply of good j to A). **If $\alpha_3 < \beta_3$**, PM falls with conflict (the coefficient of C is negative). **If $\alpha_3 > \beta_3$**, PM rises with conflict. **If $\alpha_3 = \beta_3$**, PM does not change with conflict.

Figure 1 illustrates the solution for PM in (7), where the equilibrium trade price is identified by the intersection of the bilateral import demand and export supply curves for good j. In each panel, the system is initially at equilibrium E_1, where M^D_{A1} and M^S_{B1} intersect. When A initiates conflict against B, curve M^D_{A1} shifts inward to curve M^D_{A2} (country A demands less). Curve M^S_{B1} also shifts inward to curve M^S_{B2} (country B supplies less). The shifts in the demand and supply curves are determined by α_3 and β_3, respectively. The market reaches the new equilibrium at E_2.

[Insert Figure 1 Here]

PM at E_2 can be higher than, lower than, or the same as PM at E_1. In Panel A, the export supply curve (M_B^S) shifts inward less than the import demand curve (M_A^D) ($\alpha_3 < \beta_3$), so the price of good j (PM) falls. In Panel B, M_B^S shifts inward more than M_A^D ($\alpha_3 > \beta_3$), so PM rises. In Panel C, the two inward shifts are equal in size, so PM does not change.

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[15] For additional discussion of these ideas see, e.g., Pollins (1989), Reuveny (2001a, 2001b), and Li and Sacko (2002).

Equations (5)-(7) model the determinants of trade prices; this leads to the question, what determines the effect of conflict on trade prices? Suppose A raises hostility toward B by one unit. The effect on PM is given by the expression in front of C in (7), $(\alpha_3-\beta_3)/(\alpha_1+\beta_1)$. The change in PM when C rises depends on the sensitivities of demand (β_3) and supply (α_3) to conflict, and on the price slopes of the demand and supply curves (β_1 and α_1, respectively). The shift in PM comes from two sources: B's export supply $[\alpha_3/(\alpha_1+\beta_1)]$, and A's import demand $[-\beta_3/(\alpha_1+\beta_1)]$. When conflict rises, the export's effect on raising PM increases with α_3, indicating that export supply is sensitive to conflict. The effect declines with α_1, indicating that export supply is elastic (the supply curve becomes flatter in Figure 1). Similarly, when conflict rises, the effect of import on reducing PM rises with β_3, suggesting import demand is sensitive to conflict, and falls with β_1, suggesting import supply is elastic.

So far, we have discussed A's import of good j from B (i.e., B's export to A). We now turn to A's export of good i to B (i.e., B's import from A). B's demand for A's export and A's supply of B's import are determined in manners similar to those defined by equations (5) and (6). The volume of this flow is denoted as X. We use δ for the coefficients in B's import demand in equation (8) (instead of β for A's demand in (5)), and γ for the coefficients in A's export supply in equation (9) (instead of α for B's supply in (6)). Thus B's import demand for good i from A is specified as:

(8) $$X_B^D = \delta_0 - \delta_1 PM + \delta_2 Y_B - \delta_3 C.$$

A's export supply of good i to B is specified as:

(9) $$X_A^S = \gamma_1 PM + \gamma_2 Y_A - \gamma_3 C$$

As before, all the δ and γ coefficients are defined to be positive.

The condition $X_A^D = X_B^S$ determines the equilibrium price PX for good i:

(10) $$PX = \frac{\delta_0}{\gamma_1+\delta_1} + \frac{\delta_2}{\gamma_1+\delta_1} Y_B - \frac{\gamma_2}{\gamma_1+\delta_1} Y_A + \frac{\gamma_3-\delta_3}{\gamma_1+\delta_1} C$$

Next, we turn to the effects of trade on conflict in (3) and (4). These effects depend on the first and second derivatives of the trade prices with respect to conflict (C) in (7) and (10):

$$(11) \quad PX_C = \frac{\gamma_3 - \delta_3}{\gamma_1 + \delta_1}; \quad PX_{CC} = 0; \quad PM_C = \frac{\alpha_3 - \beta_3}{\alpha_1 + \beta_1}; \quad PM_{CC} = 0.$$

Substituting these derivatives from equation (11) into equations (3) and (4), respectively, and reinstating the goods' notation in the appropriate places, we get the following solutions:

$$(12) \quad \frac{\partial C}{\partial X^i} = \frac{-\lambda \cdot \dfrac{\gamma_3^i - \delta_3^i}{\gamma_1^i + \delta_1^i}}{U_{CC}}; \quad i = 1, 2, \ldots N_X$$

$$(13) \quad \frac{\partial C}{\partial M^j} = \frac{\lambda \cdot \dfrac{\alpha_3^j - \beta_3^j}{\alpha_1^j + \beta_1^j}}{U_{CC}}; \quad j = 1, 2, \ldots N_M$$

Equations (12) and (13), which we developed from micro-foundations, offer a theory on conflict initiation. They show explicitly the *ex ante* effects of changes in country A's export of good i (where i = 1, 2, 3... N_X) and import of good j (where j = 1, 2, 3... N_M) on its decision to initiate conflict against B. Trade can motivate or deter conflict initiation. The signs of the effects of trade depend on the relative sizes of the δ_3 and γ_3 coefficients for A's export to B in (12), and on the relative sizes of the β_3 and α_3 coefficients for A's import from B in (13), which themselves vary across goods (as suggested by their superscripts).

In determining the signs of the derivatives in (12) and (13), recall that $U_{cc} < 0$. Thus, in (12), **if $\gamma_3 > \delta_3$**, a rise in A's export to B raises the conflict A initiates toward B. **If $\gamma_3 < \delta_3$**, a rise in A's export to B reduces this conflict. **If $\gamma_3 = \delta_3$**, a rise in A's export to B does not affect A's conflict against B.

Similarly, in (13), **if $\alpha_3 < \beta_3$**, a rise in A's import from B raises the conflict A initiates against B. **If $\alpha_3 > \beta_3$**, a rise in A's import from B reduces this conflict. **If $\alpha_3 = \beta_3$**, a rise in A's import from B has no effect on A's conflict against B. Linking these expectations to specific goods, one must know the values of the parameters α_3, β_3, γ_3, and δ_3. Before we turn to this task in Section 5, however, we first discuss the implications of the theoretical model.

4. Theoretical Model Implications

The theoretical model generates two implications that are new in the literature. First, the effects of A's export to B and A's import from B on the conflict A initiates against B can differ, as they depend on different coefficients, α_3 and β_3 for A's import from B, and γ_3 and δ_3 for A's export to B. Second, the effects of different traded goods on the conflict A initiates against B can vary across sectors because α_3, β_3, γ_3 and δ_3 vary across sectors. These implications provide new insights on the effect of trade on conflict. Focusing on total bilateral trade, previous studies ignore, implicitly or explicitly, the different effects of disparate goods or trade flow directions. Our model suggests that these differences are important, but what is the intuition behind this result?

The effects of trade on conflict in our model are driven by the economic costs and benefits anticipated from expected conflict-induced price movements. For example, exporters expect to benefit from conflict if a rise in conflict causes the export price to rise. This occurs *if* the bilateral supply falls with conflict (raising price) more than the bilateral demand falls (lowering price).

When does the bilateral supply of a traded good fall more than its bilateral demand? This depends on the extent of substitution of the good by alternative suppliers or buyers. Expecting higher costs due to conflict, exporters may pursue alternative buyers and importers may seek other suppliers. Both actions divert trade from foes, but different goods have varying degrees of substitution, ranging from full to no substitution. If the exporter has alternative buyers for its good, it supplies less to its foe and more to others. This implies an inward shift of the supply curve, raising the price of the good.

Expecting conflict, the importer may also buy from other suppliers. This implies an inward shift in the demand curve, reducing the price of the good. The trader that has relatively more outside alternatives is better positioned to benefit from conflict-induced market changes, and vice versa.[16]

Formally, if A's import demand over good j from B is less sensitive to conflict than B's export supply of good j to A **($\beta_3 < \alpha_3$)**, (13) predicts that a rise in A's import from B in sector j **lowers** the conflict A initiates against B. In this case, as conflict rises, A's import demand shifts inward less than B's export supply. This occurs if A has more difficulty shifting its demand for good j to other suppliers than B has in shifting its supply of good j to alternative buyers. In other words, A depends more on B as a supplier of good j than B depends on A as an outlet for good j. As conflict rises, the equilibrium price of good j, PM, rises, as shown in Panel B of Figure 1 and in (7), making it more expensive for A to buy each unit of good j from B. Hence, A has an incentive to initiate *less* conflict against B if its import of good j from B rises, *ceteris paribus*.[17]

If A's import demand of good j from B is more sensitive to conflict than B's export supply of good j to A **($\beta_3 > \alpha_3$)**, equation (13) predicts that a rise in A's import from B in sector j **raises** the conflict A initiates against B. In this case, A's import demand shifts inward more than B's export supply does. This occurs if A has less difficulty in locating other suppliers of good j than B has in finding alternative buyers for good j. As conflict rises, the equilibrium price of good j, PM, falls, as in Panel A of Figure 1 and in equation (7), making it less expensive for A to buy each unit of good j from B. Hence, A has an economic incentive to initiate *more* conflict against B, *ceteris paribus*.

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[16] Substitution of traded goods can occur across countries and within sectors. For example, the US may substitute Russian wheat with Mexican wheat (across countries), American corn (within sector), or Canadian corn (across countries and within sector). The ease of substitution within sectors may vary. For example, it may be easier to substitute some agricultural goods (e.g., wheat with rice), but harder to substitute some manufactured or energy goods (e.g., television with cars, oil with nuclear energy).

[17] This scenario is similar to the one and only scenario in Polachek's model (recall that he assumes import price rises with conflict). However, this is not the only possible scenario in our model.

Yet another possibility implied by our model occurs when A's import demand and B's export supply of good j are equally sensitive to conflict **($\beta_3 = \alpha_3$)**. In this case, a rise in A's import from B in sector j does not affect the conflict initiated by A against B. When conflict rises and B's export supply and A's import demand shift equally in absolute terms, PM does not change. As a result, A's incentive to initiate conflict against B does not change when its import of good j from B rises.

The reasoning behind the effect of A's export on the conflict A initiates toward B is similar. In (12), if A's export supply of good i to B is less sensitive to conflict than B's import demand for good i from A **($\gamma_3 < \delta_3$)**, a rise in A's export to B in sector i **reduces** the conflict A initiates against B. In this case, with conflict, A's supply of good i to B shifts inward less than B's demand for good i from A. A depends more on B as a buyer of good i than B depends on A as a supplier. As a result, the price of good i, PX, falls, as shown in (10). When PX falls with conflict, A gets less for each unit of good i exported to B. Hence, A has an incentive to *reduce* conflict if its export of good i to B rises.[18]

If A's export supply of good i to B is more sensitive to conflict than B's import demand for good i from A **($\gamma_3 > \delta_3$)**, a rise in A's export to B in sector i **raises** the conflict A sends against B. In this case, as conflict rises, A's supply of good i to B shifts inward more than B's demand for good i from A. A depends less on B as an outlet than B depends on A as a supplier. The price of good i, PX, rises, as shown in (10). A gets more for each unit of good i exported to B. Hence, A has an incentive to *raise* conflict if its export of good i to B rises, *ceteris paribus*.

If A's export supply and B's import demand of good i are equally sensitive to conflict **($\gamma_3 = \delta_3$)**, a rise in A's export to B in good i does not affect the conflict A initiates against B. In this case, A's export supply and B's import demand shift inward equally in absolute terms in response to a rise in conflict, so the price of good i does not change with conflict. As a result, there is no incentive for A to increase or decrease the conflict it initiates toward B.

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[18] This scenario is implied by Polachek's model, but again it is not the only possible scenario.

5. Deriving Hypotheses for the Empirical Analysis

Our theoretical model predicts deductively the effects of changes in bilateral exports and imports of different goods on the conflict country A initiates against country B. In this section, we employ these deductions to generate *ex ante* sector- and flow-specific hypotheses. As noted, the underlying mechanism driving these predictions is the ability of countries to substitute their bilateral trade flows in response to conflict, which are represented in the model by the coefficients of conflict in the bilateral import demand and export supply equations of country A for each good: $\alpha_{3,}$ $\beta_{3,}$ γ_3 and δ_3.

Using our model to formulate hypotheses for specific exported and imported goods, one needs to know the values of $\alpha_{3,}$ $\beta_{3,}$ γ_3 and δ_3. Like all parameters of demand and supply equations, these parameters are not readily observable and have to be estimated empirically. In principle, we could estimate the parameters ourselves, using data on bilateral trade prices and quantities for dyadic trade flows broken down along economic sectors, but these data are rarely available. Alternatively, we could use existing estimates of these parameters in the literature. In this paper, we choose the latter approach.

Only a few trade studies estimate bilateral import demand and export supply using bilateral trade prices and quantities. They use data Italianer (1986) collected for the European Commission, but they do not include conflict. To our knowledge, only Reuveny (2001b) includes conflict in estimating sectoral bilateral import demand and export supply equations. He employs Italianer's data for five sectors: (1) agriculture-fishery, (2) energy, (3) chemical-mineral, (4) manufactured products, and (5) miscellaneous consumption products. For each good traded in any dyad, he estimates a system of six equations with six endogenous variables: export of A to B, import of B from A, export of B to A, import of A from B, conflict from A to B, and conflict from B to A. The coefficients of conflict in the demand and supply equations provide our $\alpha_{3,}$ β_3, γ_3 and δ_3. We use the average estimates across dyads to compute (α_3-β_3) and (γ_3-δ_3) for each of Italianer's five sectors, which (12) and (13) employ to predict effects of the sectoral

exports and imports, respectively, on conflict.[19]

Table 1 presents the five sectors, the signs of $(\alpha_3-\beta_3)$ and $(\gamma_3-\delta_3)$ per sector, and the expected effects of A's import from B and A's export to B in each sector on the conflict A initiates against B.

[Insert Table 1 Here]

As shown, $(\alpha_3-\beta_3)$ is positive for the agriculture-fishery, energy, and chemical-mineral sectors, and negative for the manufactured goods and miscellaneous consumption products sectors. Further, $(\gamma_3-\delta_3)$ is positive for the energy, chemical-mineral, and manufactured goods sectors, and negative for the agriculture-fishery and miscellaneous consumption products sectors. These observations imply the following hypotheses:

H1: An increase in country A's imports from B in the agriculture-fishery, energy, or chemical-mineral sectors reduces the probability of A initiating military conflict against B.

H2: An increase in country A's imports from B in the manufactured or miscellaneous consumption products sectors increases the probability of A initiating military conflict against B.

H3: An increase in country A's exports to B in the agriculture-fishery or miscellaneous consumption products sectors reduces the probability of A initiating military conflict against B.

H4: An increase in country A's exports to B in the energy, chemicals-minerals, or manufactured products sectors increases the probability of A initiating military conflict against B.

6. Research Design of Empirical Analysis

Since our hypotheses anticipate the likelihood of conflict country A initiates against country B, we use a directed dyad framework.[20] Our sample includes all the directed dyads and MIDs in the time period 1970-1997, subject to data availability. The list of countries in the sample is in the Appendix.

Dependent and Independent Variables

[19] Reuveny's work has two limitations from our perspective. It employs events data to measure all types of conflict, not just MIDs, and its sample includes a few major powers in 1963-1994. Reuveny's estimates are not perfect (as in all empirical models), but the implied issue is empirical, not theoretical.

[20] In this framework, the dyad US (A) ⇒ USSR (B) (US initiates conflict against USSR), for example, differs from the dyad USSR (A) ⇒US (B) (USSR initiates conflict against the US).

The dependent variable is coded one if A initiates a MID against B and zero otherwise. Data are from the EUGene program (Bennett and Stam, 2000b). As usual, a MID involves a threat of military force, display of force, use of force, or war. For the 1970-1997 period, and given the availability of data for the empirical model, the estimation sample includes 352 MIDs.[21]

Our dependent variable, MID initiation, raises three issues. First, while it is used by many studies and enables the comparison of our results with previous findings, it aggregates the different types of MIDs, ignoring their variations. However, we believe a focus on all MIDs also has merits. Leaders moving forces to the border or threatening to use force may be driven by the same considerations as leaders actually using force. It is also debatable whether the threats to use inter-ballistic missiles or moving many divisions to the border are less hostile than border skirmishes or even clashes that cause killings. Nevertheless, to check robustness, we employ two additional dependent variables: one involves only display of force, use of force, and war; the other includes only use of force and war.

Second, conflict rises or falls in the theoretical model, but our dependent variable admits only values of 0 and 1. This issue applies to all studies that use MID data. This body of work seeks to study the effect of trade on military violence, for military conflict produces the most serious consequences in interstate relations, justifying the focus on MIDs. No MID studies, however, would argue that conflict is really a 1-0 process. Rather, the logit/probit estimators they employ predict the probability of a dispute, which is a continuous variable, preserving the spirit of treating conflict as a continuous variable.

Third, while many studies employ MID initiation (e.g., Bennett and Stam, 2000a, 2004; Reiter and Stam, 2003; Hegre, 2004; Lai and Slater, 2006; Powers, 2006), the MID data code initiators as the side first taking military action. This practice ignores actions falling below the MID threshold, may not represent who started the quarrel, ignores that for actual conflict to occur the target is important, and overlooks the

[21] As usual, when two or more MIDs occur in a year, data are from the highest intensity MIDs. Only MID originators are coded as initiators. Dyad-years with an ongoing MID are dropped (not new initiations). When A initiates a MID against B, the B→A dyad is dropped if no new MID occurs.

possibility that when one side moves, the other may essentially ignore it. That said, we believe that these limitations are not crucial here; since our theory focuses on the decision of one side to initiate military action, the MID initiation measure is appropriate for our purpose.[22]

Our theory indicates the empirical model ought to include bilateral sectoral imports and exports, and national incomes of both states in the dyad. We include import to A from B and export from A to B in the five Italianer (1986) sectors, denoted as AGRICULTURE IMPORT, AGRICULTURE EXPORT, CHEMICAL-MINERAL IMPORT, CHEMICAL-MINERAL EXPORT, ENERGY IMPORT, ENERGY EXPORT, MANUFACTURED IMPORT, MANUFACTURED EXPORT, MISCELLANEOUS CONSUMPTION IMPORT, and MISCELLANEOUS CONSUMPTION EXPORT. The raw data are purchased from the World Trade Flows database, sponsored by the University of California, Davis and the National Bureau of Economic Research (Feenstra, 2000). They are provided in current US dollars across ten Standard International Trade Classification (SITC) one-digit sectors, and include all the countries that have data (see Appendix Table A3 for a list of countries). We convert these data into millions of 1995 constant US dollars and regroup them to conform to the Italianer (1986) sectors.[23]

Moving to the control variables, GDP INITIATOR and GDP TARGET are real GDPs of the conflict initiator and the target, respectively, in millions of 1995 constant US dollars. The data are from the World Bank (2004). We do not use the trade/GDP ratio measure because it may misrepresent the effect of trade. For

[22] While most quantitative conflict studies use the MID data, some studies use events data. Several studies discuss advantages and disadvantages of events data versus MID data (e.g., Reuveny, 2003).

[23] The SITC sectors are: (0) agriculture and fishery; (1) beverages and tobacco; (2) minerals and inedible crude materials; (3) energy, fuels, and lubricants; (4) animals, vegetable oils, fats, and waxes; (5) chemicals; (6) basic manufactured products; (7) manufactured machinery and transport products; (8) miscellaneous consumption products; (9) goods not classified by kind. The five Italianer sectors are: agriculture-fishery (SITC 0), chemical-mineral (SITC 2, 5), energy (SITC 3), manufactured products (SITC 6, 7), and miscellaneous consumption products (SITC 1, 4, 9, 8). We do not use the SITC sectors directly because we do not have the required supply and demand coefficient estimates to form *ex ante* expectations for each sector. The data records only non-zero values. So for dyads covered by the trade database, trade values are set zero for years showing no values, per exchange with Robert Feenstra.

example, if trade does not change and GDP falls, the ratio rises. Suppose we find in this case that a rise in the ratio reduces conflict. One often interprets this to imply a rise in trade reduces conflict, but in our case it is the fall in GDP that reduces conflict, not a rise in trade. This potential problem is discussed in Mansfield and Pevehouse (2000) and Keshk et al. (2004). These studies include trade and GDP separately in the model, a practice we follow. By including the GDP, we also control for the size of the economy, similar to what the trade/GDP ratio does.

The remaining controls are standard in studies of directed dyads (e.g., Bennett and Stam, 2000a; 2004; Hegre, 2004). CONTIGUITY is set to one when two states in a dyad are contiguous on land or are separated by up to 150 miles of water and zero otherwise. Contiguous states are more likely to fight one another. DISTANCE is logged distance between the capitals of two states in a dyad. Some scholars (e.g., Russett and Oneal, 2001; Dorussen, 2006) argue a rise in distance decreases the probability of MID initiation, while others (e.g., Ray, 2005) argue against including this variable. Seeking to stay out of that debate, we include both variables and conduct robustness checks including only one of them at a time.

We construct three democracy related variables to capture the effects of domestic political regimes. These variables are based on the polity2 variable from the Polity IV data set, ranging from -10 to 10 (-10 = high autocracy; 10 = high democracy). INITIATOR DEMOCRACY is the level of democracy of the MID initiator. TARGET DEMOCRACY is the level of democracy of the target. REGIME DISSIMILARITY is the absolute value of the difference between their democracy levels. The initiator's democracy variable tests whether democratic countries are more likely to initiate MIDs. The target's democracy variable tests whether democracies are more likely to be MID targets. The difference variable measures the effect of political dissimilarity on MID initiation.

Following Bennett and Stam (2000b, 2004), we include two capability variables based on the COW composite index of national capabilities. POWER BALANCE is the ratio of the larger state's capabilities divided by the total of the initiator's and target's capabilities, ranging between 0.5 (equality) and 1

(dominance). It tests if MID initiation is less likely for dyads of relatively more balanced capabilities. INITIATOR CAPABILITY RATIO is the ratio of the initiator's capabilities over total dyad capabilities, testing whether a rise in the initiator's capabilities encourages MID initiation. ALLIANCE is a dummy variable indicating the presence (1) or absence (0) of dyadic defense pacts, neutrality pacts, or ententes. MINOR POWER is coded one if both states in a dyad are minor powers and zero otherwise.[24]

Simultaneity, Estimation, and Inference

Conflict as the dependent variable may affect some right hand side variables, including trade. This possibility applies to almost all statistical studies that model conflict as a function of various variables. Deviating from this norm, Keshk et al. (2004) model the simultaneous relationship between aggregate trade and MID. This method, however, is not feasible here. In our case, the system of equations would have to include 11 endogenous variables (5 imports, 5 exports, and 1 conflict variable), but the Maddala-Amemiya method used by Keshk et al. (2004) only works for a system of two endogenous variables (one continuous and one dichotomous). Therefore, we employ a sub-optimal solution for addressing the simultaneity issue; we lag the right hand side variables, a strategy that is typically applied in the literature.

Since the dependent variable is dichotomous, we use the probit estimator. Our sample includes 213,790 observations, but, as usual, only a very small number of directed dyad-years involve MIDs (352).[25] Given the pooled nature of our data, the error term of our model may be subject to serial correlation, heteroskedasticity, and temporal dependence within dyads. To control for heteroskedasticity and serial correlation, we estimate robust standard errors clustered over dyads. We also include the peace year counter (PEACE_YEARS) and three cubic spline variables (SPLINES) to control for the duration dependence of peace within dyads, as suggested by Beck, Katz and Tucker (1998).

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[24] In the EUGene program, the major powers are China, France, US, UK, and USSR/Russia (Bennet and Stam, 2000b).

[25] As King and Zeng (2001) show, the logit estimator underestimates the probability of rare events. For robustness check, we also employ King and Zeng's rare event logit estimator.

In discussing findings, we begin with general model performance, seeking to establish that our modeling platform is statistically sound. Sectoral trade flows may be correlated with one another, reflecting economic interrelationships, and may also affect other independent variables. This may lead to multicollinearity. We investigate this possibility by inspecting bivariate correlations and variance inflation factors (VIF).[26] This is followed by inspecting the model's goodness of fit from pseudo R^2 and comparing our results for the control variables to results previously reported in the literature.

We assess the effects of trade variables on conflict by testing hypotheses on the signs of effects, computing the sizes of statistically significant effects, testing hypotheses on the equality of significant effects, and employing the model for in-sample prediction. Since our sample is large, we employ the relatively more conservative two-tailed tests for the statistical significance of the effects of our variables, even though our hypotheses are directional and one-tailed tests are appropriate.[27]

In evaluating the size of effect, we compute the relative risk for each significant variable, which is the probability of an event in a treatment group divided by its probability in a control group (e.g., Gartzke, Li and Boehmer 2001; Russett and Oneal, 2001; Dorussen, 2006). Specifically, we compute the probability of MID initiation when a variable rises by one standard deviation (s.d.) above its sample mean, divided by the probability of MID initiation when this variable is set at its sample mean, *ceteris paribus*.[28]

Next, we test whether the statistically significant effects of our trade variables are equal in size (the

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[26] $VIF=1/(1-R_i^2)$, where R_i^2 is R^2 from regressing the i^{th} independent variable on all the other independent variables. If VIF>10, multicollinearity is a problem. In this case, estimated coefficients and their variances remain unbiased, but the variances may be large. If the results are significant even now, they are robust since the test is demanding (Achen 1982; Kennedy 2003).

[27] We employ significance tests since we analyze a sample, not the entire population. Even if our sample included all the countries in the 1970-1997 period, this would not have been the population since we would not have data for 2000, 1960 and so on, and we only have one collected data set.

[28] Strictly speaking, the interpretation is as follows: Assume there are 100 MIDs and the relative risk rises 5% when variable X rises. If we had many samples for a model when X rises, the average number of predicted MIDs across these samples would be 105. The one s.d. rise is widely used.

insignificant effects are statistically indistinguishable from zero). This is an important test of the practice of using total trade data aggregated across sectors and flow directions, which is common in the literature. This practice is equivalent to assuming the same coefficient applies to imports and exports in different sectors, or that all these trade flows have identical effects on conflict.

Finally, we evaluate the results with in-sample predictions. This evaluation computes the predicted probability of a MID for each directed dyad-year and compares it to a threshold, which is typically set to the proportion of MID initiation in the sample.[29] If the predicted probability is larger than the threshold, the model is said to have predicted a MID and vice versa. The proportion of correctly classified cases indicates the model's predictive power.

7. Empirical Findings

This section presents our findings. As called for by our research design, we first inspect diagnostics and results for the control variables and then present results for the trade variables.

Diagnostics and Control Variables

The correlation coefficients between the independent variables and their VIFs are reported in the Appendix Tables A1 and A2. Even though the largest correlation between any two independent variables is quite high (0.87 for manufactured goods export and chemical-mineral export), all the individual VIFs are smaller than the threshold value of 10.[30] The VIF diagnostics indicate that multicollinearity is not a serious concern. Table 2 presents the estimation results. All three models have a pseudo R^2 above 0.3, showing reasonable explanatory power.

[Insert Table 2 here]

In model 1, the results for the control variables from all MIDs largely resemble previous findings. The

[29] The sample proportion of MID initiations is a reasonable cutoff as an uninformed observer can always use this value as a guide to provide an educated guess of the probability of MID initiation.

[30] In all cases, the correlation between any two export flows is the same as the one between the import flows of the same sectors, which is one check of the validity of the data.

effect of a rise in INITIATOR CAPABILITY RATIO on the likelihood of MID initiation is positive and significant at the 5% level. A state is more likely to initiate MIDs when its share of the dyad's total capability increases. The effect of a rise in POWER BALANCE is insignificant. Conflict is not less likely between states with relatively equal capabilities. The coefficient of ALLIANCE is insignificant, suggesting the presence of a military alliance has little effect on MID initiation. The effect of a rise in INITIATOR DEMOCRACY is negative and significant at the 5% level, the effect of a rise in TARGET DEMOCRACY is insignificant, and the effect of a rise in REGIME DISSIMILARITY is positive and significant at the 1% level. More democratic countries are less likely to initiate MIDs, but not more likely to be targeted. Countries are more likely to initiate conflict against those whose regimes differ more from their own. The effects of CONTIGUITY and DISTANCE are significant at the 1% level and are positive and negative, respectively. Contiguous states are relatively more likely to initiate MIDs against each other, while a rise in distance between countries reduces the likelihood of MID initiation. The effect of MINOR POWER is negative and significant at the 5% level. Minor power dyads are less likely to experience MIDs. The effects of INITIATOR GDP and TARGET GDP are positive and significant at the 1% level. Larger economies are more likely to be initiators and targets of MIDs.

In model 2 for MIDs involving at least the display of force, the statistical results for these control variables are essentially identical to those in model 1. In model 3 for MIDs involving at least the use of force, the results for the control variables are similar to those in model 1, except that the effects of INITIATOR DEMOCRACY and INITIATOR GDP are not significant.

Effects of Trade Variables

Having shown our modeling platform is sound, we turn to the trade variables, beginning with model 1 for all MIDs. The coefficient of AGRICULTURE IMPORT is negative as expected and significant at the 1% level. The coefficient of AGRICULTURE EXPORT is negative as expected but not significant. A rise in a country's agriculture-fishery import reduces the likelihood of MID initiation toward the exporter, but the

effect of a rise in a country's agriculture-fishery export is very weak.

The coefficient of ENERGY IMPORT is negative as expected and significant at the 1% level. The coefficient of ENERGY EXPORT is positive as expected and significant at the 10% level. A rise in a country's energy import reduces the likelihood of MID initiation toward the exporter, and a rise in energy export increases the likelihood of MID initiation toward the importer.

The coefficients of MANUFACTURED IMPORT and MANUFACTURED EXPORT are both positive as expected and significant at 10% and 5% levels, respectively. A rise in a country's import of manufactured products raises the likelihood of MID initiation toward the exporter, and a rise in a country's export of manufactured products raises the likelihood of MID initiation toward the importer.

The coefficients of CHEMICAL-MINERAL IMPORT/EXPORT and MISCELLANEOUS CONSUMPTION IMPORT/EXPORT are not significant. This may be due to aggregations of very different products: chemicals and minerals in one case and various consumption goods in the other. These aggregations, however, are dictated by Italianer's (1986) classification.[31]

In model 2 for MIDs involving at least the display of force, the results for the trade variables are identical to those in model 1. In model 3 for MIDs involving at least the use of force, the results for the trade variables are consistent with those in model 1, except that the coefficient of chemical and mineral export is now negative and significant, rejecting the respective part of H4, and the coefficient of miscellaneous consumption export is negative and significant, supporting the respective part of H3.

Table 3 reports the relative risk for each statistically significant variable, where the continuous variables in the control group are set at their respective sample means, and the dichotomous variables are set for contiguous, minor power, no-alliance dyads. The summary statistics for all variables are reported in

[31] The trade results for models excluding CONTIGUITY or DISTANCE are similar, except that the p-value for energy import is weaker (0.105 or 0.142). The rare event logit results also are similar, except that the coefficient of chemical-mineral import is negative and significant as expected, and the coefficient of energy import is negative as expected but is not significant.

Appendix Table A1. When A's agriculture-fishery import from B rises by one s.d. ($187 million) above the mean, country A is 22% less likely to initiate a MID against B, relative to the control group. When A's energy import from B rises by $439 million, it is 4% less likely to initiate a MID. When A's energy export to B rises by $439 million, A is 7% more likely to initiate a MID. When A's import or export of manufactured products rises by $1.5 billion, A is 13% or 16% more likely to initiate a MID.

[Insert Table 3 here]

These effects vary across sectors and between trade flow directions, as our theory suggests, but how do they compare with those of the non-trade variables? In Table 3, relative to the control group, the risk of MID initiation due to a one s.d. rise above the sample mean is 44% higher for the initiator capability ratio, 16% lower for initiator democracy, 20% higher for regime dissimilarity, 29% lower for log distance, 51% higher for initiator GDP, and 29% higher for target GDP. Hence, the substantive effects of increases in energy import and export are smaller than those for the non-trade variables; the effects of increases in agriculture-fishery import, manufactured imports, and manufactured exports are of the same order of magnitude as those for the initiator's democracy, target GDP, regime dissimilarity, and distance; and the effects of increases in the initiator's GDP and capability ratio are larger than those for the trade variables. Overall, trade has an important effect on conflict initiation, but not the most important effect.

Are the statistically significant effects of the trade variables in Table 3 equal in size across sectors? This question concerns the validity of the conventional practice of aggregating bilateral trade flows into total trade and assigning it one coefficient in the model. Table 4 presents results for the coefficient equality tests. The first row denotes the two flows (agricultural import and energy import) that reduce the probability of MID initiation. The first column denotes the three flows (energy export, manufactured import, and manufactured export) that encourage MID initiation. Table 4 shows that all of the pair-wise equality tests are statistically significant at conventional significance levels for two tailed tests. Hence, the effects of these sectors are not equal in size, suggesting (again) that aggregating exports and imports in different sectors mask

their differential effects.

Table 5 presents results for the in-sample prediction of MID initiation based on model 1 for the whole sample as well as all the dyads where China is the initiator. The cutoff probability is 0.0016 (the sample average probability of MID initiations). Model 1 correctly predicts the absence of MID initiation in 91% of all the dyad-years and 71% of the China-dyad years, and the presence of MID initiation in 81% of all the dyas years and 92% of the China-dyad years. The model performs reasonably well in terms of in-sample prediction for both the whole sample and the China dyads specifically. It is interesting that the model does a better job predicting the MID initiations for China than for the whole sample, but predicts about 10% more false positives for the China dyads.

To illustrate the relevance of the model for China, Table 6 lists (1) all MIDs China initiated in the sample, the predicted probability, sample means and values in millions of constant US dollars for the five sectors whose effects are statistically significant, and (2) some examples of false positive predictions by the model. In the top portion of the table, the trade patterns appear to be broadly consistent with the model predictions. Both the absence of trade and increases in trade in certain sectors could be associated with MIDs. Japan, US, Russia, and South Korea, with whom China trades heavily in manufacturing products, confront with most of the MIDs China initiated. The false positives appear to derive from cases where energy exports and manufacturing trade are high. The countries identified by the false positives largely coincide with those that have actually experienced MID initiations by China.

[Insert Tables 4, 5 and 6 Here]

Comparisons to the Literature and Stylized Examples

Our empirical findings confirm several results reported in previous smaller-scale empirical studies that did not employ the MID measure or our empirical model specification. The finding that a rise in energy exports promotes conflict is consistent with the result of Polachek (1980), which is obtained for two oil producing countries. Our result that a rise in agriculture-fishery imports reduces conflict initiation agrees with

the finding of Gasiorowski and Polachek (1982) regarding the conflict behavior of the Warsaw Pact toward the US. Our finding that a rise in manufactured products import or export promotes conflict confirms the Bennett et al. (1992) study of the US-Japan dyad.

In many ways, the study of Dorussen (2006) is the closest to ours, as it also employs a large N sample and investigates the effect of disaggregated trade on the likelihood of MID. In addition, several of our findings are consistent with the spirit of Dorussen's results. For example, chemical-mineral trade has a weak effects on conflict; some sectoral trade flows reduce the probability of MID.

Our analysis, however, differs from Dorussen (2006) in other ways. While his theory is generic, like ours, it is not formalized. He argues trade is more pacifying if traded goods have greater opportunity costs. If goods can be easily appropriated, the pacifying effect is weaker, or may be reversed. Our theory works through changes in trade prices and substitution. Dorussen notes the effect of trade may change between export and import, but does not predict the effects of export and import in specific sectors. We predict the effects of import and export in different sectors on conflict and test these predictions. Empirically, Dorussen looks at both MID involvement and onset in a sample of non-directed dyads, but excludes minor disputes below the use of force, while we study the MID initiations measured in three ways (all MIDs, at least display of force, and at least use of force) in a sample of directed dyads. Finally, while Dorussen finds trade either reduces or has no effect on conflict, depending on sector, we find trade in some sectors can also increase the likelihood of conflict.

Given the complexity of our model, our exposition could benefit from a few real world-related examples, but we must first offer a caveat. Statistical studies such as ours typically do not discuss real world examples, and for good reasons. Our model predicts a tendency toward conflict or peace due to a change in some trade variable, *holding all the other variables in the model constant*. In the real world, one observes the net effect of *all* the relevant variables *held at the levels they happen to be*, not the partial effects obtained from regression. We cannot, and do not, argue that the presence or absence of conflict in these examples is only

driven by trade. Rather, we employ our model to speculate on the effect of a change in some sectoral trade flow on international conflict behavior, *ceteris paribus*.[32]

Limitations notwithstanding, we may utilize the implications of our model to better understand some stylized examples. Consider first the Iran-US dyad in the period since 1979, which included several US-Iran MIDs. Based on our model, we speculate Iran may intensify conflict with the US since this raises the price of its oil exports. In other words, our model suggests that Iran, which is likely still selling oil to the US directly or indirectly, benefits economically from hostility.

A second example involves Bulgaria, Rumania, and Hungary in the 1930s. At that time, their trade flows became highly concentrated on Germany. They imported primarily manufactured goods and coal from Germany and exported agricultural and light manufactured goods to Germany, but they were much less able than Germany to substitute these flows.[33] The three countries realized that initiating conflict against Germany would cause them large losses, as Germany was relatively more able to manipulate its trade flows (Hirschman, 1945; Arad et al., 1983). Our model suggests that in order to prevent conflict from Bulgaria, Rumania, and Hungary, Germany could increase coal and agricultural exports and reduce manufactured exports and light manufactured imports.

Finally, consider the US-Japan dyad in the period leading up to December 1941. The US reduced energy export to Japan, hoping to curb its territorial expansion in Asia, but the policy backfired. Historians such as Kennedy (1987) and Keylor (2001) argue that the fall in Japan's energy import from the US resulted in economic losses and a growing sense of vulnerability, which contributed to antagonizing Japan toward the US. This explanation is consistent with our model prediction.

8. Discussion and Conclusion

[32] We also need to be careful when using non-linear models such as probit since employing different control groups may affect the inferred sizes of effects.

[33] On Nazi Germany's trade with these countries (and others) see, e.g., Hillmann (1940), Neal (1979), and Leitz (2004).

Studies of the effect of trade on conflict typically invoke the notion of total bilateral trade, implicitly or explicitly assuming the effect does not vary across economic sectors and between trade flow directions. We challenge these premises. Our theory considers two countries that trade with one another and maintain some bilateral relations. The effects of changes in bilateral trade on the decision to initiate conflict vary across economic sectors and between trade flow directions. We employ our theory to identify *ex ante* the effects on conflict initiation of increases in export and import in the sectors of agriculture-fishery, energy, manufactured products, chemical-mineral, and miscellaneous consumption products.

In the empirical analysis, we find significant variations in the effects of trade on MID initiation across economic sectors and between trade flow directions. As predicted, rises in agriculture-fishery imports and energy imports reduce the probability of MID initiation, and rises in energy exports, manufacturing imports, and manufacturing exports increase this probability. Yet, changes in agriculture-fishery export, chemical-mineral trade, and miscellaneous consumption products trade generally do not affect MID initiation. One logical explanation of these insignificant effects is that these sectors and flows are not important enough to the leader to influence her decision. But one may also attribute these insignificant results to two empirical problems: (1) the limited data for the measurement of the parameters of the sensitivities of sectoral import and export to conflict; (2) inappropriate aggregation of, say, chemicals and minerals into one category and very different consumption goods into one category. Improvements in solving these two problems will lead to more accurate empirical testing of our theory in future research.

How does our model fit with the two primary formal models offered in the literature to explain the effect of trade on conflict, i.e., Polachek's liberal model and Gartzke et al.'s signaling argument? As discussed throughout the article, our model subsumes and extends the one of Polachek, predicting that a rise in trade may promote either peace or conflict and the effect may vary across goods and imports versus exports, depending on certain parameters. Consider next the signaling argument. In this theory, military conflict results from a bargaining failure over some contested issue. Acting under incomplete information, trading nations are

less likely to fight each other only because they can credibly signal resolve during bargaining by resorting to trade sanctions or trade dissociation (Gartzke et al., 2001). Within this logic, the classical liberal argument formalized by Polachek does not hold because the size of the benefit from bilateral trade will be subsumed into the initiator's demand and the target's concession without reducing uncertainty–the main cause of bargaining failure and military conflict.

One might argue that the same criticism against the classical liberal argument could be leveled against our model. That is, leaders factor expected economic costs into their reservation values when making demands of their opponents, and they will make more concessions to avoid military conflict when the expected economic costs are high. We argue that, in fact, our research poses some important challenges for the signaling argument.

In the signaling argument, the benefit of each actor from economic exchange is modeled by one opportunity cost parameter, which is common knowledge to both sides (e.g., Gartzke et al., 2001). The situation in our framework is more complicated because we allow n-number of trade markets for there are n-number of goods or sectors. As we have shown, each bilateral trade market does not necessarily suffer a loss due to conflict; some conflict may actually induce a rise in profit, a condition that is being assumed away in the bargaining model. Now, the leader needs to aggregate the costs and benefits across the sectors in some way to figure out the welfare implications of a conflict decision. To do so, one needs to know who supplies what to whom, who demands what from whom, and who are the alternative suppliers and buyers and at what prices. The amount of information required is daunting, and much of the information is likely to be trade secrets. The leader may have difficulty getting access to all this information; even if she does, she may not be willing to share this financially valuable private information with the other side.

Hence, our analysis of disaggregated bilateral trade creates four major problems for the signaling argument. First, the size of the opportunity cost is more difficult to pin down in multiple trading markets. Second, the costs and benefits in particular trading markets are not common knowledge such that the

manipulation of a trading relationship may misinform as to the value of a particular trading relationship. Third, if one finds gains in trade from conflict, unknown to the other side, this contributes to asymmetric information and uncertainty. Finally, the empirical finding that some sectoral export and import lead to conflict initiation challenges the theoretical prediction of the signaling argument that if trade affects conflict at all, it should reduce the likelihood of military conflict.

Taking a broader perspective, this research advances our theoretical understanding of the effect of trade on conflict initiation. To illustrate this point, let us further compare our theory with the five key theories in the literature in terms of their expected effect of trade on conflict, policy objective, policy tool, causal logic, and treatment of markets.

Assuming states maximize material welfare, liberalism argues that leaders pursue peace with trade partners because conflict reduces valuable trade gains. The causal logic stresses economic incentives, but over-simplifies market forces, assuming conflict is always costly or conflict lowers export price for an exporter and raises import price for an importer. The bargaining approach assumes leaders manipulate trade in order to facilitate negotiation over a disputed issue or influence its outcome. Cutting trade ties functions either as a credible signal to demonstrate resolve, enabling states to avoid bargaining failure and conflict, or as a tool to influence the bargaining outcome, resulting in less high-level conflict when actors face high exit costs. This approach also stresses economic ties, but reduces the economics of the marketplace to one or two parameters that denote the importance of trade to both sides.

The neo-Marxist and neo-mercantilist realist arguments postulate that states use trade as a policy tool in order to affect the outcome of a contested issue or to expand their economic gains and political power. The outcome can be conflict or peace, depending on whether the other side rebels against, or complies with, the external demand. Economic incentives also play a role here, but market forces are not fully modeled, only loosely represented by the differential importance of trade to both sides. The classical realist argument assumes that states maximize power and security, using conflict as a policy tool. In this view, trade should have no systematic effect on conflict, because political relations trump economic relations.

In our theory, states use conflict (or peace) as a policy instrument to maximize national welfare, which depends on wealth and security. Bilateral import demand and export supply in different sectors have different sensitivities to conflict, reflecting the underlying abilities of states to substitute these trade flows with others. Markets play an essential role in this logic, informing leaders about the costs and benefits of conflict via the expected changes in the bilateral trade prices. The costs and benefits, in turn, motivate or deter conflict initiation.

In general, our theory subsumes the liberal logic as one special case, and offers a plausible explanation alternative to the bargaining/signaling, neo-Marxist, neo-mercantilist realist, and classical realist arguments. Our theory also specifies *ex ante* when and how export and import flows in specific economic sectors influence the likelihood of military conflict initiation, a question that has not been systematically addressed before.

Our discussion is not merely academic, for our research has important policy implications. It informs policymakers about how to manage bilateral trade in order to improve interstate relations. Relying on the net effect of total trade may generate misleading public policy recommendations. Public policy that seeks peace should promote trade in peace-promoting goods and flows. Dispute resolution should pay attention to the tensions associated with goods whose trade induces conflict. Rival states that are interested in peace may expand the export or import of some goods, and vigilantly monitor the trade flows of some other goods. These implications appear particularly relevant for China, which has experienced dramatic increases in bilateral trade in many sectors with many countries over the past twenty-five years. China's main trading partners in manufacturing, US, Japan, Russia and South Korea, also happen to be those that experience most of China's MID initiations. The rise of China's trade with Vietnam also appears to head in the direction of more increases in manufacturing products than in other types of commodities. While we do not recommend curbing trade to avoid conflict, it is important that policymakers become aware of the potential risks and adopt preventive measures.

References

Achen, Christopher. 1982. Interpreting and Using Regression. Beverly Hills, California: Sage Publications.

Angell, N. (1912), The Great Illusion: A Study of the Relation of Military Power in Nations to their Economic and Social Advantages, London: Heinemann.

Arad, Ruth W., Seev Hirsch and Alfred Tovias (1983), The Economics of Peacemaking: A Focus on the Egyptian-Israeli Situation. New York: St. Martin's.

Ashley, Richard (1980), The Political Economy of War and Peace: The Sino-Soviet-American Triangle and the Modern Security Problematique, London: Frances Pinter.

Baldwin, David (1985), Economic Statecraft. Princeton, NJ: Princeton University Press.

Barbieri, Katherine (2002), The Liberal Illusion: Does Trade Promote Peace?, Ann Arbor, MI: University of Michigan Press.

Beck, Nathaniel, Jonathan N. Katz, and Richard Tucker (1998), "Taking Time Seriously: Time Series Cross Section Analysis with a Binary Dependent Variable," American Journal of Political Science 42: 1260-1288.

Bennett, M. R., A. Rosenblatt, and J. Wang (1992), "The Visible Hand: The United States, Japan, and the Management of Trade Disputes," International Interactions 17: 191-213.

Bennett, D. Scott, and Allan Stam (2000a), "Research Design and Estimator Choices in the Analysis of Interstate Dyads: When Decisions Matter," Journal of Conflict Resolution 44 (October): 653-685.

Bennett, D. Scott, and Allan Stam (2000b), "EUGene: A Conceptual Manual." International Interactions 26:179-204.

Bennett, D. Scott, and Allan Stam (2004), *The Behavioral Origins of War*, Ann Arbor: University of Michigan Press.

Bond, Marian E. (1985), "Export Demand and Supply for Groups of Non-Oil Developing Countries," International Monetary Stuff Papers, 32: 56-77.

Borrus, Michael and John Zysman (1992), "Industrial Competitiveness and American National Security", in W. Sandholtz, M. Borrus, J. Zysman, K. Conca, J. Stowsky, S. Vogel and S. Weber (eds.) The Highest Stakes: The Economic Foundations of the Next Security System. New York: Oxford University Press: 7-54.

Buzan, Barry (1984), "Economic Structure and International Security: The Limit of the Liberal Case," International Organization, 20: 5-41.

Bueno de Mesquita, Bruce (1981), The War Trap New Haven, CT: Yale University Press.

Choucri, Nazli and Robert North (1975), Nations in Conflict: National Growth and International Violence, New York: Freeman.

Domke, W. K. (1988), War and the Changing Global System, New Haven: Yale University Press.

Dorussen, Han (2006), "Heterogenous Trade Interests and Conflict: What You Trade Matters," Journal of Conflict Resolution, 50(1): 87-107.

dos Santos, Theotonio (1970), "The Structure of Dependence," American Economic Review, 80: 1151-1161.

Feenstra, Robert (2000), World Trade Flows, Center for International Data, Institute of Governmental Affairs, University of California, Davis, and National Bureau of Economic Research, Cambridge, MA.

Førland, Tor Egil (1991), "Economic Warfare and Strategic Goods: A Conceptual Framework for Analyzing COCOM," Journal of Peace Research, 28: 191-204.

Gartzke, Erik, Quan Li, and Charles Boehmer (2001), "Investing in the Peace: Economic Interdependence and International Conflict," International Organization 55: 339-438.

Gartzke, Erik and Quan Li (2005), "Mistaken Identity: A Reply to Hegre," Conflict Management and Peace Science 22: 225-234.

Gartzke, Erik and Quan Li (2003), "Measure for Measure: Concept Operationalization and the Trade Interdependence-Conflict Debate," Journal of Peace Research 40: 555-573.

Gartzke, Erik and Quan Li (2003), "All is Well that Ends Well: A Reply to Oneal, Barbieri and Peters," Journal of Peace Research 40: 727-732.

Gasiorowski, M. J. (1986), "Economic Interdependence and International Conflict: Some Cross National Evidence," International Studies Quarterly 30: 23-38.

Gasiorowski, M. J. and S. W. Polachek (1982), "Conflict and Interdependence: East-West Trade and Linkages in the Era of Detente," Journal of Conflict Resolution 26: 709-729.

Gilpin, Robert (1981), War and Change in World Politics, New York: Cambridge University Press.

Gilpin, Robert (1984), "Structural Constraints on Economic Leverage: Market-Type Systems," in G. H. McCormick and R. E. Bissel (eds) Strategic Dimension of Economic Behavior. New York: Praeger: 105-128.

Gilpin, Robert (1987), The Political Economy of International Relations, Princeton, NJ: Princeton University Press.

Håvard Hegre (2004). "Size Asymmetry, Trade, and Militarized Conflict," Journal of Conflict Resolution, 48: 403-429.

Hillmann, H. C. (1940), "Analysis of Germany's Foreign Trade and the War," *Economica*, 7: 66-88.

Hirschman, A. (1945) [1980], National Power and the Structure of Foreign Trade, Berkeley: University of CA Press.

Hobson, J. A. (1902), Imperialism: A Study, London: Allen and Unwin.

Italianer, Alexander (1986), Theory and Practice of International Trade Linkage Models, Boston: Kluwer.

Kant, I. (1795) [1970], “Perpetual Peace: A Philosophical Sketch,” reprinted in Kant’s Political Writings Hans Reiss (ed), Cambridge: Cambridge University Press.

Kennedy, Paul (1987), The Rise and Fall of the Great Powers: Economic Change and Military Conflict from 1500 to 2000, New York: Random House.

Kennedy, Peter (2003), A Guide to Econometrics. Cambridge, MA.: MIT Press.

Keshk, Omar, M. G., Brian Pollins, and Rafael Reuveny (2004), “Trade Still Follows the Flag: The Primacy of Politics in a Simultaneous Model of Interdependence and Armed Conflict,” Journal of Politics, 66: 1155-1179.

Keylor, William (2001), The Twentieth Century World: An International History, Oxford: Oxford University Press.

King, G. and L. Zeng (2001), “Explaining Rare Events in International Relations,” International Organization 55: 693-715.

Lai, Brian and Dan Slater (2006), “Institutions of the Offensive: Domestic Sources of Dispute Initiation in Authoritarian Regimes, 1950–1992,” American Journal of Political Science, 50: 113-126.

Leitz, Christian (2004), Nazi Foreign Policy, 1933-1941: The Road to Global War, Oxford, UK: Routledge.

Lenin, V. I. (1916), “Imperialism: A Special Stage of Capitalism,” in J. Frieden and D. Lake (eds.) International Political Economy: Perspective on Global Power and Wealth, New York: St. Martin’s, 110-119.

Li, Quan and David Sacko. (2002) “The (IR)Relevance of Interstate Militarized Disputes to International Trade,” International Studies Quarterly 46:11-44.

List, Friederich (1856), National Systems of Political Economy, Philadelphia: Lippincot.

Mansfield, Edward D. and Brian M. Pollins (2003), “Interdependence and Conflict: A Conceptual and Empirical Overview,” in Edward Mansfield and Brian Pollins (eds., Economic Interdependence and International Conflict: New Perspectives on an Enduring Debate, Ann Arbor, MI: The University of Michigan, Press, 1-30.

Matanduno, Michael (1992), Economic Containment of CoCom and the Politics of East-West Trade, Ithaca, NY: Cornel University Press.

McMillan, S. M. (1997), “Interdependence and Conflict,” Mershon International Studies Review, 41: 33-58.

Montesquieu, Baron de (1900)[1748], The Spirit of Laws, New York: Collier.

Neal, Larry. (1979), “The Economics and Finance of Bilateral Clearing Arguments: Germany, 1934-1938,” The Economic History Review, New Series, 32 (3): 391-404.

Nicholson, W. (2005), Microeconomic Theory: Basic Theory and Extensions, Forth Worth: Dryden Press.

Oneal, John R., and Bruce Russett (1997), "The Classical Liberals Were Right: Democracy, Interdependence and Conflict, 1950-1985," International Studies Quarterly 41: 267-294.

Oneal, John R., and Bruce Russett (1999), "Assessing the Liberal Peace with Alternative Specifications: Trade Still Reduces Conflict," Journal of Peace Research 36: 423-42.

Penn World Tables 6.1., Center for International Economic Comparisons, University of Pennsylvania.

Polachek, S. W. (1980), "Conflict and Trade," Journal of Conflict Resolution 24: 55-78.

Polachek, S. W. (1992), "Conflict and Trade: An Economic Approach to Political International Interactions," W. Isard and C. Anderton, eds., Economics of Arms Reduction and the Peace Process, Amsterdam: Elsevier, 89-120.

Polachek, Solomon W. (2000), "Trade-Based Interactions: An Interdisciplinary Perspective," Presidential Address, Peace Science Society, Yale University, New Haven, CT, October 28.

Polachek, S. W. and J. A. McDonald (1992), "Strategic Trade and the Incentive for Cooperation," M. Chatterji, and L. Forcey (eds.) Disarmament, Economic Conversion, and Management of Peace, Westport: Praeger, 273-284.

Pollins, B. M.. (1989), "Does Trade Still Follow the Flag?" American Political Science Review, 83:465-480.

Powers, Kathy L. (2006), "Dispute Initiation and Alliance Obligations in Regional Economic Institutions," Journal of Peace Research, 43: 453-471.

Ray, J. L. (2003), "Explaining Interstate Conflict and War: What Should be Controlled for?" Conflict Management and Peace Science, 20: 1-32.

Reiter, Dan and Allan C. Stam (2003), "Identifying the Culprit: Democracy, Dictatorship, and Dispute Initiation," American Political Science Review, 97: 333-337.

Reuveny, Rafael (2003), "Measuring Conflict and Cooperation: An Assessment," in Economic Interdependence and International Conflict: New Perspectives on an Enduring Debate, in E. Mansfield and B. Pollins (eds), Ann Arbor: University of Michigan Press, 254-269.

Reuveny, R. (1999a), "The Political Economy of Israeli-Palestinian Interdependence," Policy Studies Journal, 27: 643-664.

Reuveny, R. (1999b), "Israeli-Palestinian Economic Interdependence Reconsidered," Policy Studies Journal, 27: 668-672.

Reuveny, R. (2000), "The Trade and Conflict Debate: A Survey of Theory, Evidence and Future Research," Peace Economics, Peace Science and Public Policy 6: 23-9.

Reuveny, R. (2001a), "Bilateral Import, Export, and Conflict/Cooperation Simultaneity," International Studies Quarterly 45: 131-158.

Reuveny, R. (2001b), "Disaggregated Trade and Conflict: Exploring Propositions," International Politics 38: 401-428.

Reuveny, R. and H. Kang (1998), "Bilateral Trade and Political Conflict/Cooperation: Do Goods Matter?"

Journal of Peace Research, 35: 581-602.

Ripsman, Norrin M. and Jewan-Marc F. Blanchard (1997), "Commercial Liberalism Under Fire: Evidence from 1914 and 1936," Security Studies, 6: 4-50.

Rosecrance, Richard (1986), The Rise of the Trading State: Commerce and Conquest in the Modern World, New York: Basic Books.

Russett, B. and J. R. Oneal (2001), Triangulating Peace: Democracy, Interdependence, and International Organizations, New York: W. W. Norton.

Sayrs, L. (1989), "Trade and Conflict Revisited: Do Politics Matter?" International Interaction, 15:155-175.

Sayrs, L. (1990), "Expected Utility and Peace Science: An Assessment of Trade and Conflict," Conflict Management and Peace Science, 11: 17-44.

Schelling, Thomas C. (1958), International Economics, Boston: Allyn and Bacon.

Schneider, Gerald and Günther Schulze (2003), "The Domestic Roots of Commercial Liberalism A Sector-Specific Approach," in G. Schneider, K. Barbieri and N. P. Gleditsch (eds.) Globalization and Armed Conflict, Lanham, MD: Rowman & Littlefield, 103-122.

Schneider, G., K. Barbieri, and N. P. Gleditsch (2003), "Does Globalization Contribute to Peace? A Critical Survey of the Literature," in G. Schneider, K. Barbieri and N. P. Gleditsch (eds.) Globalization and Armed Conflict, Lanham, MD: Rowman & Littlefield Publishers, 3-30.

Sen, Gautam (1984) The Military Origins of Industrialization and International Trade Rivalry. New York: St. Martin's.

Smith, Adam (1776), The Wealth of Nations, New York: The Modern Library.

Stern, Robert M., Jonathan Francis, and Bruce Schumacher (1976), Price Elasticities in International Trade, London: McMillan.

Tyson, Laura D'Andrea (1992), Who's Bashing Whom: Trade Conflict in High-Technology Industries. Washington, DC: Institute for International Economics.

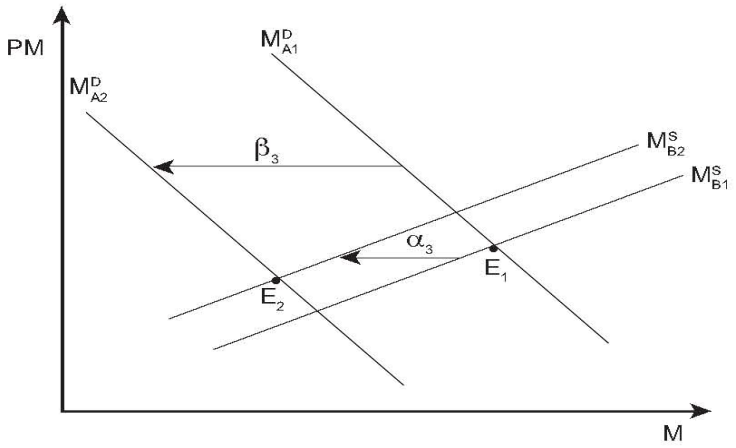
Vogel, Steven (1992), "The Power Behind 'Spin-Ons': The Military Implications of Japan's Commercial Technology," in Wayne Sandholtz et al., eds., The Highest Stakes: The Economic Foundations of the Next Security System, New York: Oxford University Press: 55-80.

Waltz, Kenneth N. (1970), "The Myth of Interdependence," in Charles P. Kindleberger (ed.) The International Corporation, Cambridge, MA: MIT Press, 205-223.

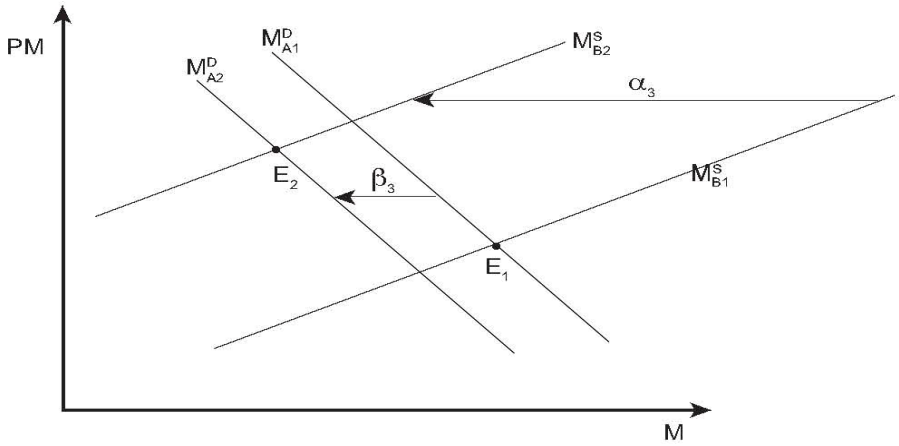
Waltz, Kenneth N. (1979), Theory of International Politics, Reading, MA: Addison-Wesley

Figure 1. Disaggregated Bilateral Trade Equilibrium

PANEL A: $\alpha_3 < \beta_3$
PM FALLS



PANEL B: $\alpha_3 > \beta_3$
PM RISES



PANEL C: $\alpha_3 = \beta_3$
PM DOES NOT
CHANGE

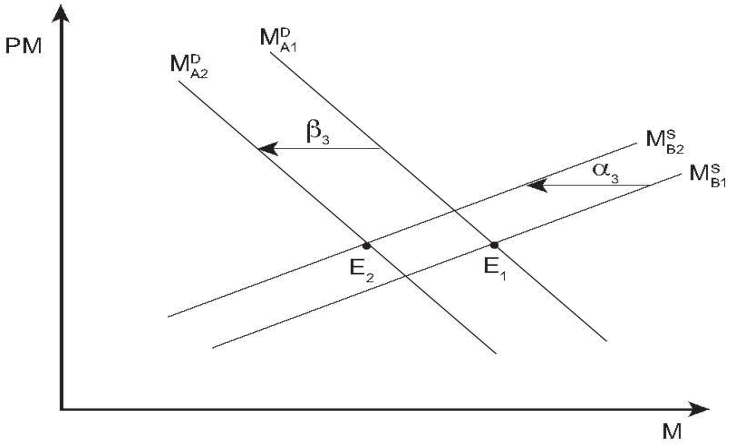


Table 1: Trade Categories and Conflict Expectations

Sector	Sector Content	α_3-β_3	Expected Effect of Import	γ_3-δ_3	Expected Effect of Export
(1) Agriculture-fishery	Agriculture products (fruits, vegetables, cereals, trees, sugars), fish, fishery products	> 0	Reducing conflict	< 0	Reducing Conflict
(2) Energy	Coal, lignite, other briquettes, products of cooking, crude petroleum, natural gas, refined petroleum and products, electric power, gas, stem, radioactive materials, ores	> 0	Reducing Conflict	> 0	Increasing Conflict
(3) Chemical-mineral	Ferrous ores and metals, non ferrous ores and metals, non radioactive ores and metals, non metallic minerals, chemicals	> 0	Reducing conflict	> 0	Increasing Conflict
(4) Manufactured products	Metals and minerals products, agricultural and industrial machinery, office and data processing machines, precession instruments, optical instruments, electrical products, motor vehicles, other transport equipment	< 0	Increasing conflict	> 0	Increasing Conflict
(5) Miscellaneous consumption products	Meats, meat preserves, milk products, food, beverages, tobacco products, textile, clothing and accessaries, leathers, leather and skin goods, footwear, wooden products, furniture, paper products, printing products, rubber goods, plastic products, goods not classified	< 0	Increasing conflict	< 0	Reducing Conflict

Note:
α_3: Conflict's effect on B's export supply of good j to A
β_3: Conflict's effect on A's import demand for good j from B
δ_3: Conflict's effect on B's import demand for good i from A
$\gamma_{3:}$ Conflict's effect on A's export supply of good i to B

Table 2: Effects of Bilateral Import and Export in Five Sectors on MID Initiation, 1970-1997

	(1) All MIDs	(2) Display of Force+	(3) Use of Force+
Agriculture-fishery import	-0.00046	-0.00046	-0.00035
	[4.27]***	[4.25]***	[3.31]***
Agriculture-fishery export	-0.00006	-0.00007	-0.00007
	[0.71]	[0.74]	[0.74]
Energy import	-0.00004	-0.00004	-0.00005
	[1.66]*	[1.76]*	[1.83]*
Energy export	0.00004	0.00004	0.00004
	[2.67]***	[2.61]***	[2.26]**
Chemical-mineral import	-0.00004	-0.00004	-0.00001
	[0.76]	[0.69]	[0.28]
Chemical-mineral export	-0.00008	-0.00008	-0.00012
	[1.19]	[1.26]	[1.80]*
Manufactured import	0.00003	0.00003	0.00003
	[1.89]*	[1.94]*	[2.05]**
Manufactured export	0.00003	0.00003	0.00005
	[2.27]**	[2.32]**	[3.14]***
Miscellaneous consumption import	-0.00005	-0.00006	-0.00003
	[0.85]	[0.88]	[0.75]
Miscellaneous consumption export	0.00002	0.00002	-0.00012
	[0.56]	[0.51]	[1.82]*
Initiator capability ratio	0.35938	0.36393	0.49638
	[2.34]**	[2.35]**	[2.87]***
Power balance	-0.01451	0.04679	0.08097
	[0.08]	[0.26]	[0.40]
Initiator democracy	-0.00789	-0.00708	-0.00618
	[2.26]**	[1.93]*	[1.52]
Target democracy	-0.00181	-0.00019	0.00356
	[0.50]	[0.05]	[0.83]
Regime dissimilarity	0.00941	0.01147	0.00898
	[2.90]***	[3.40]***	[2.31]**
Alliance	-0.01330	0.00617	0.00714
	[0.18]	[0.08]	[0.08]
Log of distance	-0.08084	-0.07961	-0.07474
	[4.93]***	[4.85]***	[4.13]***
Contiguity	0.80909	0.82614	0.81936
	[6.15]***	[6.33]***	[5.63]***
Minor power	-0.32540	-0.34438	-0.39713
	[1.89]*	[2.01]**	[1.91]*
Initiator GDP	0.06681	0.06672	0.03584
	[2.83]***	[2.84]***	[1.41]
Target GDP	0.09974	0.10066	0.11342
	[4.40]***	[4.32]***	[4.37]***
Observations	213790	213790	213790

Note: Robust z statistics in brackets; constant, peace year, and spline variables are not reported; Two-tailed test; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3: Substantive Effect of Disaggregated Trade on MID Initiation

	Relative Risk
Agriculture-fishery imports	0.78
Energy imports	0.96
Energy exports	1.07
Manufactured imports	1.13
Manufactured exports	1.16
Initiator capability ratio	1.44
Initiator democracy	0.84
Regime dissimilarity	1.20
Log of distance	0.71
Initiator GDP	1.51
Target GDP	1.84

Note: Computed for minor power, no-alliance, contiguous dyads, with other variables set at their sample mean levels.

Table 4: χ^2 Equality Tests on Significant Positive and Negative Effects of Sectoral Trade Flows

	Agriculture-fishery import	Energy import
Energy export	21.39**	9.30**
Manufactured import	22.34**	4.68*
Manufactured export	21.15**	5.35*

Note: Two tailed test; **significant at 1% level, *significant at 5% level.

Table 5: In-Sample Prediction of MID Initiation for all dyads and China dyads

	Whole Sample			***China Dyads***		
	Predicted MID		Total	Predicted MID		Total
Actual MID	0	1		0	1	
0	193,647	19,791	213,438	1765	724	2489
1	67	285	352	1	11	12
Total	193,714	20,076	213,790	1766	735	2501

Note: The model predicts MID Initiation=0 correctly in 91% of the cases for whole sample and in 71% of the cases for China dyads.

The model predicts MID Initiation=1 correctly in 81% of the cases for whole sample and in 92% of the cases for China dyads.

Table 6: MID Initiations by China and Model Predicted Probabilities

YEAR	COUNTRY	MID	P(MID)	agimp	energyimp	energyexp	manuimp	manuexp
				N	N	P	P	P
				25.16	37.93	37.93	135.43	135.43
1974	**India**	**1**	**0.092**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
1975	**Korea South**	**1**	**0.020**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
1977	**Japan**	**1**	**0.006**	**0.15**	**3.86**	**1724.84**	**3818.42**	**413.63**
1992	**Vietnam**	**1**	**0.087**	**7.60**	**49.89**	**6.15**	**2.47**	**70.07**
1992	**Russia**	**1**	**0.155**	**108.79**	**141.95**	**4.20**	**2478.05**	**563.11**
1993	**United States**	**1**	**0.012**	**422.58**	**326.36**	**390.75**	**7255.52**	**5745.82**
1993	**Korea South**	**1**	**0.039**	**14.95**	**353.44**	**549.84**	**4454.37**	**1130.74**
1993	**Vietnam**	**1**	**0.279**	**22.44**	**62.75**	**0.33**	**20.15**	**136.77**
1993	**Russia**	**1**	**0.510**	**92.42**	**224.84**	**4.36**	**4871.75**	**593.85**
1994	Philippines	1	0.001	8.09	94.23	14.51	53.06	135.31
1994	**Japan**	**1**	**0.037**	**67.64**	**349.08**	**1775.87**	**16744.89**	**5557.60**
1995	**Japan**	**1**	**0.252**	**106.88**	**314.02**	**2049.07**	**18279.53**	**8931.89**
			Examps of False Postives (P(MID) >= 0.16)					
1996	Vietnam	0	0.165	58.99	154.92	21.68	9.04	514.33
1990	USSR	0	0.180	56.75	42.99	0.01	1372.97	774.27
1971	India	0	0.191	0.00	0.00	0.00	0.00	0.00
1994	United States	0	0.192	323.29	104.63	378.42	7609.97	7887.86
1995	Korea South	0	0.193	68.61	473.85	800.70	6290.71	3718.52
1977	India	0	0.195	0.00	0.00	0.00	0.07	1.19
1989	Vietnam	0	0.199	2.14	3.99	0.00	0.00	0.34
1997	Japan	0	0.202	106.70	650.53	2293.81	17369.38	10506.03
1995	Vietnam	0	0.207	130.80	108.26	6.25	9.11	424.68
1989	USSR	0	0.212	47.40	82.31	0.00	1471.02	571.84
1997	Russia	0	0.230	207.86	80.98	55.03	1769.09	409.88
1994	Korea South	0	0.245	34.13	287.46	640.80	4927.15	1966.46
1996	Japan	0	0.255	115.46	338.88	2314.63	17479.19	9394.53
1988	Vietnam	0	0.260	0.80	0.00	0.00	0.03	0.05
1994	Vietnam	0	0.278	66.28	85.05	7.39	13.34	175.33
1996	Russia	0	0.292	217.73	240.97	27.55	3146.04	341.72
1995	Russia	0	0.407	0.20	0.00	8.13	372.23	255.22
1994	Russia	0	0.527	0.03	0.00	3.72	2327.73	224.86

Note: Predicted MID probability based on Model 1. Trade values in millions of constant US dollars.

Appendix

Table A1: Summary Statistics and Variance Inflation Factor (VIF)

ID	Variables	Mean	St Dev	Min	Max	VIF
(1)	Agriculture-fishery import	25.16	187.07	0	11802.05	3.5
(2)	Agriculture-fishery export	25.16	187.07	0	11802.05	3.5
(3)	Energy import	37.93	439.46	0	35895.02	1.21
(4)	Energy export	37.93	439.46	0	35895.02	1.21
(5)	Chemical-mineral import	39.31	317.81	0	21860.41	6.72
(6)	Chemical-mineral export	39.31	317.81	0	21860.41	6.71
(7)	Manufactured import	135.43	1501.01	0	104303.13	7.29
(8)	Manufactured export	135.43	1501.01	0	104303.13	7.29
(9)	Miscellaneous consumption import	38.24	351.5	0	27401.85	5.31
(10)	Miscellaneous consumption export	38.24	351.5	0	27401.85	5.31
(11)	Initiator GDP	17.07	2.15	11.5	22.76	3.2
(12)	Target GDP	17.07	2.15	11.5	22.76	3.2
(13)	Initiator capability ratio	0.5	0.35	0	1	4.42
(14)	Power balance	0.82	0.15	0.5	1	1.02
(15)	Initiator democracy	1.8	7.68	-10	10	1.5
(16)	Target democracy	1.8	7.68	-10	10	1.5
(17)	Regime dissimilarity	8.73	6.8	0	20	1.09
(18)	Alliance	0.1	0.3	0	1	1.25
(19)	Log of distance	8.06	1.48	0	9.42	3.39
(20)	Contiguity	0.04	0.18	0	1	3.09
(21)	Minor power	1	0.05	0	1	1.14

Table A2: In-Sample Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(1)	1.00																				
(2)	0.49	1.00																			
(3)	0.26	0.24	1.00																		
(4)	0.24	0.26	0.07	1.00																	
(5)	0.80	0.59	0.35	0.28	1.00																
(6)	0.59	0.80	0.28	0.35	0.69	1.00															
(7)	0.53	0.76	0.27	0.35	0.74	0.87	1.00														
(8)	0.76	0.53	0.35	0.27	0.87	0.74	0.75	1.00													
(9)	0.63	0.69	0.23	0.32	0.73	0.84	0.85	0.79	1.00												
(10)	0.69	0.63	0.32	0.23	0.84	0.73	0.79	0.85	0.78	1.00											
(11)	0.17	0.15	0.13	0.06	0.16	0.16	0.11	0.14	0.15	0.15	1.00										
(12)	0.15	0.17	0.06	0.13	0.16	0.16	0.14	0.11	0.15	0.15	-0.22	1.00									
(13)	0.01	-0.01	0.04	-0.04	0.00	0.00	-0.01	0.01	-0.01	0.01	0.67	-0.67	1.00								
(14)	-0.01	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	1.00							
(15)	0.09	0.09	0.07	-0.03	0.08	0.10	0.06	0.08	0.08	0.08	0.48	-0.13	0.22	0.03	1.00						
(16)	0.09	0.09	-0.03	0.07	0.10	0.08	0.08	0.06	0.08	0.08	-0.13	0.48	-0.22	0.03	-0.04	1.00					
(17)	-0.07	-0.07	0.02	0.02	-0.08	-0.08	-0.06	-0.06	-0.08	-0.08	-0.01	-0.01	0.00	0.04	-0.10	-0.10	1.00				
(18)	0.18	0.18	0.06	0.06	0.16	0.16	0.13	0.13	0.15	0.15	0.04	0.04	0.00	-0.07	0.02	0.02	-0.20	1.00			
(19)	-0.18	-0.18	-0.07	-0.07	-0.17	-0.17	-0.13	-0.13	-0.15	-0.15	0.03	0.03	0.00	0.10	0.05	0.05	0.10	-0.37	1.00		
(20)	0.18	0.18	0.07	0.07	0.17	0.17	0.14	0.14	0.15	0.15	0.01	0.01	0.00	-0.05	-0.03	-0.03	-0.09	0.25	-0.82	1.00	
(21)	-0.17	-0.17	-0.05	-0.05	-0.21	-0.21	-0.19	-0.19	-0.27	-0.27	-0.08	-0.08	0.00	0.03	-0.02	-0.02	0.00	-0.05	0.02	-0.05	1.00

Note: Each variable is denoted by its ID in Appendix Table 1 (e.g., variable 1 is Agriculture import).

Table A3: The Countries Included in the Sample

Afghanistan	Albania	Algeria	Angola
Argentina	Australia	Austria	Bahrain
Bangladesh	Belgium	Benin	Bhutan
Bolivia	Brazil	Bulgaria	Burkina Faso
Burundi	Cambodia	Cameroon	Canada
Cen African Rep	Chad	Chile	China
Colombia	Comoros	Congo Brazzaville	Congo Kinshasa
Croatia	Cyprus	Denmark	Djibouti
Dominican Rep	Ecuador	Egypt	El Salvador
Equatorial Guinea	Ethiopia	Fiji	Finland
France	Gabon	Gambia	Ghana
Greece	Guatemala	Guinea	Guinea-Bissau
Guyana	Haiti	Honduras	Hungary
India	Indonesia	Iran	Ireland
Israel	Italy	Jamaica	Japan
Jordan	Kenya	Korea South	Kuwait
Laos	Lebanon	Liberia	Madagascar
Malawi	Malaysia	Mali	Mauritania
Mauritius	Mexico	Mongolia	Morocco
Mozambique	Nepal	Netherlands	New Zealand
Nicaragua	Niger	Nigeria	Norway
Oman	Pakistan	Panama	Papua New Guinea
Paraguay	Peru	Philippines	Poland
Portugal	Romania	Russia	Rwanda
Saudi Arabia	Senegal	Sierra Leone	Singapore
South Africa	Spain	Sri Lanka	Sudan
Sweden	Switzerland	Syria	Thailand
Togo	Trinidad	Tunisia	Turkey
UAE	USSR	Uganda	United Kingdom
United States	Uruguay	Venezuela	Vietnam
Yemen	Yugoslavia	Zambia	Zimbabwe