Make Trade not War?*

Preliminary version

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Abstract

This paper analyzes theoretically and empirically the relation between trade and war. We show that the intuition that trade promotes peace is only partially true even though, in our model, trade is beneficial to all countries, war reduces trade and leaders take into account the costs of war. When war can occur because of the presence of asymmetric information in negotiations between countries, the probability of escalation is lower for countries that trade more bilaterally because of the opportunity cost associated to the loss of trade gains. However, countries more open to trade have a higher probability of war because multilateral trade openness decreases bilateral dependence to any given country and therefore the opportunity cost of war. Using a theoretically grounded econometric model, we empirically test the necessary conditions for these results and the predictions on a large data set of military conflicts on the 1948-2001 period. We find strong evidence for these contradictory effects of bilateral and multilateral trade. Our empirical results also confirm the theoretical prediction of our model that multilateral trade openness increases more the probability of war between countries which are close to each other. This may explain why military conflicts have become more localized and less global over time. We also find evidence that information flows between countries decreases the probability of war.

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Keywords: Globalization, Trade, War.

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1 Introduction

"The natural effect of trade is to bring about peace. Two nations which trade together, render themselves reciprocally dependent; for if one has an interest in buying, the other has an interest in selling; and all unions are based upon mutual needs."

Montesquieu, De l'esprit des Lois, 1758.

This paper explores the impact of trade on the prevalence of international conflicts. Our main theoretical result is that an increase in bilateral trade between two countries reduces the probability of conflicts between them but increases the probability of conflicts with other countries. Another theoretical finding is that the worldwide intensification of trade flows, as observed after the WWII has changed the nature of conflicts, with less global confrontations, involving several and distant countries, but more local confrontations, involving- fewer and closer countries. The rationale is that globalization, by enabling trade links with distant regions, has reduced countries' dependency on local trade and thus reduced the opportunity costs of local wars. On the period 1948-2001, we find strong evidence in favor of the contradictory effects of bilateral trade vs multilateral trade.

Our work is motivated by the growing concern that the end of the Cold War did not contribute to pacifying international relations. This contradicts the liberal-institutionalist view of trade as held in political science (see Oneal and Russet 1999) which argues that globalization and the spread of free markets and democracy should limit conflicts between countries. The intellectual origin of this vision can partly be traced back to the Kantian view of international relations as exposed in Kant's *Essay on Perpetual Peace (1795)* and was very influential*:* the idea of European integration was precisely conceived to prevent the killing and destruction of the two World Wars from ever happening again[1]. A rough look at the 1870-2001 period (see figure 1[2]) suggests however that the correlation between trade openness and war is not a clear cut one: positive on the 1870-1930 period and then negative on the 1930-1989 period. The end of the XIXth century, the first era of globalization with rising trade openness, was a period of multiple military conflicts, culminating with World War I. Then the interwar period was characterized by a simultaneous collapse of world trade and conflicts. After World War II, world trade increased rapidly while the number of conflicts decreased (although the risk of a global conflict was obviously high). There is no clear evidence that the 1990s was a period of lower prevalence of military conflicts even taking into account the increase in the number of sovereign states; in fact if anything, the 1990s may have marked the beginning of a new era of violent international

[1]Before this, the 1860 Anglo-French commercial Treaty was signed to diffuse tensions between the two countries. Outside Europe, MERCOSUR was created in 1991 in part to curtail the military power in Argentina and Brazil, then two recent and fragile democracies with potential conflicts over natural resources.

[2]Figure 1 depicts the occurrence of Militarized Interstate Disputes (MID) between pairs of countries divided by the number of countries. It therefore controls for the difference across time in the number of countries. MIDs are ranging from level 1 to 5 in terms of hostility level. Figure 1 accounts for level 3 (display of force), level 4 (use of force) and 5 (war, which requires at least 1000 death of military personnel). See section 3.1 for a more precise description of the data.Trade openness is the sum of world trade (exports and imports) divided by world GDP as calculated by Estevadeordal et al. (2003).

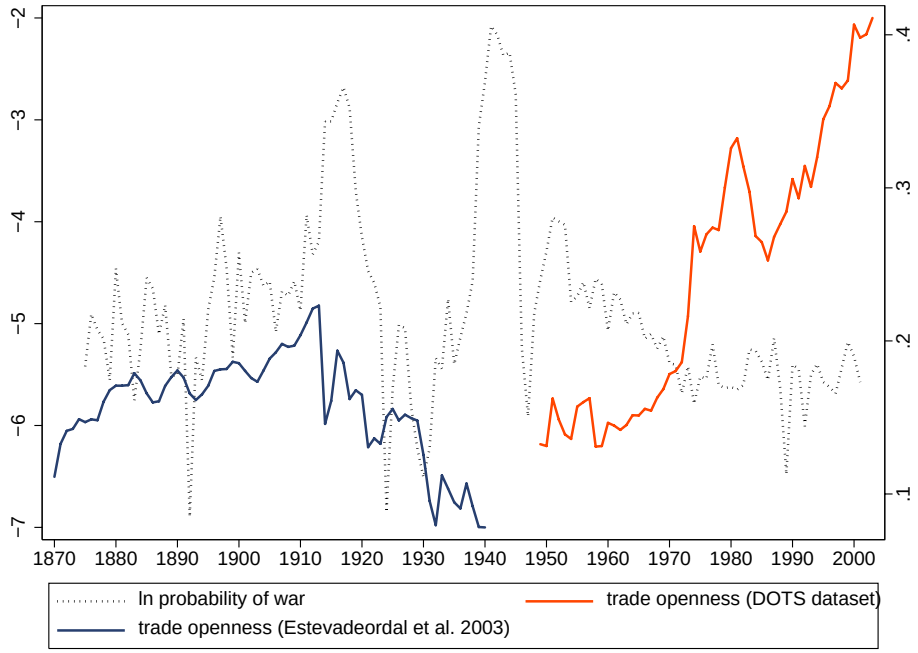

Figure 1: Militarized conflict probability and trade openness over time

conflicts, and the first years of the twenty-first century suggests the same. Another stylized fact is related to the changing nature of military conflicts after WWII. Figure 2 depicts the average distance between countries in military disputes (see footnote 1 for the characterization of these). It strongly suggests that military conflicts have become more localized over time as the average distance between two countries in military conflict has been halved during the period. This changing nature of war was first discussed in the political science literature (Keegan 1984, Bond 1986, Van Creveld 1991). In particular Levy et al. (2001) illustrate how the second half-century of the XXth century marked a significant shift in warfare from the major powers to minor powers, from Europe to other regions, and from inter-state warfare to intra-state wars.

The objective of this paper is to shed light on the following question: if trade promotes peace as illustrated by the European example, why is it that globalization, interpreted as trade liberalization at the global level, has not lived up its to its promise of decreasing the prevalence of violent interstate conflicts? We offer a theoretical and empirical answer to this question, based on the interaction between asymmetric information and trade between many countries. On the theoretical side, we build a framework where escalation to war may occur because of the failure of negotiations in a bargaining game. The structure of this game is fairly general: (i) countries must mutually agree on a utility transfer to avoid escalation to war; (ii) war is Pareto dominated by peace; (iii) countries have some private information on their disagreement payoffs, ie. what happens in case of war; (iv) we impose

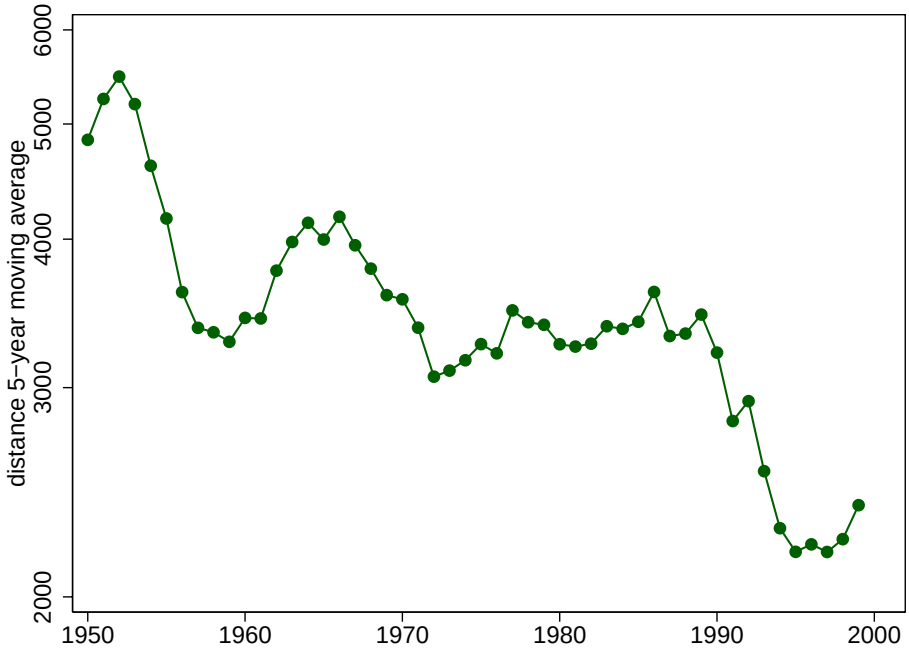

Figure 2: Average distance of militarized conflicts over time

no institutional constraint so that countries can choose any type of negotiation protocol, be they bilateral or multilateral, one stage or multi-stage, etc. We then embed this game in a standard new trade theory model with trade costs. Our analysis first highlights that information flows matter: the larger is information asymmetry between countries, the more inefficient is the bargaining process and so the highest is the probability of war. Second, a pair of countries with more bilateral trade, will have a lower probability of bilateral war. Third, multilateral trade openness has an opposite effect: any pair of countries with more trade openness with the rest of the world will decrease their degree of bilateral dependency and this results in a higher probability of bilateral war. A theoretical prediction of our model is that globalization of trade flows, interpreted as a worldwide decrease in trade costs, changes the nature of conflicts. It decreases the probability of global conflicts (may be the most costly in terms of human welfare) but increases the probability of local conflicts.

The intuition that trade increases economic dependency and the opportunity cost of war is therefore only partly right even in a model in which trade is beneficial to all countries. That trade is unambiguously conducive to peace is only true in a two country world.

We test the theoretical predictions that bilateral and multilateral trade have opposite effect on the probability of war on the 1948-2001 period using a data set from the correlates of war project, that makes available a very precise description of interstate armed conflicts. The mechanism at work in our theoretical model rests on the hypothesis that war disrupts trade and therefore puts trade gains

at risk. We first test this hypothesis. Using a gravity model of trade, we find that bilateral trade costs indeed increase significantly with a bilateral war. However, multilateral trade costs do not increase significantly with war. This is a required condition for multilateral trade openness to increase the probability of bilateral war in our theoretical model. Second, using a theory grounded econometric model, we successfully test the predictions of the model related to the contradictory effects of bilateral and multilateral trade on war. In the panel regressions, we control for potential contamination by co-determinants of war and trade, such as distance, colonial relations, political regimes, political affinity, etc. We also control for possible fixed country pair effects. Finally, we use an instrument that exerts a positive shock to multilateral trade without directly interacting with armed conflicts. We chose the Generalized System of Preferences (GSP) which are schemes of trade preferences granted on a non-reciprocal basis by developed countries to developing countries. Those schemes are unilateral tariff preferences which facilitate LDCs access to markets of rich countries. The results on the contradictory effects of trade on the probability of war are robust to these different estimation strategies. We also test the effect of informational asymmetry on the probability of war and find evidence that countries that exchange less information are more likely to go to war. This last result echoes Izquierdo et alii (2003) who provide evidence for the informational impact of trade. Finally, we find a quantitatively significant effect of trade on the probability of war. Historically, between 1960 and 2000, the bilateral openness variable has increased by 181% for the median country pair separated by less than 2000km. For the multilateral openness variable, the increase is only 87% on the same period. This implies that between 1960 and 2000, the impact of bilateral trade has been to decrease the probability of bilateral war by around 11% for this pair of countries. The impact of multilateral trade has been to increase this probability by around 19%. As predicted by theory, both effects decrease with distance.

The related literature stems from political sciences to political economy. The question of the impact of trade on war is old and controversial among political scientists (see Barbieri and Schneider, 1999 for a recent survey). From a theoretical point of view, the main debate is between the "trade promotes peace" liberal school and the neo-marxist school which argues that asymmetric trade links lead to conflicts. The main difference between these two positions comes from the opposing view they have on the possibility of gains from trade for all countries involved. From an empirical point of view, recent studies in political science test the impact of bilateral trade (in different forms) on the frequency of war between country dyads. Many find a negative relation (see for example Polachek, 1980; Polachek, Robst and Chang, 1999 and Oneal and Russet, 1999). However, some recent studies have found a positive relation (see Barbieri 1996 and 2002)[3]. These papers however do not test structural models of trade and war but various ad-hoc specifications[4]. A notable exception is a recent paper by Glick

[3]The debate between these authors rests on various issues. Among them, whether to test the relation between trade and war on all possible state pairs or only on the so-called "politically relevant dyads", contiguous states or "major powers". In our study, we use all country pairs and do not select a subset.

[4] The list of controls they include are usually those most cited in the political science literature (such as whether the countries are democratic or authoritarian, military capabilities etc...) but rarely include determinants of trade that could also affect the probability of war. For example, Barbieri does not include distance as one her controls even though it is

and Taylor (2005) who study the reverse causal link, namely from war to trade. They control for the standard determinants of trade as used in the gravity equation literature. More importantly, to our knowledge our paper is the first to derive theoretically the ambiguous effect of trade on peace (positive for bilateral trade and negative for multilateral trade) and to empirically test this prediction.

The recent literature on the number and size of countries (see Alesina and Spolaore, 1997 and 2003) has also clear connections with our paper. Alesina and Spolaore (2003a and b) study the link between conflicts, defense spending and the number of countries. Their model aims to explain how a decrease in international conflicts can be associated to an increase in localized conflicts between a higher number of smaller countries. Their explanation is the following: when international conflicts become less frequent, then the advantages of large countries (in terms of provision of public and defense goods) decreases so that countries split and the number of countries increases. This itself leads to an increase in the number of (localized) conflicts. On the contrary, the number and size of countries in our model are exogenous and we control for this in our empirical tests.

The next section derives the theoretical probability of escalation to war between two countries as a function of the degree of asymmetric information, bilateral and multilateral trade costs and analyzes the ambivalent role of trade on peace. The third section first tests the impact of war on both bilateral and multilateral trade and tests the impact of trade openness, bilateral and multilateral, on the probability of military conflicts between countries.

2 The model

In this section, we analyze a simple model of negotiation and escalation to war. We then embed it in a model of trade to assess the marginal impact of trade on war.

2.1 A canonical view of negotiation and war

We follow the rationalist view of war among political scientists (see Fearon 1995, for a survey) and economists (see Grossman, 2003) which aim is to explain the puzzle that wars are costly but do occur, even in the presence of rational leaders who consider the risks and costs implied by wars. The rationalist view is the most natural structure for our argument on the role of trade because trade gains are then taken into account in the decision to go to war. In the rationalist school view, different strategies for modelling escalations to war and the involved processes of negotiations between countries exist. Most of the studies share two important features: war is considered as Pareto dominated by peace and imperfect information explains why negotiations may fail and wars occur. However, those studies greatly differ with respect to the views they take on institutional setting and the negotiations protocols.

well known in trade that bilateral distance heavily affects bilateral trade. Distance also affects negatively the probability of conflicts (see Kocs, 1995). A similar argument can be made on some other economic and geographic determinants of trade.

We build a model where war may result from the failure of a bargaining game between two countries. The structure of this game is fairly general: its two main features are Pareto domination of war and imperfect information[5]. However, contrary to the standard literature in political science, the only institutional constraint we impose is that the negotiation protocol (bilateral or multilateral negotiations, repeated stages...) chosen is the one that maximizes ex-ante welfare of both countries. This more general view has two advantages. First, it avoids the main drawback of the existing literature, namely the high sensitivity of results to the underlying restrictions made on institutions. Second, it is consistent with the rationalist school view of war, as rationality should imply that leaders are willing to choose the institutional setting and negotiation protocol which is the most efficient.

Consider two countries i and j. Exogenous conflicts arise between these two countries. As Grossman (2003) points out, "only a small fraction of disputes between states result in inter-state war" and our objective is to analyze the determinants of escalation of disputes into war. We do not model the probability of conflicts themselves but in the empirical section, we assume they are potentially affected by the presence of a common border, distance, past wars... If a conflict arises, it can end peacefully if countries succeed through a negotiated settlement or it can end with war if negotiations fail. For simplicity, the model we consider has no time dimension. We come back to this issue in the empirical section.

Leaders in both countries care about the utility level of a representative agent. In peace, representative agents in both countries obtain: (U_i^P, U_j^P). In a situation of war, they obtain a stochastic outside option $(\tilde{U}_i^W, \tilde{U}_j^W)$. Escalation to war is avoided whenever country i and j agree on a sharing rule of the peace-surplus S^P. Peace pareto-dominates war so that the surplus in a situation of peace is larger than the surplus in war:

$$S^P \equiv U_i^P + U_j^P > \tilde{U}_i^W + \tilde{U}_j^W \equiv \tilde{S}^W \tag{1}$$

In a deterministic setting, it is clear that i and j would always agree on a sharing rule and avoid escalation to war. With imperfect information, ex-post inefficiency and escalation to war can arise because players are uncertain on the value of disagreement payoffs in case of war. As we allow rational leaders to choose the optimal bargaining protocol, it is natural that they choose the most efficient negotiation protocol among all possible protocols, namely the one which ex-ante gives the largest expected welfare.

[5]Scholars in political sciences have developed two alternative arguments : i) agents (and states leaders) are sometimes irrational; as such they misperceive the costs of war; ii) leaders may be those who enjoy the benefits of war while the costs are suffered by the other agents (citizens and soldiers). We ignore those alternative explanations of war because it is unlikely that the trade openness channel interacts with them. Indeed an irrational leader may decide to go on war whatever the trade loss suffered by his country. Similarly the way the trade surplus (and the trade loss in case of conflict) is shared between political leaders and the rest of the population is not obvious. Hence, marginally, a larger level of trade openness has no clear cut impact on the trade-off between the marginal benefits of war enjoyed by political leaders and the marginal costs suffered by the population. Consequently, internal politics do not play a role in our theoretical analysis. Studies on the relation between domestic politics and war include Garfinkel (1994) and Hess and Orphanides (1995, 2001).

Solving for such a second best protocol in bargaining under private information constitutes one of the most celebrated results in the mechanism design literature (Myerson and Satherwaite 1983). However, we cannot apply directly Myerson and Satherwaite's results because they assume that 1) private information should be independently distributed between agents; 2) once an agent has agreed to participate in the negotiation, it has no further right to quit the negotiation table. Hereafter, we want to relax both assumptions because we believe they are not realistic in the context of interstate conflicts that may escalate in wars[6]. First, it is reasonable to think that in case of war, the disagreement payoffs are partially and negatively correlated: losses for the winning country (in terms of territory, national honor or freedom for example) may partially mirror gains for the other country. Second, no institution (even or especially the UN) has the power to forbid a sovereign country to leave negotiations and enter war. Hence the class of protocols we want to consider is smaller than in the initial approach by Myerson and Satherwaite as we will consider only *no commitment mechanisms*.

The bargaining problem is depicted in figure 3. We assume that stochastic outside options $(\tilde{U}_i^W, \tilde{U}_j^W)$ are equal on average to the equilibrium values (U_i^W, U_j^W) as determined in the next section. More precisely:

$$\tilde{U}_i^W = (1+\tilde{u}_i).U_i^W \text{ and } \tilde{U}_j^W = (1+\tilde{u}_j).U_j^W \tag{2}$$

where $\tilde{u}_i$ and $\tilde{u}_j$ are privately known by each country. Private information is partially correlated as $(\tilde{u}_i, \tilde{u}_j)$ are drawn in a uniform law distributed in the triangle MM_AM_B(see Figure 3) where minimum and maximum values for $(\tilde{u}_i, \tilde{u}_j)$ are respectively $-V/2$ and $+V$. Unconditional mean and variance are: $E(\tilde{u}_i) = E(\tilde{u}_j) = 0$ and $var(\tilde{u}_i) = var(\tilde{u}_j) = V^2/8$. Hence, the parameter V measures the degree of informational asymmetry between the countries.

Following Compte and Jehiel (2005) we show in appendix that the bargaining protocol chosen optimally by the two countries corresponds to a *Nash Bargaining protocol*. Importantly, with such a protocol (described in the appendix), disagreements arise for every outside option $(\tilde{U}_i^W, \tilde{U}_j^W)$ inside the dashed area ABM_AM_B where A and B are such that: $\overline{MA} = 3/4.\overline{MA'}$ and $\overline{MB} = 3/4.\overline{MB'}$. Intuitively, countries do not reach an agreement when the disagreement and agreement payoffs are sufficiently close.

Hence, the probability of escalation to war corresponds to the surface of ABM_AM_B divided by the surface of the triangle MM_AM_B : $\Pr(escalation_{ij}) = 1 - \frac{\overline{MA}.\overline{MB}}{\overline{MM_A}.\overline{MM_B}}$. Assuming that the informational

[6]It is fundamental to relax simultaneously both assumptions. Relaxing the first one only would imply that war never occurs; indeed in the correlated case with interim participation constraints, Cremer and Mc Lean (1988) have shown that the first best efficiency can be obtained and players always reach an agreement. Compte and Jehiel (2005) show that relaxing assumption 2 in order to let agents quit negotiations at any time implies that private information, even if correlated, results in inefficiency, which in our context translates into possible escalation to war.

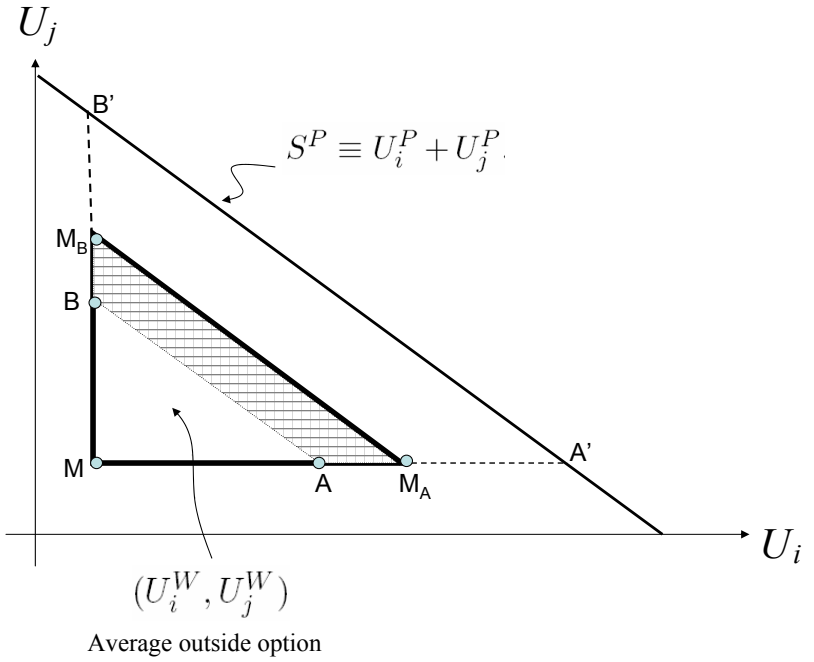

Figure 3: Negotiation under uncertainty

noise V is sufficiently small, we obtain:

$$\Pr(escal_{ij}) \simeq 1 - \frac{1}{4V^2}.\frac{\left[\left(U_i^P + U_j^P\right) - (U_i^W + U_j^W)\right]^2}{U_i^W.U_j^W} \tag{3}$$

The probability of escalation to war increases with the degree of asymmetric information as measured here by the observational noise V^2 and decreases with the difference in the surplus under peace and under war. Trade may affect both surpluses. The next section is devoted to build an explicit model of trade so as to express the probability of war as a function of trade parameters.

2.2 A simple model of trade

Our theoretical framework is based on a standard new trade theory model with trade costs. The reason we use such a model is that we want to take into account the relative ease that countries in a situation of war have to substitute from one origin to another. A model with constant elasticity of substitution obviously facilitates this analysis. Also, distance between countries plays an important empirical role for both trade and war. Hence, trade costs, that can account for distance, are an important part of our story, and they are relatively easy to manipulate in new trade models.

The world consists of R countries which produce differentiated goods under increasing returns. The utility of a representative agent in country i has the standard Dixit-Stiglitz form:

$$U_i = \left[\sum_{h=1}^{R} n_h c_{ih}^{1-1/\sigma}\right]^{1/(1-1/\sigma)} \tag{4}$$

where n_h is the number of varieties produced in country h, c_{ih} is country i demand for a variety of country h (all goods produced in h are demanded in the same quantity), and $\sigma > 1$ is the elasticity of substitution. Dual to this is the price index for each country:

$$P_i = \left(\sum_{h=1}^{R} n_h \left(p_h T_{ih}\right)^{1-\sigma}\right)^{1/(1-\sigma)} \tag{5}$$

where p_h is the mill price of products made in j, and $T_{ih} > 1$ are the usual iceberg trade costs that depend on distance and other trade impediments between country i and country h such as political borders or trade restrictions. If one unit of good is exported from country h to country i, only $1/\left(T_{ih}\right)$ units are consumed. In each country the different varieties are produced under monopolistic competition and the entry cost in the monopolistic sector is assumed to require f units of a freely tradable good which is chosen as the world numeraire. Produced in perfect competition with labor only, this sector is here to fix the wage rate in country i to labor productivity a_i, common to both sectors. It is not essential to our argument but simplifies the analysis. Mill prices in the manufacturing sector in all countries are identical and equal to the usual mark-up over marginal cost (here equal to 1): $p_i = \sigma/\left(\sigma - 1\right), \forall i$. As labor is the only factor of production, and agents are each endowed with one unit of labor, this implies that total expenditure of country i is $E_i = \hat{L}_i$ where $\hat{L}_i \equiv a_i L_i$ is effective labor, productivity multiplied by L_i the number of workers in country i. Also, labor market equilibrium and free entry imply $n_i = \hat{L}_i/(f\sigma)$. The value of imports by country i of varieties of country h is given by:

$$m_{ih} \equiv n_h p_h T_{ih} c_{ih} = E_i E_h \left(\frac{p_h T_{ih}}{P_i}\right)^{1-\sigma} \tag{6}$$

The indirect utility level is then given by:

$$U_i = \frac{\sigma - 1}{\sigma}\left(\frac{f}{\sigma}\right)^{\frac{-1}{\sigma-1}} \left(\sum_{h=1}^{R} m_{ih}^{1-\frac{1}{\sigma}} E_h^{\frac{1}{\sigma}} T_{ih}^{-1+\frac{1}{\sigma}}\right)^{\frac{1}{(1-1/\sigma)}} \tag{7}$$

Utility increases with trade flows, the income of trade partners (as the number of imported varieties increases with Foreign income) and decreases with trade costs.

We assume that the possible economic effects of a war between country i and country j are: i) a decrease of λ percent in effective labor $\hat{L}_i$ and $\hat{L}_j$ in both countries (which may come from a loss in productivity or in factors of production), and ii) an increase of τ_{bil} percent and τ_{multi} percent, in respectively the bilateral and the multilateral trade costs T_{ij} and T_{ih}, $h \neq i, j$. Note that the assumed percentage increase in trade costs due to the war is the same across countries, but that the level of initial trade costs between countries differ across country-pairs.

To sum up, a country i's welfare under peace is $U_i^P = U(\mathbf{x}_i)$ where the vector $\mathbf{x}_i \equiv (\hat{L}_i, \hat{L}_j, T_{ij}, T_{ih})$. Under war, country i's welfare is stochastic (see equation (2)) but is equal on *average* to an equilibrium value $U_i^W = U\left[\mathbf{x}_i(1-\mathbf{\Delta})\right]$ with: $\mathbf{\Delta} \equiv (\lambda, \lambda, -\tau_{bil}, -\tau_{multi})$.

2.3 Trade openness and war

According to our model, the probability of escalation to war between country i and country j is given by (3). Together with (7), we show in appendix that, using a Taylor expansion around the symmetric equilibrium where countries i and j are identical, war occurs with probability :

$$\Pr(escal_{ij}) \simeq 1 - \frac{1}{V^2}\left[W_1\lambda + W_2\tau_{bil} + W_3\tau_{multi}\right]^2 \tag{8}$$

The probability of escalation to war depends on the degree of asymmetric information as measured by V and on the welfare differential between war and peace for both countries i and j. This differential has three components which are given in appendix 2. The first one, $W_1 > 0$, says that war reduces available resources among belligerents. There is a negative impact on welfare through the direct impact on income and an indirect effect on the number of varieties produced at home and imported from the other country. The second component, $W_2 > 0$, stands for the fact that war potentially increases bilateral trade barriers and therefore decreases bilateral trade. Similarly the third component $W_3 > 0$ stands for the possible increase of multilateral trade costs.

Importantly, equation (8) can also be rewritten in terms of the observed trade patterns. For this, we use (6) and the national accounting identity:$\frac{m_{ii}}{E_i} + \frac{m_{ij}}{E_i} + \sum_{h\neq j,i}^{R} \frac{m_{ih}}{E_i} = 1$, where m_{ii} is the value of trade internal to country i and (m_{ij}, m_{ih}) are the observed trade flows. We then obtain the probability of escalation as a function of observed bilateral flows $\left(\frac{m_{ij}}{E_i}\right)$ and multilateral trade flows $\left(\sum_{h\neq j,i}^{R} \frac{m_{ih}}{E_i}\right)$ as ratios of income:

$$\Pr(escal_{ij}) = 1 - \frac{1}{V^2}\left\{\frac{\sigma\lambda}{\sigma-1} + \tau_{bil}\frac{m_{ij}}{E_i} - \left(\frac{\lambda}{\sigma-1} - \tau_{multi}\right)\sum_{h\neq j,i}^{R}\frac{m_{ih}}{E_i}\right\}^2 \tag{9}$$

There are two important implications that can readily be derived from this equation, and which are tested in the empirical section.

Testable implication 1: An increase in bilateral trade as a ratio of income of country i, between countries i and j, decreases the probability of escalation to war between these two countries:

This prediction holds as long as $\tau_{bil} > 0$: bilateral trade costs increase following a war between country i and j. We test this condition in the empirical section and find that it holds. Bilateral trade between two countries generates trade gains which are lost in case of war so that it increases the opportunity cost of a bilateral war.

Testable implication 2: An increase in multilateral trade as a ratio of country i's income, with other countries that country j, implies a higher probability of escalation to war with country j.

This prediction holds under a stricter condition than the one necessary for *testable implication 1*, namely that: $\tau_{multi} < \frac{\lambda}{\sigma-1}$ the increase in multilateral trade costs following a war with j is small enough compared to the welfare loss due to the decrease in effective factors of production. In the empirical section, we find that the impact of conflicts on multilateral trade costs is indeed either small or insignificant. This implies that in case of a war with country j, country i will not put at risk too much of its trade gains with its other trade partners. In this case, a high level of multilateral trade reduces the bilateral dependence vis-a-vis country j and therefore reduces the opportunity cost of war with this country. Note also that Hess (2004) empirical work suggests that pure economic welfare cost of conflicts are quite large.

We have derived simple testable implications in terms of observable trade flows. These trade flows are however not exogenous as made clear by our trade model. We now analyze the effects of *exogenous* changes in trade costs, that generate *exogenous* changes in trade flows, on the probability of escalation to conflict. This allows us to discuss the impact of globalization on war. By differentiating equation (8), we obtain the effect on the probability of bilateral war of an *exogenous* decrease in bilateral trade barriers T_{ij} which induces an increase in bilateral trade as a ratio of the two countries incomes as $\frac{m_{ij}}{E_j E_i} = \left(\frac{p_j T_{ij}}{P_i}\right)^{1-\sigma}$ (see appendix 2 for computational details):

$$\frac{d\Pr(escal_{ij})}{d(-T_{ij})} = -\frac{\sigma-1}{V^2}\frac{m_{ij}}{E_i}T_{ij}^{-1}\left[\tau_{bil}\left(1-\frac{m_{ij}}{E_i}\right)+\left(\frac{\lambda}{\sigma-1}-\tau_{multi}\right)\sum_{h\neq j,i}^{R}\frac{m_{ih}}{E_i}\right] \tag{10}$$

Result 1: Lower bilateral trade costs between countries i and j decreases the probability of escalation to war between these two countries: $\frac{d\Pr(escal_{ij})}{d(-T_{ij})} < 0$.

A sufficient condition for *Result 1* to hold is $\tau_{multi} < \frac{\lambda}{\sigma-1}$ The intuition is similar to *Testable implication 1.* Note that distance between countries should decrease the effect of bilateral trade openness on war as distance increases trade costs, i.e. T_{ij}. When distance between i and j is sufficiently large so that $\frac{m_{ij}}{E_i}T_{ij}^{-1}$ approaches zero, the effect of decreasing trade costs (such as trade barriers) on the probability of escalation also approaches zero. The reason is that distance (as any trade cost) reduces welfare gains from an increase in bilateral trade as seen in equation (7)

Similarly, the impact on the probability of escalation to war of an exogenous decrease in T_{ih}, the trade barriers between country i and a third country h) is:

$$\frac{d\Pr(escal_{ij})}{d(-T_{ih})} = \frac{\sigma-1}{V^2}\frac{m_{ij}}{E_i}T_{ij}^{-1}\left[\tau_{bil}\frac{m_{ij}}{E_i}+\left(\frac{\lambda}{\sigma-1}-\tau_{multi}\right)\left(1-\sum_{h\neq j,i}^{R}\frac{m_{ih}}{E_i}\right)\right] \tag{11}$$

Result 2: An increase in multilateral trade openness of country i with other countries than country

j implies a higher probability of escalation to war with country j: $\frac{d\Pr(escal_{ij})}{d(-T_{ij})} > 0$.

The condition for this result to hold is the same as for *Testable implication 2*. The intuition is also similar. Note again that the positive effect of multilateral trade openness on the probability of bilateral war should decrease with bilateral distance.

A direct consequence of these two results is that regional and multilateral trade liberalization may have very different implications for the prevalence of war. Regional trade agreements between a group of countries will unambiguously lead to lower prevalence of regional conflicts. Multilateral trade liberalization may increase the prevalence of wars.

We can use our model to shed some light on the following question: why did the process of globalization not lead to a decrease of the number of military conflicts as was hoped in the beginning of the 1990s? For simplicity, we assume from now on that the world is made of R *similar countries with symmetric trade barriers*, $T_{ij} = T$ for all i, j. We interpret globalization as a uniform decrease in trade barriers between all pairs of countries. Combining equations (10)-(11) we obtain that for two countries i, j the probability of escalation to war is given by:

$$\frac{d\Pr(escal_{ij})}{d(-T)} = \frac{\sigma - 1}{V^2}\frac{m_{ij}m_{ii}}{E_i^2}(R-2)T_{ij}^{-1}\left(\frac{\lambda}{\sigma - 1} - \tau_{multi} - \frac{\tau_{bil}}{R-2}\right) \tag{12}$$

Result 3: Under the same condition necessary for result 2, and as long as the number of countries R is sufficiently large then globalization, interpreted as a symmetric decrease in trade costs, increases the probability of war between any given pair of countries i and j: $\frac{d\Pr(escal_{ij})}{d(-T)} > 0$.

The reason is that in a world where countries can easily substitute from one trade partner to another, globalization reduces the bilateral economic dependence of any given pair of countries. The intuition that trade is good for peace only holds for bilateral trade, or when we restrict the analysis to a two country world.

Note that this positive effect of globalization on the probability of escalation to bilateral war is larger when the number of countries R increases. It can also be checked from (10) and (11) that for a given level of globalization, an increase in the number of countries leads to a higher probability of war between any pair of countries under the same condition. This is reminiscent of the results of Alesina and Spolaore (2003) although the mechanism here is very different. The reason here for the increase in war probability between any two countries is not directly that more countries generate more conflicts as in Alesina and Spolaore (2003), but that a higher number of countries (like lower trade costs) imply less economic dependence with any given country.

There are two important provisos to this (pessimistic) message. The first one is the effect of trade on information flows and therefore on information asymmetries as measured by V.

Result 4: If globalization is interpreted as generating more information flows ($dV/dT < 0$), it decreases the probability of war between any given pair of countries i and j: $\frac{d\Pr(escal_{ij})}{dV}\frac{dV}{d(-T)} < 0$.

Contrary to the trade gains channel, the information channel should work in the same direction whether trade liberalization takes place at a bilateral (or regional) or multilateral level. Information flows are complements rather than substitutes so that trade liberalization, bilateral or multilateral, should decrease information asymmetry and the probability of war. This last result echoes Izquierdo et alii (2003) who provide evidence for the informational impact of trade.

The second crucial proviso is that even though multilateral trade liberalization may increase the probability of bilateral wars, it also changes the nature of war in terms of global versus local wars.

Result 5: Globalization changes the nature of interstate conflicts: it decreases the probability of a global war but increases the probability of local wars.

The simplest way to see the first part of this result is to note that the sign of (12) is positive for R sufficiently large but negative for R sufficiently small. At the limit, when $R = 2$, globalization (multilateral trade liberalization) unambiguously decreases the probability of a world war between two groups or coalitions of countries for the same reason that bilateral trade liberalization induces a lower probability of bilateral war. This result shows that our model cannot be interpreted as saying that globalization puts global peace in danger. On the contrary, if one thinks that world wars are the most costly in terms of welfare, then globalization plays a very positive role.

The second part of the result is that the positive effect of multilateral trade liberalization on the prevalence of war is larger for countries with low bilateral distance as distance increases trade costs T_{ij} in equation (11). The intuition is that multilateral trade liberalization, by increasing trade with many other countries, decreases bilateral economic dependence and therefore the opportunity cost of bilateral war. This is more so for countries which, everything else constant, trade more bilaterally for example because of low bilateral distance.

Hence, controlling for the effect of trade on information flows, multilateral trade liberalization reduces the probability of "global" wars but may increase the probability of "local" conflicts. On the other hand, bilateral trade liberalization and more generally regional trade agreements, by increasing bilateral or regional dependence, lead to lower probability of bilateral or regional militarized conflicts. This also suggests that in a world with multiple regional trade agreements in parallel with multilateral trade agreements, "small scale" wars, with a limited number of countries involved would occur mostly between countries that do not belong to regional trade agreements and do not trade much bilaterally.

3 Empirical Analysis

3.1 Data description

Most of the data we use in this paper comes from the correlates of war project, that makes available (at http://cow2.la.psu.edu/) a very large array of datasets concerning armed conflicts but also country characteristics over the last century. Our principal dependent variable is the occurrence of a Militarized

Interstate Dispute (MID) between two countries. This dataset is available for the years 1816 to 2001, but we restrict our attention to the years 1948-2001, because this is the period for which our principal explanatory variable, bilateral trade over income product, is available on a large scale. Each Militarized Inter-state Dispute (MID) is coded with a hostility level ranging from 1 to 5 (1=No militarized action, 2=Threat to use force, 3=Display of force, 4=Use of force, 5=War).[7] International war is a relatively rare phenomenon. A common and arbitrary but reasonable criterion of war is that at least 1,000 deaths of military personnel must occur. By this standard, only about 150 international wars have been fought since 1815, of which fewer than 100 were interstate wars. At the dyadic level of analysis the number of pairs of states at war is larger, since in multi-state wars each state on one side would be paired with every state on the other. Even so, the small number of warring dyads inhibits the creation of truly robust estimates of relative determinants of wars. Consequently, it is common to analyze the causes of MIDs using a broader definition: use or threat to use military force. These are explicit, overt, not accidental, and government approved; they may take the form of verbal diplomatic warnings, troop or ship movements constituting a demonstration of force, or actual use of force at any level up to and including war. We thus consider our explained variable to be a MID of hostility level 3, 4 or 5. We have also investigated with a hostility level of MID restricted to 4 and 5 and find qualitatively similar results. Our sample of country dyads that can possibly be at war consists of all relevant combinations of pairs of countries in existence each year according to the correlates of war database. Out of this universe of dyads, few are in fact engaged in an MID even with our enlarged definition. As appears in Table 1, for the 1948-2001 period, our universe sample contains 559,306 observations, out of which 2,773 (0.49%) are in conflict according to our definition. In one of our preferred specification below (column 6 of Table 8) where we loose a substantial number of observations due to missing values in the explanatory variables, this overall war frequency is almost exactly preserved (1,027 conflicts out of 202,649 dyads, that is 0.50%). Even within the MID, the intensity distribution of the conflicts is relatively stable.

Bilateral trade is constructed from two different datasets. The first one is the dataset assembled by Katherine Barbieri (see http://sitemason.vanderbilt.edu/site/k5vj7G/new_page_builder_4), which uses mostly information from the IMF since WWII and from the League of Nations international trade statistics and various other sources including individual countries before the second world war. Her data spans over the 1870-1992 period. We completed it for the post-WWII period using the IMF DOTS database (the same primary source as Barbieri (2002) for this period). Income data comes from two different sources, Barbieri (2002), which assembles a dataset for the 1948-1992 period, and the World Bank WDI database for 1960-2001. Variables for the bilateral trade regressions accounting for bilateral trade impediments of facilitating factors (distance, contiguity, colonial links) come from the CEPII bilateral distance database (www.cepii.fr/anglaisgraph/bdd/distances.htm).

Among covariates explaining war, are the democracy index for each country. This comes from the

[7] Much more detail about this data is available in Jones et al. (1996), Faten et al. (2004) and online on the correlates of war project.

Table 1: Distribution of conflicts' intensity over 1948-2001

	Full sample		Restricted sample	
Non-fighting dyads	556,533		202,649	
Hostility level of MID	Freq.	Percent	Freq.	Percent
3 (display of force)	478	17.24	214	20.84
4 (use of force)	1,812	65.34	715	69.62
5 (war)	483	17.42	98	9.54
Total	2,773	100	1,027	100

Note: The restricted sample is from our preferred specification in the first set of regressions (column 6 of Table 8).

Polity IV database (available at www.cidcm.umd.edu/inscr/polity) and we use the composite index that ranks each country on a -10 to + 10 scale in terms of democratic institutions. We also use the correlation between countries' positions during votes on resolutions in the General Assembly of the United Nations as an index of their "political affinity". The UN votes correlation is based on the roll-call votes. This form of vote happens when one Member State requests the recording of the vote so that its stand, or the stand of another Member State, on the issue under discussion is clearly identified. This recording must be requested before the voting is conducted. This annual database created by Gartzke et al. (1999) covers the period 1946-1996.

3.2 The effect of war on trade barriers

The first step of our empirical analysis is to assess the impact of past wars on both bilateral and multilateral trade patterns. In particular, we are interested in quantifying the effect of wars on trade and to analyze how long lasting these effects have been. This empirical analysis is also performed by Glick and Taylor (2005) on a This empirical analysis is also crucial to understand the effect of trade on the probability of wars. Hence, the aim of this section is to test conditions that bilateral trade barriers increase after a war and that a bilateral conflict has little effect on multilateral trade barriers. Remember that these are the conditions that enable us to sign the impact of trade on the probability of escalation to war. We therefore want to evaluate empirically τ_{bil} and τ_{multi}, the impact of war on the levels of bilateral and multilateral trade barriers.

To do this, note that using (6), reintroducing time subscripts, and neglecting constants, we obtain that bilateral imports at time t of country i from country j are an increasing function of income in the importing country E_{it}, of income in the exporting country E_{jt} and of bilateral trade openness $T_{ijt}^{1-\sigma}$ (since $\sigma > 1$) and the country specific price index P_{it} which in particular increases with the peripherality of the country. While the rest of the equation is relatively straightforward to estimate, this term is hard to measure empirically but important theoretically (see for example Anderson and Van Wincoop, 2003). In words, wars are likely to affect remote countries with large price indices very

differently from centrally located countries. Omitting the price index potentially leads to mispecification. Suppose for instance that New-Zealand enters in a conflict with Australia. If bilateral trade costs between the two countries rise, the price index of New-Zealand will increase more than for a non peripheral country because Australia is its main trade partner. The omission of this term will bias downward the coefficient on the bilateral trade effects of war. Several solutions have been recently proposed to this problem which we can apply in our case (see Combes et al., 2005, for a review). The simplest here is to use a convenient feature of the CES demand structure that makes relative imports from a given exporter independent of the characteristics of third countries. We can eliminate price indices in the bilateral trade equation by choosing the imports from the United States as a benchmark of comparison for all imports of each importing country:

$$\frac{m_{ijt}}{m_{iut}} = \frac{E_{jt}}{E_{ut}} \left(\frac{T_{ijt}}{T_{iut}} \right)^{1-\sigma}, \tag{13}$$

where the first term of relative productivity-adjusted labor forces is proportional to relative output, and the second term involves trade costs of imports of country i from country j, relative to the US (u). Since the price index of the importer does not depend on characteristics of the exporter, it cancels out here, which solves the mentioned issue in estimation.[8] The last step is to specify the trade costs function. Here, we follow the gravity literature in the list of trade costs components (see Frankel, 1997 and Rose, 2000, 2004 for recent worldwide gravity equations comparable to our work in terms of time and country coverage). We separate trade costs between non-policy related variables (bilateral distance, contiguity and similarity in languages, colonial links) and policy-related ones (trade agreements and communist regime) and those induced by militarized incidents:

$$T_{ijt} = d_{ij}^{\delta_1} \exp(\delta_2 \text{cont}_{ij} + \delta_3 \text{lang}_{ij} + \rho_1 \text{col}_{ij} + \rho_2 \text{ccol}_{ij} + \rho_3 \text{fta}_{ijt} + \rho_4 \text{gatt}_{ijt} + \rho_5 \text{com}_{ijt} + \rho_6 \text{war}_{ijt}), \tag{14}$$

where d_{ij} is bilateral distance, cont_{ij}, col_{ij}, ccol_{ij}, com_{ijt} are dummy variables indicating respectively whether the two countries have a common border, whether one was a colony of the other at some point in time, whether the two have been colonized by a same third country and whether one is a communist regime. We also account for common membership in a free trade area (the fta_{ijt} dummy, which includes the EU, CUSA/NAFTA, the ASEAN/AFTA agreements, MERCOSUR, and a myriad of other agreements reported in Baier and Bergstrand (2004), each under their different time varying membership configurations). A dummy for common membership of GATT/WTO is also included. ρ_6 is therefore the coefficient of interest for us. Combining (14) with (13), our variable of interest, the war_{ijt} dummy, therefore has an effect on trade costs (with elasticity $(1-\sigma)\rho_6$) which can be estimated by the following equation:

[8]Note that war can naturally also affect outputs of trading partners, but this will not result in biased coefficients on the effect of wars on T_{ijt} here as long as we observe GDPs and include them in the regression.

$$\ln\left(\frac{m_{ijt}}{m_{iut}}\right) = \ln\left(\frac{\text{GDP}_{jt}}{\text{GDP}_{ut}}\right) + (1-\sigma)\left[\delta_1 \ln\left(\frac{d_{ijt}}{d_{iut}}\right) + \delta_2(\Delta_{\text{us}}\text{cont}_{ij}) + \delta_3(\Delta_{\text{us}}\text{lang}_{ij})\right]$$
$$+(1-\sigma)\left[\rho_1(\Delta_{\text{us}}\text{col}_{ij}) + \rho_2(\Delta_{\text{us}}\text{ccol}_{ij}) + \rho_3(\Delta_{\text{us}}\text{reg}_{ij}) + \rho_4(\Delta_{\text{us}}\text{gatt}_{ij}) + \rho_5\text{com}_{ijt}\right]$$
$$+(1-\sigma)\rho_6(\Delta_{\text{us}}\text{war}_{ijt}), \quad (15)$$

where the shortcut Δ_{us} designates the fact that all variables are in difference with respect to the United States so that for instance, $\Delta_{\text{us}}\text{lang}_{ij} = (\text{lang}_{ij} - \text{lang}_{iu})$.

3.3 Results

We estimate the impact of wars on bilateral trade through both a traditional gravity equation, which neglects the price index issue (results are in Table 2), and with equation (15) that takes into account this concern by considering all variables (including the war variable) relative to the United States (results are in Table 3). All regressions include year dummies (not shown in the regression tables). All estimates other than the war variables, in both sets of results, are reasonably similar to what is usually found in the literature[9].

The first way to look at the impact of war on trade is simply to introduce in the gravity equation a variable equal to the number of years of peace between the two countries (this variable is divided by 100 to ease readability). Peace here means that there is no conflict of levels 3 to 5 in the MID data set. This is done in the first column of both tables. The effect is positive and significant only in the odds with US specification. However, this variable specifies the impact of armed conflict in a quite restrictive way, notably through the linearity it imposes.

We therefore investigate the effect of wars on bilateral trade, allowing for the possibility that war can have contemporaneous as well as delayed effects on bilateral trade barriers. Hence, in column (2) of both tables, we include variables war_{ijt} to war_{ijt-10} and the coefficient for each of those tells us the decrease of trade due to a war that occurred at date t to $t-10$. Whether in the traditional gravity equation or in the difference with the US version (our preferred specification), the impact of a bilateral military conflict has a sizable impact on bilateral trade. During a military conflict, trade falls by around 15% relative to normal. This effects remains of the same order in the 3 following years in the basic gravity version. In our preferred specification, the impact is larger: the contemporary fall is 26% and remains of the same order for around 5 years. We also find that the fall is long lasting as the war coefficient is significant and negative for at least 10 years. In columns (3), we report the first estimate of a regression that includes ten more war dummies from year $t-11$ to $t-20$. In the gravity specification, the effect of the conflict ceases to be negatively significant after the tenth year and is generally not significantly different from zero. In our preferred specification, the effect lasts longer as it remains negative and significant for around 16 years.

[9]We have checked that the inclusion of the control GDP/capita variable, often introduced in the gravity literature, but which does not come naturally in our theoretical setup, does not change our results.

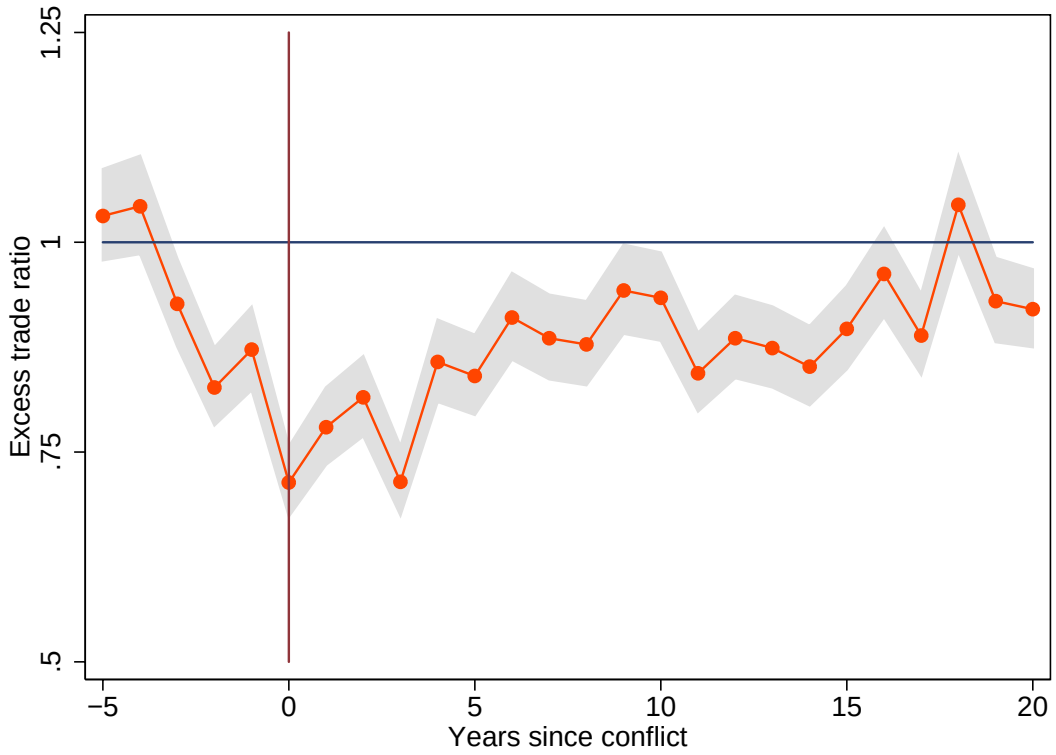

Figure 4: The impact of a conflict on bilateral trade

In the fourth column of both tables, we investigate whether trade flows "anticipate" a war. We add dummies for the five years preceding the war. If those are also negative and significant, it will point to a common cause that structurally explains why a specific country pair both trades less than the gravity norm, and experiences armed conflicts. In addition, if the coefficients values increase (in absolute value) as we get closer to the war, it might suggest for example that business climate deteriorates between the belligerent countries before the war itself. Looking at what happens to trade flows *before* the war is therefore important as it can reveal potential static and dynamic omitted variable bias in the analysis. In the traditional gravity equation, no significant effect can be detected. In the version relative to the US, the dummies for the three years preceding the war are negative and significant. We have experienced with the use of Switzerland as an alternative to US as the norm. Whereas other results were similar, the impact of war on past trade was insignificant. This suggests that we can use trade lagged by four years in the regressions that test for the impact of trade on war in the next section. To summarize, and after having experienced with many different time windows both backward and forward, whereas the evidence that trade is affected by the expectation of war is mixed, war has a large and persistent effect on future trade. The effect lasts between ten and twenty years.

We also want to investigate the impact of wars on total (multilateral) trade. This is done by inserting in the bilateral trade equation dummies set to one when the exporter or the importer is in war with *another* country than the trade partner. It therefore also gives the impact of wars on overall exports and imports with countries not at war. We perform this exercise only in the odds specification and we investigate the impact for the five years preceding the conflict as well as the ten years after the conflict. This regression involves 75 dummies (on top of the year dummies and of the other variables from equation 15): 25 for the bilateral impact and 50 for the multilateral effects. This regression yields our preferred estimates as it accounts for the full set of potential bilateral and multilateral impacts of war over a long period of time (and deals properly with the price index issue). Admittedly, the table is difficult to read, and we prefer to represent estimates of interest graphically, using three different "event-type" figures. Figure 4 shows, using this regression, the fall of trade relative to "natural" trade with 5% confidence intervals in grey bands. There is a significant effect of an upcoming war on bilateral trade for the three years preceding the war. The effect of war on contemporaneous trade is large: The coefficient implies a more than 25% decrease in trade from its natural level. It then decreases in absolute value, and the fighting dyad recovers a level of trade not statistically different from the norm in the 16th year after the war. We have checked that the probability of missing trade data is not substantially affected by the occurrence of war. This might be an issue as missing bilateral trade data could be interpreted as a consequence of a conflictual bilateral relation and this could lead to underestimate the impact of war on trade.

In figures 5 and 6, using the same regression, the impact on multilateral exports and imports is depicted, respectively. They show that the effect is either non statistically significant, for exports, or negative but very small, for imports (around 5% when significant). Overall, these empirical results confirm the validity of the conditions necessary to sign testable implications 1 and 2 derived in the theoretical sections. These conditions are necessary to establish the theoretical results that bilateral trade openness reduces the probability of bilateral a war but that multilateral trade openness increases the probability of a bilateral war, a prediction that we proceed to test in the next section.

3.4 The impact of trade on war

The probability of war is the probability of a conflict between countries i and j multiplied by $\Pr(escal_{ijt})$, the conditional probability of escalation given that a conflict arises as given by equation (9). Allowing for asymmetry between countries i and j, we use the simple arithmetic average of bilateral trade flows as ratios of income as a measure of bilateral openness. For multilateral trade openness, we use the arithmetic average of total imports of the two countries excluding their bilateral trade, as a ratio of their GDPs. We then estimate the equation through logit:

$$\Pr(war_{ijt}) = \gamma_0 + \gamma_1 \text{controls}_{ijt} + \gamma_2 \ln\left(\frac{m_{ijt}}{E_{it}} + \frac{m_{jit}}{E_{jt}}\right) + \gamma_3 \ln\left(\sum_{h\neq j,i}^{R} \frac{m_{iht}}{E_{it}} + \frac{m_{jht}}{E_{jt}}\right) \qquad (16)$$

Table 2: Impact of wars on trade (gravity version)

	Dependent Variable: ln imports			
Model :	(1)	(2)	(3)	(4)
ln GDP origin	0.91^a	0.93^a	0.96^a	0.91^a
	(0.01)	(0.01)	(0.01)	(0.01)
ln GDP destination	0.83^a	0.85^a	0.88^a	0.85^a
	(0.01)	(0.01)	(0.01)	(0.01)
ln distance	-0.98^a	-1.00^a	-1.00^a	-0.98^a
	(0.01)	(0.02)	(0.02)	(0.02)
contiguity	0.25^a	0.30^a	0.42^a	0.26^a
	(0.07)	(0.07)	(0.07)	(0.07)
similarity in language index	0.30^a	0.28^a	0.34^a	0.24^a
	(0.06)	(0.06)	(0.07)	(0.07)
colonial link ever	1.40^a	1.21^a	0.99^a	1.17^a
	(0.08)	(0.08)	(0.08)	(0.08)
common colonizer post 1945	0.82^a	0.71^a	0.67^a	0.62^a
	(0.05)	(0.05)	(0.06)	(0.06)
preferential trade arrangement	0.52^a	0.44^a	0.41^a	0.36^a
	(0.05)	(0.05)	(0.05)	(0.06)
number of gatt/wto members	0.08^a	0.09^a	0.13^a	0.09^a
	(0.02)	(0.02)	(0.02)	(0.02)
one communist regime among partners	-0.73^a	-0.73^a	-0.70^a	-0.78^a
	(0.03)	(0.03)	(0.03)	(0.03)
number of peaceful years / 100	-0.07^b			
	(0.03)			
bil. war + 0 years		-0.16^a	-0.18^a	-0.14^a
		(0.05)	(0.05)	(0.03)
bil. war + 1 years		-0.15^a	-0.14^a	-0.17^a
		(0.04)	(0.04)	(0.04)
bil. war + 2 years		-0.12^a	-0.10^a	-0.15^a
		(0.03)	(0.03)	(0.03)
bil. war + 3 years		-0.17^a	-0.16^a	-0.16^a
		(0.03)	(0.03)	(0.03)
bil. war + 4 years		-0.06^c	-0.04	-0.06^c
		(0.03)	(0.03)	(0.03)
bil. war + 5 years		-0.01	0.00	-0.01
		(0.03)	(0.03)	(0.03)
bil. war + 6 years		-0.03	-0.04^c	-0.01
		(0.02)	(0.03)	(0.03)
bil. war + 7 years		-0.03	-0.04^c	-0.02
		(0.02)	(0.02)	(0.03)
bil. war + 8 years		-0.05^b	-0.06^a	-0.04^c
		(0.02)	(0.02)	(0.03)
bil. war + 9 years		-0.07^a	-0.08^a	-0.06^b
		(0.02)	(0.02)	(0.03)
bil. war + 10 years		-0.06^c	-0.05^b	-0.10^a
		(0.03)	(0.02)	(0.03)
bil. war + 11 years			-0.01	
			(0.02)	
...				
bil. war - 1 years				-0.02
				(0.03)
bil. war - 2 years				0.02
				(0.03)
bil. war - 3 years				0.01
				(0.03)
bil. war - 4 years				-0.03
				(0.04)
bil. war - 5 years				-0.06
				(0.05)
N	448947	361752	291306	293095
R^2	0.634	0.646	0.663	0.636
RMSE	1.799	1.778	1.746	1.748

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels. Standard errors are corrected to take into account correlation of errors among dyads.

Table 3: Impact of wars on trade (odds version relative to the USA)

	Dependent Variable: $\ln m_{ijt}/m_{iut}$			
Model :	(1)	(2)	(3)	(4)
ln GDP origin /US	0.95^a	0.97^a	1.00^a	0.95^a
	(0.01)	(0.01)	(0.01)	(0.01)
ln distance /US	-1.18^a	-1.19^a	-1.19^a	-1.16^a
	(0.01)	(0.02)	(0.02)	(0.02)
contiguity /US	0.56^a	0.58^a	0.61^a	0.58^a
	(0.06)	(0.06)	(0.06)	(0.06)
similarity in language index /US	-0.05	-0.01	0.10^c	-0.09
	(0.05)	(0.06)	(0.06)	(0.06)
colonial link ever /US	0.54^a	0.40^a	0.28^a	0.40^a
	(0.05)	(0.06)	(0.06)	(0.06)
common colonizer post 1945 /US	0.71^a	0.61^a	0.61^a	0.53^a
	(0.05)	(0.05)	(0.06)	(0.06)
preferential trade arrangement /US	0.37^a	0.36^a	0.33^a	0.31^a
	(0.05)	(0.05)	(0.05)	(0.05)
number of gatt/wto members /US	0.20^a	0.21^a	0.22^a	0.21^a
	(0.03)	(0.03)	(0.03)	(0.03)
one communist regime among partners /US	-1.19^a	-1.15^a	-1.15^a	-1.16^a
	(0.04)	(0.04)	(0.04)	(0.04)
number of peaceful years/US (/100)	0.32^a			
	(0.03)			
bil. war + 0 years		-0.31^a	-0.30^a	-0.33^a
		(0.03)	(0.03)	(0.02)
bil. war + 1 years		-0.23^a	-0.22^a	-0.25^a
		(0.02)	(0.02)	(0.02)
bil. war + 2 years		-0.24^a	-0.25^a	-0.18^a
		(0.02)	(0.02)	(0.02)
bil. war + 3 years		-0.37^a	-0.37^a	-0.29^a
		(0.02)	(0.02)	(0.02)
bil. war + 4 years		-0.22^a	-0.24^a	-0.13^a
		(0.02)	(0.02)	(0.02)
bil. war + 5 years		-0.18^a	-0.18^a	-0.16^a
		(0.02)	(0.02)	(0.02)
bil. war + 6 years		-0.09^a	-0.10^a	-0.09^a
		(0.02)	(0.02)	(0.03)
bil. war + 7 years		-0.16^a	-0.14^a	-0.15^a
		(0.02)	(0.02)	(0.02)
bil. war + 8 years		-0.16^a	-0.12^a	-0.17^a
		(0.02)	(0.02)	(0.02)
bil. war + 9 years		-0.15^a	-0.04^b	-0.17^a
		(0.02)	(0.02)	(0.02)
bil. war + 10 years		-0.32^a	-0.10^a	-0.26^a
		(0.03)	(0.02)	(0.03)
bil. war + 11 years			-0.16^a	
			(0.02)	
...				
bil. war - 1 years				-0.12^a
				(0.02)
bil. war - 2 years				-0.16^a
				(0.02)
bil. war - 3 years				-0.10^a
				(0.02)
bil. war - 4 years				0.04^b
				(0.02)
bil. war - 5 years				0.04^c
				(0.02)
N	433275	349917	281387	281259
R^2	0.570	0.579	0.592	0.564
RMSE	1.978	1.947	1.921	1.906

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels. Standard errors are corrected to take into account correlation of errors among dyads.

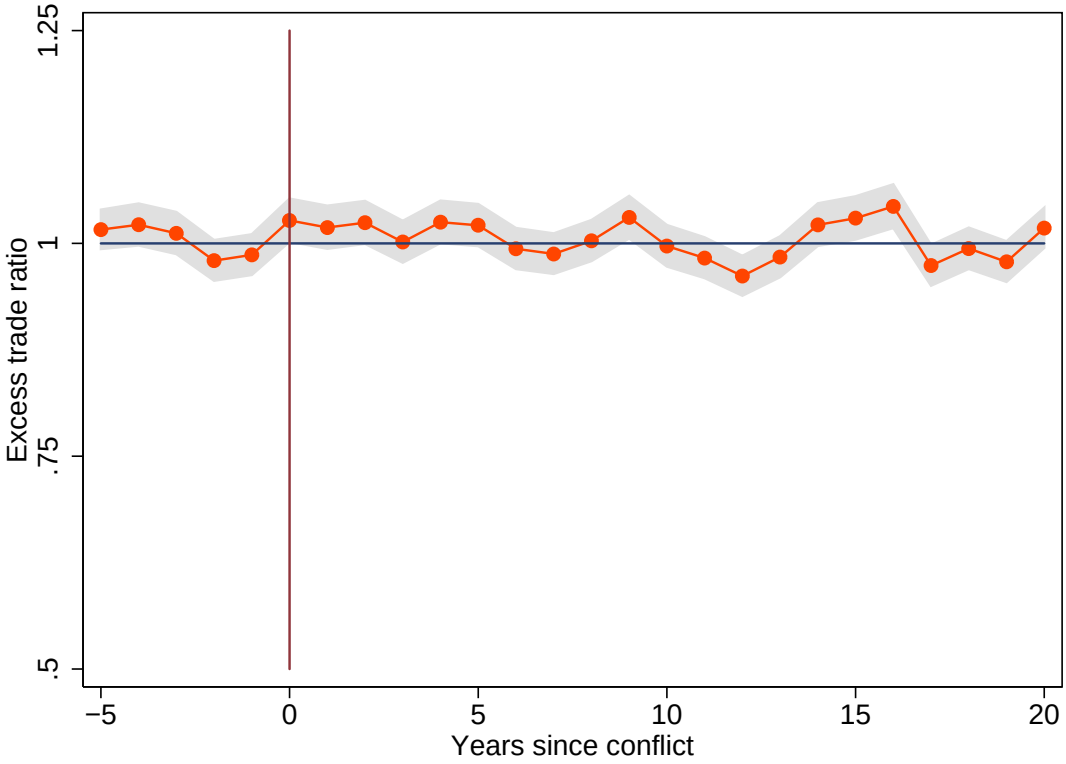

Figure 5: The effect of wars on total exports

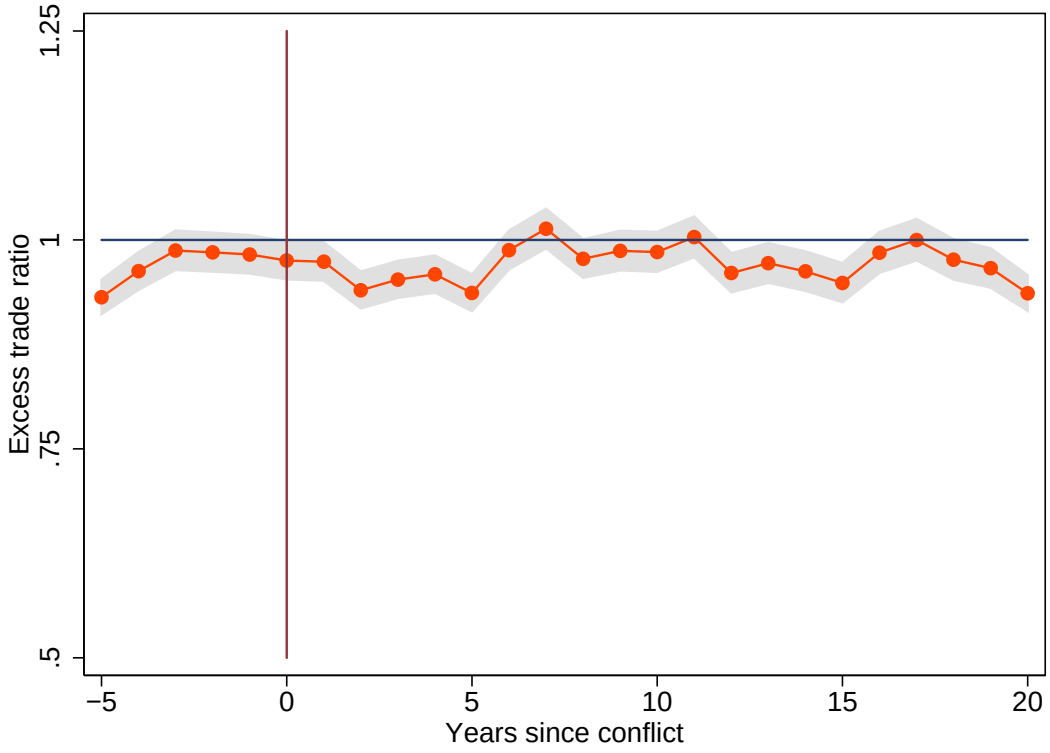

Figure 6: The effect of wars on total imports

Given that we checked that conditions under which testable implications 1 and 2 can be signed were empirically valid in the previous section, our model predicts $\gamma_2 < 0$ and $\gamma_3 > 0$: A negative impact of bilateral trade openness between i and j on the probability of war but a positive impact of multilateral trade openness on the probability of war.

3.5 Results

We estimate equation (16) through logit in three different ways. First, based on results from the preceding section, we lag by 4 years the bilateral and multilateral openness in order to limit contemporaneous reverse causality. Results of this first estimation are provided in Table 4. It might still be argued that omitted variables could cause both lagged trade to fall and conflictuality to rise, even though the preceding section did not find strong evidence of this. The cross-section analysis would then not be satisfactory. We implement two strategies to solve this problem. The bias may come for instance from the fact that some countries (because of cultural, historical or other reasons that we cannot fully control for) have good bilateral relations and therefore trade large amounts with respect to their income while also having a low probability of war. Table 5 controls fully for those possible fixed country pair effects, using panel data logit estimation together with lagged values of trade over GDP of the last five years[10]. In the next section, we implement a different strategy and use an instrumental variable.

In Table 4, column (1) shows that the number of years of peace between two countries has, unsurprisingly, a large negative effect on the probability of war between these two countries. In addition to our trade variable, we introduce a dummy for all observations for which trade flows (both exports and imports) are reported as zero. We can interpret the dummy of zero trade observations as a control for trade costs interpreted as fixed costs. These are not missing values but country pairs for which no trade is reported. There are many such observations. Non surprisingly, such pairs of countries have a lower probability to go to war.[11] The coefficient on the bilateral openness variable is negative as predicted by the theory but not significant. The first control we use is distance in column (2). The reason is that it is reasonable to think that distance affects both trade and the probability of war negatively. Indeed, bilateral distance has a strong negative and significant effect on the probability of war and the coefficient on bilateral trade becomes more negative as expected and significant at the 1% level [12]. We then test in column (3) for the effect of multilateral openness by adding the

[10] We also performed another set of regressions where we used the last five years deviation from average dyadic historical trade levels (expressed relative to GDPs over our whole 1948-2001 time period). This partially controls for the presence of omitted dyadic specific fixed effects. The results were similar to Table 5 so we do not report them here. They are available on request.

[11] We have checked that the absence of this dummy does not change the sign or significance of the coefficients of interest.

[12] The omission of distance as a control in Barbieri (2003) is, we believe, the main reason why our results are opposite to hers on the bilateral trade variable. In the empirical political science literature on the subject (see among others Polachek, 1980; Polachek, Robst and Chang, 1999, Oneal and Russet, 1999, Barbieri 1996 and 2002), the debate between authors has recently focused on two issues: 1) whether to test the relation between trade and war on all possible state

multilateral trade variable: the log of the average of lagged multilateral (excluding bilateral) trade flows in percentage of GDPs as specified in (16). The impact is negative and significant. This may, in particular, come from the assumption in this regression that the effect of openness is the same for all countries. However, the theoretical section made clear that both the effect of bilateral trade and multilateral trade should be stronger for country pairs with low bilateral distance . Hence, in column (4), we add two interaction terms: between distance and the multilateral openness variable and between distance and bilateral openness. Our theoretical model predicts a negative sign on this first interaction term and a positive sign on the second one. Remember that the mechanism at work in our model is that bilateral (multilateral) openness strengthens (loosens) bilateral dependence and therefore the opportunity cost of a bilateral war. Both mechanisms should be stronger for countries that are close to each other than for distant countries because of larger trade gains. The introduction of the interaction terms is important both because it is a further test of the mechanism at work but also because its absence could bias the coefficient on the openness variables. In column (4), the bilateral (multilateral) openness interaction term is positive (negative) as predicted and significant. The multilateral openness becomes positive and significant at 1% as predicted by our theory [13]. In column (5), we add controls which have been shown by the literature on gravity equations, to have an important effect on trade and which may also affect the probability of war. These are most notably contiguity, the index of similarity of language, the existence of a free trade area and the number of GATT members in the dyad. We also add a control for country pairs which had a colonial relationship and a control for those with a common colonizer. Consistent with theory, the coefficient on bilateral trade and on the free trade area are significant and negative. In this case, all the variables of interest have the expected sign and are significant at 1% (bilateral trade, multilateral trade and the interaction terms).

In column (6), we add political controls which are possible determinants of war and which could be correlated with trade flows, yielding biased (inflated in absolute value) estimates of the impact of trade openness on conflicts. These are the sum of areas of the two countries (in log), the product of the democracy indexes and the correlation of UN votes. The first control is potentially important because large area countries are typically countries with important minorities that can be the source of conflicts with neighboring nations. Large countries may also be more difficult to defend, making them potential targets to frequent attacks. Larger countries are also naturally less open to trade. Controlling for the size of countries is also a way to control for mechanisms that are present in the models of Alesina and Spolaore (2003a and b). Democratic countries may also be more open and less prone to wars. This is

pairs or only on the so-called "politically relevant dyads", contiguous states or "major powers". In our study, we use all country pairs and do not select a subset. 2) temporal dependence. We follow most of the literature and add the number of peaceful years between two countries.

[13] We have checked that the presence of the interaction term is not necessary to have a positive estimate of the effect of multilateral trade on the probability of war. The controls we introduce in columns (4) and (5) are enough. In particular, controlling for the area of the country, which affects both multilateral openness and the probability of conflict is the key factor. The results in Table 5, 6 and 7 where the interaction terms are absent also confirm this.

Table 4: Impact of trade on wars - I (lagged trade)

	Dependent Variable: War between two countries							
Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intcpt	-1.90^a	2.33^a	1.60^a	-0.73	-1.83^a	-5.83^a	-3.86^a	-3.86^a
	(0.09)	(0.18)	(0.19)	(0.65)	(0.67)	(1.09)	(1.35)	(1.35)
ln bil. openness t-4	-0.02	-0.06^a	-0.05^a	-0.84^a	-0.87^a	-0.71^a	-0.59^a	-0.59^a
	(0.01)	(0.01)	(0.01)	(0.06)	(0.06)	(0.09)	(0.11)	(0.11)
dummy for zero trade t-4	-1.24^a	-1.11^a	-1.07^a	-0.96^a	-0.93^a	-0.53^a	-0.72^a	-0.70^a
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.11)	(0.14)	(0.14)
number of peaceful years	-0.11^a	-0.09^a	-0.09^a	-0.08^a	-0.07^a	-0.06^a	-0.06^a	-0.06^a
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln distance		-0.61^a	-0.64^a	-0.31^a	-0.13	-0.24^c	-0.43^b	-0.40^b
		(0.02)	(0.03)	(0.08)	(0.09)	(0.14)	(0.17)	(0.17)
ln mult. openness t-4			-0.42^a	1.04^a	1.58^a	0.88^b	1.18^b	1.13^b
			(0.03)	(0.23)	(0.23)	(0.38)	(0.49)	(0.49)
ln distance × ln mult.open				-0.18^a	-0.24^a	-0.09^c	-0.12^c	-0.11^c
				(0.03)	(0.03)	(0.05)	(0.06)	(0.06)
ln distance × ln bil.open				0.11^a	0.11^a	0.10^a	0.07^a	0.08^a
				(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
contiguity					1.18^a	1.15^a	1.12^a	1.10^a
					(0.07)	(0.10)	(0.13)	(0.13)
common language					-0.04	0.08	-0.02	0.00
					(0.07)	(0.08)	(0.10)	(0.10)
free trade area					-0.25^c	-0.35^b	-0.34^c	-0.31^c
					(0.14)	(0.16)	(0.17)	(0.18)
Nb of GATT members					-0.36^a	-0.32^a	-0.39^a	-0.38^a
					(0.04)	(0.05)	(0.06)	(0.06)
pair ever in colonial relationship					0.43^a	0.36^a	0.26^c	0.27^c
					(0.11)	(0.13)	(0.16)	(0.16)
common colonizer					-0.28^a	-0.33^a	-0.35^b	-0.37^b
					(0.09)	(0.12)	(0.15)	(0.15)
product of democracy indexes						-0.17	0.05	0.08
						(0.14)	(0.15)	(0.16)
sum ln areas						0.25^a	0.23^a	0.22^a
						(0.02)	(0.02)	(0.02)
UN vote correlation						-0.98^a	-1.00^a	-1.12^a
						(0.10)	(0.13)	(0.14)
ln mult. info. t-2								-0.03^b
								(0.01)
N	325953	322927	322908	322908	322908	203676	154611	154611
R^2	0.272	0.298	0.306	0.314	0.334	0.336	0.33	0.331

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels.

the democratic peace hypothesis, which has been studied by both political scientists and economists (see Levy and Razin, 2004, for example for a recent explanation of the hypothesis). The absence of these two controls may bias the coefficient on multilateral openness downward. Finally, we control for UN vote correlation because we believe this is a good measure of ideological, cultural and historical affinity between countries that may affect both the probability of war and bilateral trade. The absence of this control may bias the coefficient on bilateral trade downwards. In this specification, the two coefficients of interest on bilateral and multilateral trade have the expected sign and are significant. The coefficient on democracy is negative as expected not significant. We have checked that it is negative and very significant if we omit the UN vote correlation measure. Also, when more controls are added (see appendix 3), the democracy index typically becomes more significant. This is our preferred specification.

In appendix 3, we perform numerous robustness checks (see table 8): we restrict the sample to conflicts with hostility level 4 and 5 to check that concentrating on more severe conflicts does not alter our results. We control for the length of wars to further reduce the possible reverse effect of conflicts on trade. We restrict the sample first to the cold war years (before 1990). We restrict the sample to countries which (following the World Bank classification) are either low or middle income countries. We control for those countries which are permanent members of the UN Security Council and also for communist regimes We control for trade sanctions because they could both decrease bilateral trade and be correlated with future conflicts. We add a time trend. We control for both the level and the difference in GDP/capita of the two countries, as well as military expenditures. We give more detailed comments on these robustness checks in appendix 3, which show that our results are robust to these controls. Our trade variables remain of the right sign and significant.

Using this preferred regression, column (6) in table 4, we want to quantify the effect of trade on the probability of military conflict between two countries. First note that since our principal variables of interest are in logs, each coefficient is a very close approximation of the elasticity of the war probability with respect to a change in the considered variable, when all variables are at their mean value.[14] A standard approach in our context is to imagine the following counterfactual experience. Take a pair of countries with a mean level for all variables, including bilateral and multilateral trade openness. Denote this dyad's initial probability of being in militarized dispute as $\bar{P}$. A ten percent increase in bilateral openness implies a 7 percent fall in the probability of war for this "average dyad", while a similar increase of multilateral openness increases the probability of war by 8.8 percent. But how large is this 10 percent increase in openness? The interpretation of coefficients in terms of economic magnitude is here made difficult by the terms interacting openness with distance. As emphasized by Ai and Norton (2003), the nonlinear nature of logit (or probit) estimation makes it impossible to simply make the usual linear adjustment to coefficients for different levels of distance.[15] A simple solution to

[14]The exact formula for this elasticity is $\beta(1-\bar{P})$, where β is the obtained coefficient and $\bar{P}$ is the war probability given by the logit formula when all variables are at their mean values. With coefficients obtained in column (6) of table 4, $\bar{P} = 0.00039$.

[15]we thank Harry Bowen for pointing out this issue.

this issue is to estimate the same equation, without the interaction terms, for two different subsamples, one of proximate countries and one of distant ones. When estimated for pairs of countries separated by less than 2000 kilometers, the coefficient on bilateral and multilateral openness becomes -0.06 and 0.22 and are significant at 5% and 1% respectively. A one standard deviation in both variables involves augmenting mean values by 176% and 45% respectively, which involves a change in the probability of war by -10.6% and +9.98% respectively. Both coefficients are not significantly different from 0 for countries distant by more than 10000 kilometers (which defines the largest quartile of this sample in terms of distance). Historically, between 1960 and 2000, the bilateral openness variable has increased by 181% for the median country pair separated by less than 2000km. For the multilateral openness variable, the increase is only 87% on the same period. This implies that between 1960 and 2000, the impact of bilateral trade has been to decrease the probability of bilateral war by around 11% for this median pair of countries separated by less than 2000km. The impact of multilateral trade has been to increase this probability by around 19%.

Following our model, we finally want to test for the effect of asymmetric information on the probability of war. We add in column (8), a variable that accounts for multilateral trade in newspapers as a percentage of the countries' GDPs (the source of this data is the COMTRADE database from UNCTAD). We choose a multilateral rather than a bilateral measure because we believe that it is the total volume of information flows that determines the extent of information asymmetry. To be able to compare the effect of information flows and trade in goods flows, we construct this variable like the multilateral trade openness one. In order to avoid contamination by variables which could simultaneously impact the probability of bilateral war and the bilateral flow of information, we subtract from total multilateral trade in newspapers the bilateral value. The main problem with this variable is its availability. This is the reason we lag this variable by only two years. Including it makes the sample size decrease by 45%. To be able to compare results, we run the regression with (column 8) and without (column 7) the information variable, holding the sample size constant. The information variable is negative and significant at the 5% level as expected. As in our logit procedure, we control for the political regime, this empirical result cannot be driven by the fact that democratic regimes, more tolerant towards press freedom, are also the most reluctant to go to war. Finally, note that both bilateral trade and multilateral trade remain of the right sign and significant at 1% and 5% respectively in this much reduced data set.

In Table 5, we go further and use country-pair fixed effects with lagged values of our trade and information openness variables. Note that this specification is extremely demanding in the sense that identification of the impact of different covariates will be made only inside those pairs of countries that have a conflict at some point in time. That is, the effect of variables is conditional upon the fact that the considered country-pair has had a conflict over our time frame. All non-fighting country-pairs during the 1948 to 2001 period are dropped and will not be used in the identification of the impact of trade on wars for instance. Furthermore, the use of the fixed effects imposes the effect to come solely from variation within the fighting dyad. Hence, all variables which are constant over time are

eliminated from estimation. This can be seen as an extreme version of our regressions. It omits any type of cross-sectional variation that explains for instance why two countries never went at war since WWII, which can be argued to also be interesting information. Although the impact of most variables is usually less significant, results are again in accordance with our theoretical priors. The bilateral trade variable reduces the probability of going at war but is not significant in all regressions. The multilateral trade variable is positive and significant at the 1% level in all regressions. Note that the absolute value of the coefficient grows as the set of war covariates is expanded. This underlines the crucial importance of proper war controls in this more demanding estimation procedure to sort out the impact of trade from other determinants of conflicts. In the last column, we again test for the asymmetric information canal. The coefficient is significant at the 10% level and negative as predicted. Hence, this suggests that multilateral openness has opposite impact on the probability of war depending on the nature of flows, goods or information.

Table 5: Impact of trade on wars - II (fixed effects with lagged trade)

	Dependent Variable: War between two countries				
Model :	(1)	(2)	(3)	(4)	(5)
ln last 5 years bil. open. trade avg.	-0.02	-0.02	-0.02	-0.11^b	-0.11^b
	(0.02)	(0.02)	(0.03)	(0.05)	(0.05)
last 5 years 0 trade dummy avg.	0.25	0.18	-0.56^a	-1.09^a	-1.07^a
	(0.16)	(0.16)	(0.21)	(0.31)	(0.31)
number of peaceful years	-0.01^a	-0.01^a	-0.01^a	-0.01^a	-0.01^a
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln last 5 years mult. open. trade avg.		0.37^a	0.50^a	0.65^a	0.65^a
		(0.09)	(0.13)	(0.21)	(0.21)
Nb of GATT members		-0.77^a	-0.48^a	-0.49^b	-0.46^c
		(0.10)	(0.14)	(0.24)	(0.24)
free trade area		-0.13	-0.24	-0.33	-0.31
		(0.23)	(0.27)	(0.36)	(0.36)
UN vote correlation			-0.36^c	-0.92^a	-0.92^a
			(0.19)	(0.30)	(0.30)
product of democracy indexes			-0.08	-0.24	-0.18
			(0.24)	(0.29)	(0.29)
ln last 5 years mult. open. info avg.					-0.10^c
					(0.06)
N	16129	16113	9999	5173	5173

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels.

3.6 Instrumental variables' results

In this section, we use a different strategy to control for potential endogeneity of multilateral trade in the explanation of armed conflicts. We choose an instrument that exerts a positive shock to multilateral

trade without directly interacting with armed conflicts. We focus hereafter on the Generalized System of Preferences (GSP) which are schemes of trade preferences granted on a non-reciprocal basis by developed countries to developing countries. Those schemes are unilateral tariff preferences which facilitate LDCs access to markets of rich countries[16]. The increase in exports and income generated by GSP schemes also allows beneficiary countries to increase total imports. The first GSP schemes were implemented by the EEC and Japan in 1971 and by the USA in 1976; the number of beneficiary countries rose dramatically in the 80s and early 90s. All GSP schemes provide tariff concessions on a wide range of products (although many goods on which developing countries have comparative advantages have been excluded). GSP resulted in a substantial increase in LDCs' exports (for empirical evidence, see Baldwin and Murray (1977), Rose (2002) and Romalis (2003)). From our perspective, a crucial feature is that GSP schemes are (officially) free from reciprocity. LDCs' eligibility to GSP programs is primarily based on their level of poverty[17]. In particular there is no condition imposed on the beneficiary country's propensity to enter in military conflicts. This last point is crucial to our instrumentation strategy. A valid instrument should have no direct relationship with the dependent variable (conflicts here). Our instrumental variable is constructed such that, for each dyad, we measure the number of GSP programmes received by each country. This variable will therefore capture the impact on wars of an exogenous shock to multilateral openness of poor countries, while the official conditions of preferences' attribution should limit the direct correlation between military conflicts and the instrument.

Despite those official rules, GSP participation might in reality be linked to political objectives of granting countries. Indeed it is clearly possible that political ties between the two countries affect what remains a discretionary decision for the rich country. From this perspective, a look at the history of the US GSP scheme is instructive: (i) most communist countries were excluded from the US scheme until the end of the cold war; (ii) while most suspensions from the US program involve countries that in fact reached a high enough level of development (e.g. Hong-Kong, Singapore and South Korea in 1989; Israel in 1995), there are several cases involving bad political relations between the beneficiary country and the US (e.g. Nicaragua in 1985, Paraguay in 1987 and Chile in 1988). Nevertheless, regarding the validity of our instrument, what matters is the fact that GSP participation has no causal link with the beneficiary country's conflicts with countries *different* from the one granting the program.

We use in the regressions two different instrumental variables. They are defined as follows: For each pair of countries, we build IV1, the 5 year lagged value of the total number of GSP programs which the two countries benefit from the rest of the world (excluding the possible bilateral GSP relationship). We also build IV2 which is a dummy variable for $IV1 > 0$. Those two variables serve as instruments for multilateral trade in regressions of Table 4 and Table 5. We implement this instrumentation strategy

[16] A detailed exposition of GSP schemes and analysis of their effects can be found in Romalis (2003) and UNCTAD (2003)

[17] Some GSP schemes add further conditions. For example the American GSP program imposes three conditions: (1) the country's general level of development must be low enough, (2) some workers' rights must be respected, (3) and intellectual property rights must be enforced.

both in the cross section and in the panel dimension. The cross-sectional results could be linked to the fact that poor countries, which are the only beneficiaries of GSP programs, could be intrinsically more prone to war. Controlling for country-pair fixed effects allows to eliminate this concern.[18]

Using instrumental variables' methods is not straightforward in our case, since no standard estimation technique is readily available when the dependent variable is qualitative. Wooldridge (2003) suggests two main methods: First turn to an estimation technique where proper instrumentation is standard, that is in this case, using the linear probability model (LPM) with IVs. Of course, the linear probability model suffers from the well known issue that the predicted probability is not bounded to be between 0 and 1. The second method uses therefore a two-step approach with a proper limited dependent variable. We regress in a first step the multilateral openness variable on our two IVs, and we use the predicted values in the second-step logit estimations.

Table 6 presents results of our preferred specification explaining conflicts with lagged values of openness (column 6 of Table 4). Column 1 reports benchmark estimates of logit estimates where the terms interacting both openness variables with bilateral distance are omitted. Note that the interaction term is important for bilateral trade, as the coefficient looses significance in its absence. However, it remains negative and significant in the LPM specification (see column 4). The effect of multilateral openness remains positive and significant without the interaction terms. Column 2 and 3 replace multilateral openness with predicted values from our two IVs, and shows that an exogenous increase in multilateral openness has a positive effect on the probability of going at war that is about 9 times *larger* than the initial estimate. The first step regressions of multilateral openness on each of the IVs have an R^2 of 0.06 in both cases with a t-stat around 36 and 40 respectively, using robust standard errors clustered by dyad. Column 4 reports benchmark LPM estimates (multiplied by 100 for presentation purposes). All covariates' coefficients have the right sign and are significant at the 1% level. Instrumented regressions with IV1 and IV2, results of which are presented in the last two columns show exactly the same qualitative results as with the logit procedure. An exogenous increase of multilateral openness has a much larger than in the non-instrumented regression.

We last proceed to a similar exercise with the within specification, where constant characteristics

[18] A skeptical reader could still be concerned by the fact that GSP scheme is an indirect way for rich countries to influence the foreign policy of the beneficiary countries. In our following empirical analysis we partially deal with that concern by (5 year) lagging our instrumental variables. This allows to eliminate any contemporaneous spurious correlations between GSP participation and conflictuality. However this does not entirely solve the problem. In particular, during the cold war period, it is quite clear that US or European GSP schemes were generally not granted to poor countries aligned with the Soviet Union interests. From a statistical point of view, this could imply that for observations consisting of a pair of West vs East aligned poor countries, there is a positive causal link between GSP participation of the West aligned country and the probability of conflict between them in the following years. In unreported regressions we deal with this last concern. As an instrumental variable for country-pair level of multilateral trade we consider only GSP participations to the European scheme. We set $IV_{3,t} = 1$ if *both countries of the dyad* participate to the European scheme at date $t-5$; $IV_{3,t} = 0$ otherwise. All our results are robust to this alternative instrumentation choice. Moreover this strategy is suitable as: (i) The European scheme was the first to be implemented in 1971 (ii) there is no unified foreign policy at the European level; hence it is hard to believe that the EU GSP scheme is used by the different members for their own foreign policy (iii) and by focusing only on shocks where both members of the dyad benefit from the EU GSP, we clearly controls for this West vs East Alignment concern.

Table 6: Impact of trade on wars - IV regressions (lagged trade)

	Dependent Variable: War between two countries					
Model :	(1)	(2)	(3)	(4)	(5)	(6)
intcpt	-2.42^a	2.78^a	2.89^a	2.76^a	2.73^a	2.74^a
	(0.43)	(0.71)	(0.70)	(0.24)	(0.24)	(0.24)
ln bil. openness t-4	0.01	0.03^c	0.02	-0.04^a	-0.07^a	-0.07^a
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
dummy for zero trade t-4	-0.56^a	-0.43^a	-0.46^a	-0.35^a	-0.31^a	-0.31^a
	(0.11)	(0.11)	(0.11)	(0.05)	(0.05)	(0.05)
ln mult. openness t-4	0.23^a			0.13^a	1.59^a	1.54^a
	(0.06)			(0.03)	(0.11)	(0.13)
number of peaceful years	-0.06^a	-0.06^a	-0.06^a	-0.01^a	-0.02^a	-0.02^a
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln distance	-0.76^a	-0.74^a	-0.77^a	-0.32^a	-0.46^a	-0.45^a
	(0.05)	(0.05)	(0.05)	(0.02)	(0.03)	(0.03)
contiguity	1.12^a	1.00^a	1.03^a	7.15^a	7.27^a	7.27^a
	(0.10)	(0.11)	(0.11)	(0.10)	(0.11)	(0.11)
common language	0.06	0.07	0.09	-0.02	-0.01	-0.01
	(0.08)	(0.08)	(0.08)	(0.04)	(0.05)	(0.05)
free trade area	-0.44^a	-0.40^b	-0.38^b	-1.20^a	-1.05^a	-1.05^a
	(0.16)	(0.16)	(0.16)	(0.11)	(0.12)	(0.12)
Nb of GATT members	-0.32^a	-0.43^a	-0.41^a	-0.28^a	-0.31^a	-0.31^a
	(0.05)	(0.05)	(0.05)	(0.02)	(0.03)	(0.03)
pair ever in colonial relationship	0.35^a	0.32^b	0.35^a	1.08^a	1.25^a	1.24^a
	(0.13)	(0.13)	(0.13)	(0.11)	(0.12)	(0.12)
common colonizer	-0.29^b	-0.34^a	-0.28^b	-0.42^a	-0.54^a	-0.53^a
	(0.12)	(0.12)	(0.12)	(0.06)	(0.06)	(0.06)
product of democracy indexes	-0.09	-0.09	-0.09	0.05	0.03	0.03
	(0.14)	(0.14)	(0.14)	(0.06)	(0.06)	(0.06)
sum ln areas	0.27^a	0.24^a	0.24^a	0.08^a	0.26^a	0.25^a
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)
UN vote correlation	-1.15^a	-1.46^a	-1.38^a	-0.64^a	-1.00^a	-0.99^a
	(0.10)	(0.11)	(0.10)	(0.06)	(0.06)	(0.06)
predicted mult. open. (1)		2.13^a				
		(0.23)				
predicted mult. open. (2)			2.12^a			
			(0.22)			
N	203676	199249	199249	203676	199240	199240
R^2	0.331	0.337	0.338	0.044	0.031	0.032

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels.

that are specific to country pairs are controlled for through dyad-level fixed effects. Results are presented in Table 7, and again the first column presents benchmark results of the preferred specification (column 3 of Table 5). Again the first three columns report results from logit estimation, while the last three report linear estimates. The coefficient on multilateral openness, which now is entirely estimated from the changes within each considered country dyad across time is once again magnified rather than downsized by the different instrumentation procedures.

Table 7: Impact of trade on wars - IV regressions (fixed effects)

	Dependent Variable: War between two countries					
Model :	(1)	(2)	(3)	(4)	(5)	(6)
ln last 5 years bil. open trade avg.	-0.02	0.01	0.01	-0.16	-0.60^{c}	-0.54^{c}
	(0.03)	(0.03)	(0.03)	(0.29)	(0.31)	(0.31)
last 5 years 0 trade dummy avg.	-0.56^{a}	-0.33	-0.33	-4.36^{a}	-3.23^{c}	-3.37^{b}
	(0.21)	(0.22)	(0.22)	(1.65)	(1.68)	(1.67)
ln last 5 years mult. open. trade avg.	0.50^{a}			3.82^{a}	16.01^{a}	14.42^{a}
	(0.13)			(0.97)	(2.51)	(2.55)
number of peaceful years	-0.01^{a}	-0.01^{a}	-0.01^{a}	-0.05^{a}	-0.04^{a}	-0.04^{a}
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Nb of GATT members	-0.48^{a}	-0.76^{a}	-0.70^{a}	-3.90^{a}	-5.69^{a}	-5.46^{a}
	(0.14)	(0.15)	(0.15)	(1.03)	(1.09)	(1.09)
free trade area	-0.24	-0.17	-0.22	-1.73	-1.59	-1.61
	(0.27)	(0.29)	(0.28)	(2.11)	(2.13)	(2.12)
UN vote correlation	-0.36^{c}	-0.66^{a}	-0.59^{a}	-3.32^{b}	-1.50	-1.73
	(0.19)	(0.19)	(0.19)	(1.45)	(1.50)	(1.50)
product of democracy indexes	-0.08	-0.23	-0.09	-0.45	-4.46^{b}	-3.94^{b}
	(0.24)	(0.25)	(0.24)	(1.74)	(1.92)	(1.92)
predicted mult. open. (1)		1.55^{a}				
		(0.25)				
predicted mult. open. (2)			1.54^{a}			
			(0.27)			
N	9999	9999	9999	9999	9999	9999

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels.

4 Conclusion

Our paper is the first, to our knowledge, to base the empirical analysis of the relation between trade and war on a theoretical model that allows to generate and test a controversial question. Our results are somewhat ambivalent on the impact of trade and more generally of globalization on the prevalence and the nature of war. We have shown that even in a model where trade increases welfare and war is Pareto inferior, higher trade flows may not lead to peace. The intuition that trade promotes peace is only partially right: bilateral trade, because it increases the opportunity cost of bilateral war indeed

deters bilateral war. However, multilateral trade openness, because it reduces the opportunity costs of going to war with any given country, increases the probability of war between any given pair of country. Trade globalization also affects the nature of war: multilateral trade openness increases the probability of small-scale, local wars and deters multilateral conflicts. This last point is important: our paper should not be interpreted as suggesting that trade globalization leads to war. In fact, a natural implication of our empirical results, which we cannot however test directly, is that trade globalization leads to a lower probability of a global or world war. Given that these wars are certainly the most costly in human welfare, this is not a small achievement. We interpret more our paper as a word of caution and an explanation of the changing nature of wars. Finally, globalization, both directly and indirectly through trade flows, facilitates information flows, which we show decrease the probability of war if they lead to lower information asymmetry. Our empirical analysis provides strong evidence in favor of these contradictory effects of globalization.

Our model suggests a way through which multilateral trade openness and globalization could in fact be conducive to peace at the local level. Remember that the condition under which multilateral trade increases the probability of war is that the increase in multilateral trade costs following a war is small. Our empirical analysis confirms this the case. However, if countries in bilateral war were to suffer large multilateral trade losses, for example through multilateral trade sanctions imposed by an international organization, then multilateral trade would become a deterrent to bilateral wars. A second possible implication is that local trade integration should be encouraged by international organizations.

Various extensions are possible especially on the impact of globalization on information flows and through this channel on the probability of war. A recent literature in trade (see Rauch 1999) has argued both theoretically and empirically that trade in differentiated products (as opposed to homogenous products traded anonymously) should generate more interactions between traders and therefore more international information flows. Hence, we could more precisely test the impact of trade on war through the asymmetry of information channel by distinguishing between different types of trade flows following Rauch distinction between differentiated and homogenous products.

Another possible extension is to focus on the impact of regional trade agreements on the probability of war and in particular to better understand which features of trade agreements are peace promoting. Is regional free trade, allowing for an increase in regional trade flows, enough or should countries be tied further by institutional and political ties?

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A Appendix 1: Solving for the second best protocol

This section derives the second best mechanism of our bargaining game under asymmetric information. To this purpose we rely on Myerson-Satherwaite (denoted M-S) and provide a two stage proof which follows Compte and Jehiel (2005). First, we study the equilibrium of a particular protocol, the so-called *Nash bargaining protocol*. We then show that this protocol implements the second best mechanism.

Remember that our setup differs from the M-S setup as 1) at any time, countries may quit negotiations; hence, we impose ex-post participation constraints ; 2) private information is partially correlated between countries: the outside options are uniformly distributed on the triangle Γ=(M, M_A, M_B) (see Figure 3).

$$\Gamma = \{(\tilde{U}_i^W, \tilde{U}_j^W) \mid (\tilde{U}_i^W, \tilde{U}_j^W) \geq \left(\underline{v_i}, \underline{v_j}\right) \text{ and } \tilde{U}_i^W + \tilde{U}_j^W \leq \bar{v}\}$$

with $\underline{v_i} \equiv (1 - V/2).U_i^W$ and $\underline{v_i} \equiv (1 - V/2).U_j^W$ and $\bar{v} = (1 + V).(U_i^W + U_j^W)$. From assumption (1), peace Pareto dominates war, meaning that $\bar{v} < S^P \equiv U_i^P + U_j^P$. In the rest of the section, for the sake of expositional clarity, we assume without loss of generality[19] that $V = 2$ such that $\underline{v_i} = \underline{v_j} = 0$

A.1 The Nash Bargaining protocol

The Nash bargaining protocol was first described in a slightly different setting by Chaterjee and Samuelson (1983). This is a two stage protocol.

- *"announcement stage":* In the first stage, both countries i and j announce an outside option $(\hat{U}_i^W, \hat{U}_j^W)$ and a sharing rule is proposed.

  If the announcements are compatible, that is, if the sum $\hat{U}_i^W + \hat{U}_j^W \leq S^P$, an agreement is proposed along with transfers $\tau_i(\hat{U}_i^W, \hat{U}_j^W)$ and $\tau_j(\hat{U}_i^W, \hat{U}_j^W)$ chosen so that each party obtains in addition to its announced outside option, half the surplus $S^P - (\hat{U}_i^W + \hat{U}_j^W)$ that is:

  $$\tau_i(\hat{U}_i^W, \hat{U}_j^W) = \hat{U}_i^W + \frac{S^P - (\hat{U}_i^W + \hat{U}_j^W)}{2} \text{ and } \tau_j(\hat{U}_i^W, \hat{U}_j^W) = \hat{U}_j^W + \frac{S^P - (\hat{U}_i^W + \hat{U}_j^W)}{2}$$

  In case the announcements are not compatible, $\hat{U}_i^W + \hat{U}_j^W > S^P$, the bargaining process stops, war is triggered and each party gets its (true) outside option $(\tilde{U}_i^W, \tilde{U}_j^W)$.

- *"agreement stage":* In the second stage, parties sequentially report if they accept the deal[20]. If both parties say "yes", the deal is implemented. Otherwise, negotiation stops, war is triggered and each party gets its (true) outside option $(\tilde{U}_i^W, \tilde{U}_j^W)$.

Clearly, in the second stage, it is a dominant strategy for each party $k \in (i, j)$ with true outside option $\tilde{U}_k^W$ to say "yes" (respectively "no") if $\tau_k \geq \tilde{U}_k^W$ (respectively $\tau_k < \tilde{U}_k^W$). From Compte and

[19] In figure 3, assuming $V = 2$ means that M corresponds to the origin $(0, 0)$.

[20] This stage corresponds to our assumption of "no commitment protocol". In the M-S and C-S original approach, this stage is not allowed: the parties agree ex-ante on the sharing rule; they cannot ex-post renegotiate.

Jehiel (2005), we are able to characterize the equilibrium of the outside option announcement game[21]:

Lemma 1: At equilibrium, a party $k \in \{i,j\}$ with (true) type $\tilde{U}_k^W$ announces $\hat{U}_k^W = a(\tilde{U}_k^W)$ where

$$a(\tilde{U}_k^W) = \frac{1}{4}S^p + \frac{2}{3}.\tilde{U}_k^W$$

Consequently, there is an agreement and Peace is maintained when $\tilde{U}_i^W + \tilde{U}_j^W \leq \frac{3}{4}S^P$. War occurs for $\tilde{U}_i^W + \tilde{U}_j^W > \frac{3}{4}S^P$. On Figure 3, disagreement arises for every couple of outside options which are located in the ABM_BM_A dashed area.

Intuitively, it is clear that parties i and j do not report their true outside option. One the one hand, the two parties have an incentive to announce higher values of their outside option to obtain a larger share of the surplus. On the other hand, they have an incentive to announce lower values in order to secure an agreement. At equilibrium, for high values of their true outside option, the second effect is not strong enough to produce an agreement.

Proof of lemma 1: The expected gain of player i with type $\tilde{U}_i^W$ when announcing $\hat{U}_i^W$ is

$$\begin{aligned} G(\tilde{U}_i^W, \hat{U}_i^W) &= \int_{\frac{S^p - \hat{U}_i^W + a(\tilde{U}_j^W)}{2} > \tilde{U}_j^W} \max(\hat{U}_i^W, \frac{S^p - \hat{U}_i^W - a(\tilde{U}_j^W)}{2}).\frac{d\tilde{U}_j^W}{\bar{v} - \tilde{U}_i^W} \\ &\quad + \tilde{U}_i^W . \int_{\frac{S^p - \hat{U}_i^W + a(\tilde{U}_j^W)}{2} < \tilde{U}_j^W} \frac{d\tilde{U}_j^W}{\bar{v} - \tilde{U}_i^W} \end{aligned}$$

We now check that it is optimal for party i to announce $\hat{U}_i^W = a(\tilde{U}_i^W)$. Given the form of $a(.)$ it is readily verified that whenever the announcements are compatible, i.e. $a(\tilde{U}_i^W) + a(\tilde{U}_j^W) < S^p$, we have: $a(\tilde{U}_k^W) > \tilde{U}_k^W$ for both $k \in \{i,j\}$. Hence the Nash bargaining share of each party k is above $\tilde{U}_k^W$. This allows to simplify the expression of $G(\tilde{U}_i^W, \hat{U}_i^W)$ when $\hat{U}_i^W$ lies in the neighborhood of $a(\tilde{U}_i^W)$ in:

$$\begin{aligned} G(\tilde{U}_i^W, \hat{U}_i^W) &= \int_{a(\hat{U}_j^W) < S^p - \hat{U}_i^W} . \frac{S^p + \hat{U}_i^W - a(\hat{U}_j^W)}{2} . \frac{d\tilde{U}_j^W}{\bar{v} - \tilde{U}_i^W} \\ &\quad + \tilde{U}_i^W . \int_{a(\hat{U}_j^W) > S^p - \hat{U}_i^W} \frac{d\tilde{U}_j^W}{\bar{v} - \tilde{U}_i^W} \end{aligned}$$

Differentiating $G(\tilde{U}_i^W, \hat{U}_i^W)$ with respect to $\hat{U}_i^W$ yields:

$$\frac{\partial G(\tilde{U}_i^W, \hat{U}_i^W)}{\partial \hat{U}_i^W} = \frac{1}{\bar{v} - \tilde{U}_i^W} \left[\frac{b(S^p - \hat{U}_i^W)}{2} - (\hat{U}_i^W - \tilde{U}_i^W,).b'(S^p - \hat{U}_i^W) \right]$$

[21] In the general case of $V < 2$, the formula becomes more complicated. Indeed a straightforward variable change shows that in equilibrium, a party $k \in \{i,j\}$ with (true) type $\tilde{U}_k^W$ announces $\hat{U}_k^W = a(\tilde{U}_k^W)$ where $a(\tilde{U}_k^W) = \underline{v_k} + \frac{1}{4}(S^p - \underline{v_i} - \underline{v_j}) + \frac{2}{3}(\tilde{U}_k^W - \underline{v_k})$. Consequently, there is an agreement and Peace is maintained when $(\tilde{U}_i^W + \tilde{U}_j^W - \underline{v_i} - \underline{v_j}) \leq \frac{3}{4}(S^P - \underline{v_i} - \underline{v_j})$. War occurs for $(\tilde{U}_i^W + \tilde{U}_j^W - \underline{v_i} - \underline{v_j}) > \frac{3}{4}(S^P - \underline{v_i} - \underline{v_j})$.

where $b(x) \equiv -\frac{3}{8}S^p + \frac{3}{2}x$ is the inverse of function $a(.)$. Straightforward computations show that

$$\left.\frac{\partial G(\tilde{U}_i^W, \hat{U}_i^W)}{\partial \hat{U}_i^W}\right|_{\hat{U}_i^W = a(\tilde{U}_i^W)} = 0$$

A.2 Second Best

We now show that the Nash bargaining protocol described in the previous section implements the second best. From M-S (1983), we know that when outside options are uniformly distributed on the square $(\tilde{U}_i^W, \tilde{U}_j^W) \in [0, S^p] \times [0, S^p]$ the second best (requiring interim participation constraint but not an ex-post one) is implemented by the Nash bargaining protocol and leads to an agreement whenever $\tilde{U}_i^W + \tilde{U}_j^W \leq \frac{3}{4}S^P$. But this is also the domain of agreement induced by the Nash Bargaining protocol in our model where outside options are uniformly distributed on the triangle Γ which can be viewed as a restriction of the uniform distribution to a subset of $[0, S^p] \times [0, S^p]$. This implies that the allocation resulting from the Nash Bargaining protocol induces the second-best in our particular setup.

Indeed by contradiction, assume that in our setup where outside options are uniformly distributed on the triangle Γ, there is a mechanism Ω that generates a strictly higher expected welfare than the Nash Bargaining Protocol. It would then be possible to improve upon the second best of the M-S setup, which we call the MS mechanism. To this purpose, note that any "no commitment" truthful direct mechanism (ie. satisfying the ex-post participation constraints) is a truthful mechanism in the M-S setup (ie. satisfying the interim participation constraint). Hence in the M-S setup, we can build a mechanism Ω' stipulating: for $(\tilde{U}_i^W, \tilde{U}_j^W) \in \Gamma$, we have $\Omega'(\tilde{U}_i^W, \tilde{U}_j^W) = \Omega(\tilde{U}_i^W, \tilde{U}_j^W)$; and for $(\tilde{U}_i^W, \tilde{U}_j^W) \in [0, S^p]^2 - \Gamma$, we have $\Omega'(\tilde{U}_i^W, \tilde{U}_j^W) = MS(\tilde{U}_i^W, \tilde{U}_j^W)$. From the previous remark, such a mechanism Ω' is a truthful direct mechanism. Moreover as Ω generates a strictly higher expected welfare than the Nash Bargaining Protocol on Γ, we have that Ω' generates a strictly higher expected welfare than the Nash bargaining protocol on the whole domain $[0, S^p] \times [0, S^p]$. But this is in contradiction with the fact that the Nash bargaining protocol is the second best for $(\tilde{U}_i^W, \tilde{U}_j^W)$ uniformly distributed on $[0, S^p] \times [0, S^p]$.

In conclusion, the Nash bargaining protocol implements the second best. Because we assume that leaders are rational, it is clear that they will choose this protocol to conduct negotiations. But from lemma 1, we know that disagreement arises for every pair of outside options located in the ABM_BM_A dashed area (see Figure 3). Hence the probability of war corresponds to the ratio of the area of disagreement ABM_BM_A over the total area of disagreement MM_AM_B.

B Appendix 2: equilibrium value of the probability of war.

In the main text we assume that the effect of war is the folllowing: A country i's welfare under peace is $U_i^P = U(\mathbf{x}_i)$ where the vector $\mathbf{x}_i \equiv (\hat{L}_i, \hat{L}_j, T_{ij}, T_{ih})$; under war, country i's welfare is stochastic (see equation (2)) but is equal on *average* to an equilibrium value $U_i^W = U\left[\mathbf{x}_i(1 - \mathbf{\Delta})\right]$ with: $\mathbf{\Delta} \equiv$

$(\lambda, \lambda, -\tau_{bil}, -\tau_{multi})$. According to our model of escalation developed in the previous section, the probability of escalation to war between country i and country j, given by (3), is now equal to:

$$\Pr(escal_{ij}) = 1 - \frac{1}{4V^2} \frac{[U(\mathbf{x}_i) - U(\mathbf{x}_i(1-\boldsymbol{\Delta})) + U(\mathbf{x}_j) - U(\mathbf{x}_j(1-\boldsymbol{\Delta}_j))]^2}{U(\mathbf{x}_i(1-\boldsymbol{\Delta}_i))U(\mathbf{x}_j(1-\boldsymbol{\Delta}))}$$

In order to obtain closed-form solutions we assume that the two countries are identical (however, they may be different from the other countries in the world): $\mathbf{x}_i = \mathbf{x}_j$. We restrict our attention to first order effects so that we can use a Taylor expansion around an equilibrium where countries are identical, such that:

$$\Pr(escal_{ij}) \simeq 1 - \frac{1}{V^2} \left[\boldsymbol{\Delta} \frac{\nabla \mathbf{U}(\mathbf{x}_i)}{U(\mathbf{x}_i)} \right]^2$$

which can be rewritten, using (7) as:

$$\Pr(escal_{ij}) \simeq 1 - \frac{1}{V^2} . [W_1 . \lambda + W_2 \tau_{bil} + W_3 \tau_{multi}]^2$$

with

$$W_1 \equiv 1 + \frac{1}{\sigma - 1} \left(\frac{\hat{L}_i}{\sum_{h=1}^{R} \hat{L}_h T_{ih}^{1-\sigma}} + \frac{\hat{L}_j T_{ij}^{1-\sigma}}{\sum_{h=1}^{R} \hat{L}_h T_{ih}^{1-\sigma}} \right) = 1 + \frac{1}{\sigma - 1} \left(\frac{m_{ii}}{E_i} + \frac{m_{ij}}{E_i} \right) > 0$$

$$W_2 \equiv \frac{\hat{L}_j T_{ij}^{1-\sigma}}{\sum_{h=1}^{R} \hat{L}_h T_{ih}^{1-\sigma}} = \frac{m_{ij}}{E_i} > 0; W_3 \equiv \sum_{h \neq j,i}^{R} \frac{\hat{L}_h T_{ih}^{1-\sigma}}{\sum_{h=1}^{R} \hat{L}_h T_{ih}^{1-\sigma}} = \sum_{h \neq j,i}^{R} \frac{m_{ih}}{E_i} > 0$$

so that:

$$\Pr(escal_{ij}) = 1 - \frac{1}{V^2} \left\{ \frac{\sigma \lambda}{\sigma - 1} + \tau_{bil} \frac{m_{ij}}{E_i} - \left(\frac{\lambda}{\sigma - 1} - \tau_{multi} \right) \sum_{h \neq j,i}^{R} \frac{m_{ih}}{E_i} \right\}^2$$

¿From this, we obtain equation (9) in the text which is the testable analog. Differentiating (8) yields (10) and (11) in the text.

C Appendix 3: Robustness checks.

In table 8, we start from regression 6 in Table 3 and perform various robustness checks all (except the last one) relative to this baseline regression. In the first column we restrict the sample to the conflicts of highest intensity (4 and 5), i.e. those that are characterized by the use of force or war per se (defined as more than 1000 military deaths). The coefficient on bilateral trade, remains significant at 1% . The coefficient on multilateral trade remains positive and is significant at 5%. In regression (2), we attempt to better control for the length of war by adding a dummy for country pairs that were in military conflict the year before. The reason is that we have seen in section 3.2 that the effect of war on trade can be long-lasting. If the war itself is long-lasting, then lagging the trade variable

by four years is not enough to eliminate the contemporaneous effect of war on trade. The results remain robust. Regression (3) restricts the sample to include only cold war years (before 1990). One might think indeed that part of the effect of bilateral openness comes from the radical change in both conflictuality and trade patterns of soviet-bloc countries around 1990. The fall of the Berlin wall meant drastic increases in trade volumes between neighboring countries of the two former blocs as well as a drop in conflicts between them, which could influence results. Column (3) shows that it is not the case, as coefficients are remarkably stable when restricting the sample to years preceding the end of the cold war. In regression (4), we estimate our regression on a sub-sample of the low and middle income countries (as defined by the World Bank). The openness coefficients are significant at 1% and 5%. In regression (5), we add a dummy for "major powers" which we define as those five (US, UK, France, China and Russia) with a permanent seat at the UN Security Council. We have checked that entering those countries separately does not alter the results. Not surprisingly, those countries have more conflicts but the trade results are not driven by them. In column (6), we add a dummy for communist regimes as we know that those regimes are less open in terms of trade. The trade variables remain significant even though the multilateral openness is significant only at 5.1%. In column (7), we add a dummy that designates those country pairs for which trade sanctions (lagged 5 years) are reported by Elliot et al. (2005). Trade sanctions lead to a decrease in trade as reported by Elliot et al. (2005) and they reflect bad political relations between countries which can escalate into conflicts. Hence, the negative effect of bilateral trade on conflicts could be spurious and generated by the effect of trade sanctions on trade that would also predict future conflicts. The last part of the reasoning is right as shown by the positive and significant coefficient on the trade sanctions dummy. However, the effect of bilateral trade on war remains quantitatively similar, significant at 1% and keeps the right sign. The multilateral trade coefficient also remains significant. In regression (8), we add a time dummy in the regression: the opposite sign for multilateral and bilateral openness could come from the fact that both grow with time. Regression (8) shows this is not the case. In regression (9), we control for the level and difference in development of the two countries as well as for military expenditures. If richer countries are more open to trade and are also more prone to warfare (maybe because of higher military capacities) then our positive link between multilateral trade openness and the probability of war could be spurious. Controlling for military expenditures also allows to control for another possibility. Countries at war may import more weapons which may explain the positive sign on multilateral trade in our regression. We do not have data on trade in weapons but military expenditures should proxy for this. For this, we add controls for the sum of the log of GDP/capita of both countries, the difference in GDP/capita and the level of reported military expenditures, all variables are lagged five years. The result suggests that richer countries have a higher probability to go to war. The difference in development (and presumably military capabilities) affects negatively the probability of conflicts between two countries. Finally, the level of military expenditures is positively correlated with the probability of war. More important, trade coefficients remain significant although at 1% and 5% levels. Note that controlling for development and military expenditures makes the

democracy index negative and very significant.

D Appendix 4: Examples of conflicts.

Table 9 provides examples of representative conflicts that are classified as MIDs in our sample. For each hostility level, two cases with narratives from the correlates of war project are presented.

Table 8: Impact of trade on wars - Robustness checks

	Dependent Variable: War between two countries								
Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln bil. openness t-4	-0.72^a	-0.57^a	-0.70^a	-0.70^a	-0.66^a	-0.68^a	-0.64^a	-0.64^a	-0.59^a
	(0.10)	(0.10)	(0.11)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
dummy for zero trade t-4	-0.50^a	-0.52^a	-0.40^a	-0.51^a	-0.56^a	-0.56^a	-0.56^a	-0.46^a	-0.39^a
	(0.12)	(0.12)	(0.13)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.12)
ln mult. openness t-4	0.75^c	0.95^b	1.06^b	0.79^b	0.73^b	0.75^c	0.63^c	0.64^c	0.92^b
	(0.41)	(0.43)	(0.46)	(0.38)	(0.37)	(0.38)	(0.38)	(0.38)	(0.39)
ln distance × ln bil.open	0.10^a	0.08^a	0.10^a	0.10^a	0.09^a	0.09^a	0.09^a	0.09^a	0.08^a
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
ln distance × ln mult.open	-0.07	-0.11^b	-0.10	-0.08	-0.06	-0.08	-0.06	-0.08	-0.10^b
	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
number of peaceful years	-0.06^a	-0.03^a	-0.05^a	-0.06^a	-0.05^a	-0.05^a	-0.05^a	-0.06^a	-0.06^a
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln distance	-0.19	-0.39^b	-0.38^b	-0.21	-0.28^b	-0.29^b	-0.21	-0.25^c	-0.35^b
	(0.16)	(0.16)	(0.17)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
contiguity	1.17^a	0.99^a	1.31^a	1.14^a	1.21^a	1.12^a	1.13^a	1.09^a	1.19^a
	(0.12)	(0.12)	(0.12)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
common language	-0.09	0.04	-0.07	0.07	0.09	0.02	0.04	0.10	0.07
	(0.09)	(0.09)	(0.10)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.09)
free trade area	-0.44^b	-0.31^c	-0.30^c	-0.35^b	-0.36^b	-0.36^b	-0.31^b	-0.34^b	-0.43^a
	(0.18)	(0.18)	(0.18)	(0.17)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
Nb of GATT members	-0.37^a	-0.30^a	-0.25^a	-0.31^a	-0.33^a	-0.35^a	-0.36^a	-0.38^a	-0.28^a
	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
pair ever in colonial relationship	0.26^c	0.50^a	0.12	0.33^b	0.35^a	0.37^a	0.36^a	0.38^a	0.38^a
	(0.15)	(0.15)	(0.16)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
common colonizer	-0.21	-0.14	-0.50^a	-0.36^a	-0.31^a	-0.32^a	-0.31^b	-0.36^a	-0.17
	(0.13)	(0.13)	(0.15)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
product of democracy indexes	-0.19	-0.33^b	-0.04	0.05	-0.28^b	-0.20	-0.22	-0.33^b	-0.63^a
	(0.16)	(0.15)	(0.17)	(0.16)	(0.14)	(0.14)	(0.14)	(0.14)	(0.15)
sum ln areas	0.25^a	0.21^a	0.33^a	0.24^a	0.23^a	0.24^a	0.24^a	0.22^a	0.23^a
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
UN vote correlation	-0.86^a	-0.89^a	-1.07^a	-0.92^a	-0.78^a	-1.08^a	-0.73^a	-1.12^a	-0.77^a
	(0.11)	(0.11)	(0.12)	(0.10)	(0.11)	(0.11)	(0.11)	(0.10)	(0.11)
war t-1		3.11^a							
		(0.10)							
security council					0.61^a				
					(0.11)				
communist regime						-0.47^a			
						(0.12)			
trade sanctions t-5							1.26^a		
							(0.12)		
Year								0.03^a	
								(0.00)	
sum ln (gdp/cap.) t-5									0.18^a
									(0.02)
diff ln (gdp/cap.) t-5									-0.06^b
									(0.03)
military expenditures t-5									0.00^b
									(0.00)
N	203676	203623	157146	192406	203676	203676	203676	203676	197109
R^2	0.33	0.416	0.349	0.343	0.338	0.337	0.342	0.342	0.346

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels. Intercept not reported.

Table 9: Narratives of representative MIDs

Countries involved	Hostility level	Short narrative
Guatemala/Belize	3	1993: Guatemala had long claimed the British colony of British Honduras (Belize) to be Guatemalan territory. Guatemalan residents along the border with Belize claimed that Belizean soldiers made an incursion to Guatemala and destroyed corn and rice crops. Belize claimed that the soldiers were operating on Belizean soil. As a response, the Guatemalan government dispatched 60 soldiers to the disputed border. No further incidents occurred in the immediate aftermath of the incursion.
Togo/Ghana	3	1994: Togo claims an incursion of 100 fighters (irregulars) from Ghana and accuses Ghana of supporting rebels. Togo closes its border with Ghana based on this claim. Ghana denies any involvement and accuses Togo of aggression. This MID is the border closing by Togo.
Cameroun/Nigera	4	In June 1995, Camerounian troops attacked a Nigerian post and captured it, only to lose it later in a Nigerian counteroffensive.
USA/Iraq	4	The FBI determined that the Iraqi government undertook a plot to assassinate former President Bush when he visited Kuwait in mid-April, 1993. The Clinton administration retaliated by launching a cruise missile strike against an Iraqi intelligence facility in downtown Baghdad.
Ethiopia/Eritrea	5	In May 1998, border skirmishes between Ethiopia and Eritrea spun into the world's largest conventional war at the time. The war displaced hundreds of thousands of residents and claimed several thousands causalities. In June 2000, Ethiopia and Eritrea signed a cease-fire, December 12, 2000 they signed a permanent peace treaty.
Jordan, Egypt, Syria, Iraq/Israel	5	1966-67: Six Day War Jordan, Egypt, Syria and Iraq against Israel