Trade Patterns as a Source of Militarized Conflict*

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Abstract

The analysis of the effects of international trade on conflict has almost exclusively focused on the volume of trade flows, mostly disregarding any consideration related to the content of trade flows. This paper empirically explores the determinants of bilateral conflict taking into account several measures describing relevant dimensions of trade flows at the product level, as the degree of complementarity between the two countries, the extent of substitutability of the partner as a destination market and an imports provider, and the level of rivalry between the members of each pair as exporters and importers in third markets. Proposing an innovative instrument to address the endogeneity of trade variables, I estimate a directed model which takes advantage of a continuous event-based measure of interstate conflict. Results show that the three considered dimensions of the patterns of trade are relevant to explain interstate conflict. Results also vary when explaining the frequency or the hostility level of conflict events. According to the results, liberal and realist approaches emerge as coexisting explanations of the consequences of trade on political relations between countries.

Keywords: interstate conflict, international trade, trade patterns, rivalry, trade substitutability, trade complementarity, trade network

JEL codes: F51, F14

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1 Introduction

A central hypothesis in the international relations' literature states that trade reduces conflict between countries. Assuming that conflict has a deterrent effect on trade, it is straightforward to see that political disruptions lead to a loss of gains from trade, which can be seen as the opportunity cost of conflict. Hence, in this liberal approach the higher the volume of bilateral trade, the higher the opportunity cost of conflict, and the lower the incentives for political leaders to engage in international disputes. An opposing view asserts that higher trade leads to an increase in the vulnerability of each country to the interruption of trade, and so can in turn increase conflict.

The debate the effects of international trade on conflict has almost exclusively focused on the volume of trade flows, mostly disregarding any consideration related to their content. This paper focuses on the role that trade specialization patterns, i.e. the specific groups of products imported from and exported to each partner, may have on the level of conflict between countries. More specifically, trade patterns allow to consider not only observed trade flows but also the role of potential trade, they enrich the operationalization of the opportunity costs of conflict, and they enable to weigh the role of actors and targets in the international trade network.

If trade is already disrupted by some degree of conflict, exports and imports will no longer reflect the strategic importance of a partner. However, the degree of complementarity between the products imported and exported by the two partners gives an indication about the amount of potential trade, which could still be relevant in explaining new variations in the level of conflict. Still, both positive and negative effects are theoretically possible, since as for the volume of trade countries could react to a high complementarity caring about opportunity costs of conflict or could also react aggressively against strategic providers. Our results will show that countries tend to fight more with complementary origin and destination markets, and conflict is particularly high in the second case.

Second, not every conflict embeds the same opportunity costs. The loss produced by the interruption of trade relations is larger when the goods being traded are harder to substitute. For a given country, some partners are hardly substitutable as providers of imported products or as destinations for specific exports, while other partners can be easily replaced in both roles. Our results suggest that countries react with more frequent and intense engagements against hard to substitute origins and destinations, using conflict to secure sensitive markets.

Finally, countries' conflict decisions towards a particular target might respond not only to bilateral trade but to the role of the target country on the entire trade network. Hence, conflict could pursue a utility gain in terms of strategic trade interests in third markets, and countries may have incentives to send out higher conflict against their global competitors.[1] We will show that the degree of rivalry in terms of the product-specific destination markets significantly increases the expected level of conflict in a country-pair, whereas coincidence in the sourcing markets is actually pacifying.

To understand the causal links behind international militarized conflict, in particular to weigh the role of the pattern of traded products as a source of political disrupts, is important for many reasons. Countries' development is somehow related to their capacity to produce a very diverse set of goods,

[1] We refer to countries' utilities in a wide sense, it can represent the welfare level for all the economy, which would coincide with the case of a political leader maximizing social utility, or it can also be thought as the result of lobbying groups, where some would beneficiate from increased trade and then lobby for peace, while others would lobby for war as a means to obtain private gains.

while least developed countries typically produce a narrow basket of some primary goods. So development could be seen as a process in which among other things countries diversify their production, acquiring new capacities to produce more complex goods. The political dimension of this process, in terms of the reactions it will produce in trade partners who could be benefited or hindered, have not been systematically explored. We contribute to the literature on the determinants of conflict, which seeks to explain the reasons why countries fight with each other as a means to improve peace promoting policies, and we alert about the relevance of the trade patterns mechanisms that could trigger militarized disputes. It is politically relevant to know if some kinds of trade instead of promoting peace promote conflict, and our findings suggest considering theories where some forms of trade can promote conflict. Our approach also contributes to the debate over the liberal peace. Showing that more conflict should be expected the more substitutable the partner we are giving support to the liberal interpretation on the gains from trade as a component of the opportunity cost of conflict. Nonetheless, the role of trade rivalries as a source of conflict could be evidence in favor of a realist approach.

The main challenges for an empirical evaluation of the forces at play are related to the measurement of the relevant dimensions for the patterns of trade and their inclusion in a directed model for conflict, as well as the adequate treatment of endogeneity of trade values within a conflict model.

In order to measure complementarities, substitutabilities and rivalries at the country-pair level we turn to the distances between countries in different bipartite networks. Links are defined as probabilities and e.g. country j is more complementary for i's exports the higher the probability of j importing a product that i exports. Analogous measures are defined for substitutability and rivalry in trade.

The relevant dimensions of trade patterns are necessarily asymmetric; since the degrees of commercial complementarity, substitutability, or rivalry, are not the same when country i evaluates country j than when the reciprocal evaluation is observed. This means we need a directed dataset, in which observations are directed dyads (i,j and j,i are two separate observations) and each variable is defined accordingly when possible. This is particularly infrequent when measuring bilateral conflict, since war variables or the commonly used Militarized Interstate Disputes (MID) conceive conflict as undirected. To overcome this limitation we turn to an event-based measure of material military actions taken by official actors in each country towards official actors of every partner. An additional advantage comes from the proposed variable being continuous, since this involves a possibility to capture the importance of the actions countries engage in, and also appreciably increases the nonzero values in comparison with the typical binary variables for war or MID.

The empirical assessment of the effects of trade patterns on conflict needs to control for the volume of bilateral trade for each directed dyad, but reverse causality is a serious problem since many authors have shown the deterrent effects of conflict on trade (even if this conclusion is subject of debate). We address this endogeneity issue through an Instrumental Variable (IV) approach, proposing original excluded instruments that measure exports to synthetic destinations and imports from synthetic origins, being these synthetic partners built as an average of the most similar third countries in term of economic size. Considering a large enough number of countries in the averages, neighbors are so diverse that a synthetic directed trade flows should not be associated with the directed conflict in the dyad.

Related literature has mainly developed around the liberal/realists debate over the existence of pacifying effects of trade. Liberals argue that interdependence between two countries tend to reduce the probability of conflict between them, operationalizing interdependence with trade values. The

argument is based on the dissuading role of the opportunity cost of conflict in terms of losing the potential gains from trade during hostility times (Russett and Oneal, 2001)[2]. Realists show many channels through which dependence from another country would encourage the use of force (Waltz, 1979). Marxist argue that trade promotes conflict because specialization and interdependence produce insecurity and vulnerability to external events (Choucri and North, 1975). Empirical studies give mixed results, with papers showing trade reduces conflict[3], others obtaining that trade increases conflict[4], and some that reveal no statistical relation[5].

Interdependence is a theoretically debated concept[6], and it has been operationalized in different manners, using volumes of total bilateral trade or relative measures of bilateral trade (in terms of total trade of each country, or in terms of their GDPs). But the notion of interdependence is much richer if we take the content of each flow into account. Intuitively, political leaders would care more about relations with those countries exporting the very kind of products their country imports, and also when trade flows include goods that are hard to buy or sell elsewhere. Some literature has addressed this distinction through the notions of "sensitivity interdependence" and "vulnerability interdependence" (Keohane and Nye, 1977). Blanchard and Ripsman (1996) proposed to evaluate vulnerability of a country to trade disruptions looking at the potential for each country to mitigate the costs of a cut-off by considering the availability of alternative suppliers, the prospects of increasing domestic production, the prospects of conservation, and the potential for substitution. Our measure focus on alternative suppliers and adding the alternative buyers we use disaggregated product information to weigh how exclusive each partner is in terms of the particular products contained in their bilateral trade flows.

Few studies have explored the effects of the content of trade on conflict, most of them based on a decomposition of trade by sector. Literature on resource-conflict relationship, asking whether some specific resources increase the probability of conflict, is mostly based on qualitative approaches and case studies.[7] In an early cross-country approach, Reuveny and Kang (1998) consider 10 different sectors and find that while trade Granger-causes conflict in some cases, the reverse causality holds for others, describing a pattern that leads to the strategic-goods literature. The main limitation in their study comes from the limited scope of their sample, comprised by just 20 dyads.

More recently Goenner (2010) identified six groups of strategic goods (at the SITC 4-digits level) showing that an increase in trade in energy, non-ferrous metals, and electronics increases conflict, while more trade in chemicals and arms reduces conflict. Coinciding with Dorussen (2006), he shows that homogeneous commodities (highly elastic import demand and export supply curves) are less

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[2] Gasiorowski (1986) emphasizes that measures of aggregate bilateral trade reflect interconnectedness rather than interdependence, since the latter concept requires not only trade but countries' vulnerability to its disruption, which depends of the specific pattern of trade in terms of goods and number of partners.

[3] See Polachek (1980, 1997); Pollins (1989a, 1989b); Oneal, et al. (1996); Oneal and Russett (1997, 1999), Russett and Oneal (2001); Mansfield and Pevehouse (2000); Gartzke and Li (2003); and Oneal, et al. (2003).

[4] See Gasiorowski (1986) and Barbieri (1996, 2002).

[5] See Beck, Katz, and Tucker (1998); Goenner (2004); Keshk, Pollins, and Reuveny (2004); and Kim and Rousseau (2005).

[6] For an extensive review see Baldwin (1980).

[7] Empirical studies on renewable resources are mostly about water scarcity, and show that states tend to cooperate when they have shared water resources. Empirical studies on non-renewable resources are mostly focused on the effects of oil or diamonds abundance on local conflict. They identify two causal mechanisms: resource scarcity for renewable resources (with low market value) leads to fight-for-survival conflicts rarely observed in quantitative studies; while abundance of non-renewable resources has been clearly documented but leads mostly to local (internal) conflicts as shown by Homer-Dixon (1999). Koubi, Spilker, Bohmelt and Bernauer (2014) present the essential findings in these studies.

likely to reduce conflict than trade of more differentiated products (inelastic curves). Dorussen (2006) finds pacifying effects for apparel, low-tech, high-tech, and machinery, and he fails to find the expected pacifying effect for chemicals and electronics.

Goenner (2010) also shows that trade in strategic commodities is more likely to lead to conflict when the exporter is concentrated in a few commodities to a few destinations or also when production is concentrated within a country, since in these cases the producing country is a potential target for plundering. Concentration of international trade partners is especially important for goods with very high transportation costs that are almost exclusively traded with neighbors, as in the case of electricity.

Another relevant hypothesis recently put forward by Peterson and Thies (2012) suggests that the effect of trade on conflict depends on whether trade is intra-industry or inter-industry. In the first case, trade is associated with reduced conflict propensity, because exchange of similar products resulting from economies of scale and consumer tastes for variety is mostly a cooperative sort of relationship. On the other hand, inter-industry trade provokes vulnerability in trading partners. The authors find empirical support for this distinction.

These last papers address the issue of the content of trade by means of a decomposition of trade by sectors, a strategy that makes particularly difficult to deal with endogeneity concerns and only allows extracting conclusions on the role of particular kinds of products. In this paper we propose a different approach, taking advantage of theoretically founded descriptive measures of the content of trade for each dyad. Therefore we propose to qualify trade flows instead of decomposing them. The main advantage is that our strategy expands the possibilities for dealing with endogeneity, and it also avoids an arbitrary selection of sectors.

2 Conceptual framework

A model to explain conflict among countries needs to be based on a rational justification about the decision of engaging in military confrontations. The consequences of conflict on trade are a crucial element for the evaluation of the expected gains or losses produced by an interstate conflict. The expected utility approach has been a workhorse in this field, assuming in general that the higher the volume of bilateral trade the larger the costs of conflict (Polachek 1980, 1992; Polachek, Robst, and Chang, 1999; Robst, Polachek, and Chang, 2007). In these models the cost of lost trade comes from conflict reducing a country's supply for its imports and demand for its exports, increasing thus the domestic price of imported products and decreasing the price received for exported products, i.e. a terms of trade effect.

Li and Reuveny (2011, LR hereafter) propose a more general model, in which Polachek's approach becomes a particular case, admitting the possibility of differential effects of conflict on the demand of imports of a country and the supply of these same products by a partner. Depending on the magnitudes of the shifts produced by conflict on a partial equilibrium demand and supply model, and depending also on the price elasticities of these curves, the effect of conflict on the price of imports/exports can be positive or negative. Thus, rational political leaders who maximize social utility (subject to some level of trade surplus in each good) will respond to higher exports with higher conflict when the price of exports rises with conflict, and will respond to higher exports with lower conflict when the price of exports decreases with conflict. An analogous reasoning works for imports, where faced with higher imports the leader responds with higher conflict if the price of imports decreases with conflict and responds with lower conflict if the price of imports increases with conflict. Since elasticities vary by

sector, their strategy is to decompose trade selecting specific sectors and use the elasticities estimated in Reuveny (2001) to verify if the effect of each sector trade flow is the expected one.

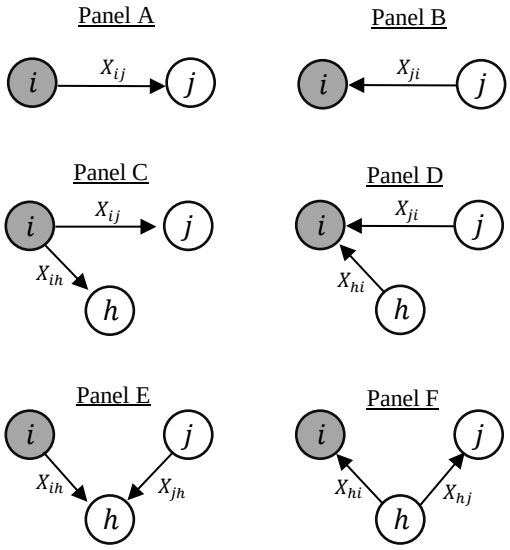
Our approach is based on an extension of LR's partial equilibrium two-country model to the case of many countries and products. As in LR we consider countries as unitary actors that rationally decide the levels of economic relations (trade) and political relations (conflict) among each other. Thus, each country will maximize a utility function that depends on economic consumption and the levels of conflict they send to other countries (assuming that utility rises with higher consumption and with higher conflict).

We start by analyzing the market for one product, admitting the possibility of it being bilaterally traded in both directions. The model assumes countries are small, nevertheless the particular price in each bilateral relation can vary due to changes in bilateral supply and demand as well as specific costs or restrictions to trade.

A crucial feature in a directed model of trade and conflict is how far conflict distortions on supply and demand curves of countries are allowed to go. The simplest option is to assume that conflict from i to j (C_{ij}) only shifts market curves in one country. If changes occur in the own market curves, i.e. supply for exports (X_{ij}^S) and demand for imports (X_{ji}^D) are shifted to the left, then the model will predict a gain in terms of trade for country i together with a decrease in the volume of trade. Polacheck's (1980) micro-foundation for liberalism takes an opposite view, and assuming that conflict will always worsen terms of trade predicts unambiguous welfare losses for country i when he increases conflict towards j. This reasoning is equivalent to shift only foreign market curves, meaning that an increase in C_{ij} will reduce the demand for i's exports (X_{ij}^D) and the supply for i's imports (X_{ji}^S).

A key aspect in LR's model is that conflict from i to j affects both the supply of exports done by country i and the demand for these exports in the importing partner j. With higher conflict between a country i and a partner j, both supply and demand for exports from i to j will move to the left, so traded quantities will fall but the price of exports (and exporter surplus) can be higher. Thus conflict might have a welfare increasing or decreasing effect through exports, depending on the magnitude of the different shifts in supply and demand. Similar effects occur in the market for imports from j in country i.

Figure 1
Relevant trade relations and the role of third countries



The extension to the three-country case allows considering new channels through which country i could gain or lose when increasing the level of conflict sent towards j. Figure 1 represents the main mechanisms, starting by the direct impact on exports and imports considered in Polachek and LR (Panels A and B). On the one hand, losses in the market of bilateral exports to j could be partially or totally offset by an increase in exports to country h (Panel C), and the same occurs with the bilateral market of imports from j (Panel D) where country h could substitute country j as a provider of goods. If substitutability was perfect conflict would only produce a reallocation effect with no associated losses. On the other hand, when third countries are included in the analysis the effects of conflict on supply and demand curves can be taken further, considering how an increase in C_{ij} affects the supply of j's products in h (X_{jh}^{S}) and j's demand for products from h (X_{hj}^{D}). In this case conflict could be used by country i to improve his position in country h, seeking to produce a retreat of j as a buyer or a seller in that market.

A direct consequence of extending LR's approach to three countries is that the model loses its intuitive and parsimonious results. The model is presented and derived in Appendix 1 the simplest case in which conflict from i to j affects only country i's supply and demand curves. We show that in this case the optimum level of C_{ij} is affected by four of the six trade flows in the system: X_{ij}, X_{ji}, X_{ih}, and X_{hi} (see equations A7 to A10) [8]. In each case the sign of the effect depends on an intricate function of all the parameters in the model and is theoretically ambiguous.

The one-product and three-country case is still a very simplified situation, since countries trade thousands of products and have almost two hundred potential partners, although a huge proportion of the product-specific bilateral trade flows are zero. The main patterns shown in Figure 1 still nonetheless relevant, the problem being how to weigh the importance of each arrow when the whole range of products and all possible third-countries are taken into account. The next section presents six measures matching the panels in Figure 1, all of them built as the probability of finding the corresponding pattern of arrows in the bilateral relation between i and j.

For country i, we call "downstream complementarity of j" ($complDS_{ij}$) the probability of finding a product imported by j given the set of products exported by country i, i.e. the probability with which the arrow in Panel A will exist. Inversely, we compute the "upstream complementarity of j" ($complUS_{ij}$) as the probability of finding a product exported by j given the set of products imported by country i (Panel B). We define as "downstream substitutability of j" ($substDS_{ij}$) the probability of finding alternative countries that import the different products being exported from i to j (Panel C), and "upstream substitutability of j" ($substUS_{ij}$) the probability of finding alternative countries that export the different products being imported in i from j (Panel D). Finally, we measure "downstream rivalry of j" ($rivalDS_{ij}$) as the probability of finding markets where both i and j export the same products (Panel E), and "upstream rivalry of j" ($rivalUS_{ij}$) as the probability of finding markets from where both i and j import the same products (Panel F).

In the next section we propose an operationalization of these variables, and in Section 4 we present our empirical strategy, including the set of control variables comprised in matrix $\boldsymbol{A}_{ijt}$ in equation (1), where the main theoretical explanations of conflict are taken into account. Notably, bilateral imports and exports variables are encompassed in matrix $\boldsymbol{A}$.

[8] It can also be shown that in the case of case in which conflict from i to j affects also country j's supply and demand curves the optimum level of C_{ij} will depend also on X_{jh} and X_{hj}.

$$C_{ijt} = \gamma_0 + \alpha_1 complUS_{ijt} + \alpha_2 complDS_{ijt} + \beta_1 substUS_{ijt} + \beta_2 substDS_{ijt} + \delta_1 rivalUS_{ijt} + \delta_2 rivalDS_{ijt} + \boldsymbol{\gamma A}_{ijt} + \varepsilon_{ijt} \quad (1)$$

From a Polachek's approach we should expect $\alpha_1 < 0$ and $\alpha_2 < 0$, but given we admit prices can increase or decrease in each market we could also find $\alpha_1 \geq 0$ and $\alpha_2 \geq 0$. Also, from a liberal point of view it should be the case that $\beta_1 > 0$ and $\beta_2 > 0$ since an easier substitution of the trading partner would mean a lower opportunity cost of conflict, i.e. a less costly outside option. On the contrary, a realist or Marxist approach would expect $\beta_1 \leq 0$ and $\beta_2 \leq 0$ since countries would tend to increase conflict with those partners with which dependency and vulnerability are the highest, in an extreme case a unique provider/consumer of some strategic good. This last result, together with the direct effects of exports and imports on conflict, will give an innovative insight over the old liberal peace debate. We clearly expect $\delta_1 > 0$ and $\delta_2 > 0$, and going beyond the liberal peace debate the significance of the presented coefficients would tell how far trade interests can be seen as a source of militarized conflict.

3 Complementarity, substitutability, and rivalry

In this section we propose an innovative way of operationalizing these three dimensions in a common setting. [9]

In order to discard irrelevant trade flows, we consider that a country exports a product only in the case he does it with Revealed Comparative Advantage as proposed by Balassa (1965), i.e. we require the country to export the product with a weight in his total exports that is larger than the weight of the product's trade in total world trade. Thus, for a generic country $c = i, j, h, ...$, and for a specific product p in time t, we have an indicator variable such that:

$$RCAX_{pct} = \mathbf{1}\left\{\frac{\frac{X_{pct}}{\sum_p X_{pct}}}{\frac{\sum_c X_{pct}}{\sum_p \sum_c X_{pct}}} \geq 1\right\} \quad (2)$$

The same notion is applied for the case of imports, where the dummy for Revealed Comparative Disadvantage as Importer (Ng and Yeats, 1999) is defined as:

$$RCDM_{pct} = \mathbf{1}\left\{\frac{\frac{M_{pct}}{\sum_p M_{pct}}}{\frac{\sum_c M_{pct}}{\sum_p \sum_c M_{pct}}} \geq 1\right\} \quad (3)$$

Where M_{pct} represents imports of product p by country c in time t.

[9] The proposed measures are based on the different country networks taken from Flores and Vaillant (2013) and Flores (2014), an extension in turn to what Hidalgo, Klinger, Barabási and Hausmann (2007) define as the Product Space.

3.1 Complementarity

To measure the extent of complementarity between exports and imports at the bilateral level we will focus on the existence of comparative advantages and disadvantages. If the importer has a comparative disadvantage in products in which the exporter has a comparative advantage then we observe some degree of trade complementarity. For brevity's sake we will refer to a country exporting a product when he does it with $RCAX$, and the same for the case of importing.

A frequency-of-products approach is used to calculate the probabilities of countries exporting or importing products (where the index p refers to HS 6-digit products). The downstream complementarity of j, i.e. probability of j importing a product that i exports, is given by:

$$complDS_{ijt} = Pr\left(RCDM_{pjt} = 1 \middle| RCAX_{pit} = 1\right) = \frac{\sum_{p=1}^{P} RCDM_{pjt} RCAX_{pit}}{\sum_{p=1}^{P} RCAX_{pit}} \quad (4)$$

On the other hand, the upstream complementarity of j, i.e. the probability of j exporting a product i imports, is given by:

$$complUS_{ijt} = Pr\left(RCAX_{pjt} = 1 \middle| RCDM_{pit} = 1\right) = \frac{\sum_{p=1}^{P} RCAX_{pjt} RCDM_{pit}}{\sum_{p=1}^{P} RCDM_{pit}} \quad (5)$$

Given these are new measures for complementarity, in Appendix 2 we compare our results with two other complementarity measures proposed by Anderson and Nordheim (1993) and Michaely (1996). Comparing product shares in exports and imports, both measures take into account the value of trade in each good. This is the main difference with the index proposed here, since our trade complementarity measures respond almost exclusively to changes in the extensive margin of trade (only reacting to changes in the intensive margin that lead a product to surpass the specific threshold considered in the definition of the RCAs). Results show strong correlations among the three complementarity measures as well as a stable behavior of our variable during conflict peaks.

3.2 Substitutability

The true opportunity cost of conflict is likely to depend on the ease with which one country can substitute imports from and export to a belligerent partner with imports from and exports to other partners. In other words, we need a measure of how dependent each country is on its trade with potentially belligerent partners. We compute the probability for exporter i of finding alternative destinations for the products exported to j; as well as alternative origins for the products imported from j. Thus, downstream substitutability of j is given by the probability of finding a country $h = 1, \dots, H$ importing the products i exports to j:

$$substDS_{ijt} = Pr\left(RCDM_{pht} \middle| RCAX_{pit}, RCDM_{pjt}\right) = \frac{\frac{1}{H}\sum_{h=1}^{H}\sum_{p=1}^{P} RCDM_{pht} RCAX_{pit} RCDM_{pjt}}{\sum_{p=1}^{P} RCAX_{pit} RCDM_{pjt}} \quad (6)$$

Analogously, upstream substitutability of j is given by the probability of finding a country h exporting the products i imports from j:

$$substUS_{ijt} = Pr\left(RCAX_{pht} \middle| RCDM_{pit}, RCAX_{pjt}\right) = \frac{\frac{1}{H}\sum_{h=1}^{H}\sum_{p=1}^{P} RCAX_{pht} RCDM_{pit} RCAX_{pjt}}{\sum_{p=1}^{P} RCDM_{pit} RCAX_{pjt}} \quad (7)$$

The higher the probabilities the easier for country i to substitute country j as a destination for its exports or as an origin for its imports.[10] Then, both are inverse measures of trade dependency, and their inclusion in a model for conflict should reflect this strategic dimension of the trading partner for each of the members of the dyads.

The effects of substitutability on conflict could be subject of debate, being associated with higher conflict from a liberal approach paying attention to outside options and opportunity costs. Contrarily, a realist approach would expect higher conflict in the cases of low substitutability, because of risk and vulnerability reasons. Also, this is related to Carlson's (1995) observation that a state that can demonstrate high "cost tolerance" has an advantage in bargaining.

3.3 Rivalry

Finally, we seek to capture rivalry relations in every specific third market. These measures are based on the probability of country i and country j coinciding as common exporters or common importers in any third market h. Even if we name these measures as "rivalry" we have to acknowledge that coincidence in third markets could increase competition and thus rivalry, or could also reflect greater cooperation or even participation in global value chains, in which case we would expect that coincidence fosters peace instead of conflict.

Downstream rivalry with j will be given by the probability of j exporting a product that i exports to h:

$$rivalDS_{ijt} = Pr\left(RCAX_{pjt} \middle| RCAX_{pit}, RCDM_{pht}\right) = \frac{\sum_{h=1}^{H}\sum_{p=1}^{P} RCAX_{pjt}RCAX_{pit}RCDM_{pht}}{\sum_{h=1}^{H}\sum_{p=1}^{P} RCAX_{pit}RCDM_{pht}} \qquad (8)$$

In other words, $rivalDS_{ijt}$ measures the proportion of i's product-specific destination markets in which country j is also present as a provider of goods. Analogously, upstream rivalry with j will be given by the probability of j importing a product that i imports from h:[11]

$$rivalUS_{ijt} = Pr\left(RCDM_{pjt} \middle| RCDM_{pit}, RCAX_{pht}\right) = \frac{\sum_{h=1}^{H}\sum_{p=1}^{P} RCDM_{pjt}RCDM_{pit}RCAX_{pht}}{\sum_{h=1}^{H}\sum_{p=1}^{P} RCDM_{pit}RCAX_{pht}} \qquad (9)$$

The role played by different partners in the trade network could also affect the probability of bilateral conflict. Indeed, the effects of trade on conflict could be very different when the two countries in the dyad are providers of primary products or when one of them is a provider of primary products and the other an industrial economy. In other words the proximity of specialization patterns among countries in the networks could be an important characteristic when evaluating rivalries.

4 Empirical strategy

Equation (1) being a directed model for the level of conflict, its estimation requires the use of a continuous measure for the level of conflict sent from each country i to country each country j. The

[10] Note that with simple algebraic transformations $substUS_{ijt}$ can be expressed in terms of $complUS_{ijt}$, showing that upstream substitutability of j is the share of the upstream complementarity with j in which j can be replaced by other providers (and the share is obtained in terms of product-country specific markets). The same occurs with $substDS_{ijt}$, which can be expressed as a share of $complDS_{ijt}$.

[11] Here again, some transformations allow expressing $rivalDS_{ijt}$ as the matching between downstream complementarities of countries i and j across third countries, and the same occurs with upstream rivalries.

empirical literature tends to use binary and undirected variables of war, or Militarized Interstate Disputes (MIDs)[12], which is constraining both from a theoretical and an empirical point of view.[13] Additionally, there are few observations of MIDs in comparison with the pacific dyad-year observations, so estimation using MIDs could be based in very few particular cases. This problem is even worse when using war dummies (Lin and Seiglie, 2014).

We use a continuous variable of directed conflict built as proposed in Flores (2016). The variable is based on event data, i.e. coded information on actions taken by countries (sources) and directed towards other countries (targets), as reported in international press and newswire agencies cables. The original event information is taken from GDELT database, and the Goldstein Scale (GS) allows classifying events as conflict (negative) or cooperation (positive) actions (Goldstein, 1992). Our conflict variable is then obtained as the yearly sum of (minus) GS scores for conflict events in a directed pair.

Some additional comments are necessary. Cooperation and conflict are not necessarily the opposite extremes of a single scale, since a country can simultaneously cooperate and have conflict with a partner (Pollins, 1989a). Our computation drops purely cooperative actions (events where actors unite their efforts towards a certain goal, like giving humanitarian or economic aid, sharing intelligence information or providing military aid), keeping cooperative actions that lead to a de-escalation in conflict levels (like declaring truce or ceasefire, surrendering, demobilizing armed forces, receiving peacekeepers or easing military or administrative sanctions). In the same manner, we drop those conflict events that are just a dismantling of cooperation schemes among actors.

Another distinction done by the GS is between material and verbal actions. We work only with material actions, and more specifically with a subgroup of military-related events (the detail of the type of events used is in Appendix 2). This decision is based on our focus on militarized conflict, as it is the one involving the more serious costs and receiving most theoretical and empirical attention. Finally, GDELT actors' dictionary allows identifying official national actors, and we keep only the events involving this kind of actors. This means we drop all the sub-national or supra-national actors, as well as non-official national actors. This decision is based on our focus on interstate conflict, and has the value of comparability with other studies in the field.

For most dyads there are many events in a year, each one with a score given by the Goldstein Scale. Thus, a whole distribution of GS events' values is available for each directed dyad-year observation, and the new conflict variable requires choosing an appropriate summary measure, being the count, the mean, the median, the maximum and the sum all natural candidates. Given we want to capture both the extensive and the intensive margins of conflict (variations in the number of events and in its seriousness, respectively), we work with the sums of GS scores for the events found in each directed-dyad-year observation.

[12] MIDs are one of the two typical sources of conflict data, the other being events datasets. MIDs are defined as events of conflict consisting in a "threat, display or use of military force by one state, explicitly directed towards the government, official representatives, official forces, properties or territories of another state". The variable has five potential hostility levels: 1-no militarized action, 2-threat to use force, 3-display of force, 4-use of force, and 5-war. In this context a War is a MID causing the death of more than 1000 soldiers in battle (Gochman and Maoz, 1984; Jones, Bremer, and Singer 1996).

[13] If conflict is seen as an undirected measure then every effort to model the decisions taken by one country will clash with the impossibility of disentangling each country's role. On the other hand, the fact of considering conflict as a discrete phenomenon precludes any consideration of the magnitudes of conflict, forcing to model the determinants of conflict initiation or conflict duration. Additionally, many empirical specification problems are difficult to treat in the case of a limited dependent variable, even more in the context of panel data models.

Another important challenge for the identification of effects in equation (1) comes from the fact that aggregate bilateral imports and exports are endogenous in the model. As mentioned, many recent papers have shown the existence of a deterring effect of conflict on trade, meaning that reverse causality has to be addressed in order to obtain a consistent estimation. We will follow an instrumental variable strategy, exploiting an innovative instrument presented in Flores (2016) as synthetic trade flows.

For each country we first find the K nearest neighbors in terms of economic size, as measured by similarity in GDP levels. The idea is that countries of similar economic sizes will tend to have similar bilateral flows with third countries. Thus, a synthetic destination $\tilde{\jmath}$ is the result of averaging K neighbors of j, and once neighbors have been chosen we average aggregate exports from the origin country i to the different destination countries included in the synthetic destination $\tilde{\jmath}$:

$$X_{i\tilde{\jmath}t} = \frac{1}{K}\sum_{k=1}^{K} X_{ikt} \tag{10}$$

An analogous reasoning applies for imports, where a synthetic origin is built using the same set of j's neighbors:

$$M_{i\tilde{\jmath}t} = \frac{1}{K}\sum_{k=1}^{K} M_{ikt} \tag{11}$$

These counterfactual flows are used to instrument exports from i to the real country j and imports in i from the real j. We argue that these variables should not be correlated with conflict from i to j, since this criterion excludes their bilateral trade, and none of it components should be systematically related to C_{ijt}. Our instrument would be questionable if e.g. disrupted trade after an increase in i's conflict towards j was systematically redirected to countries being similar in size with j. Even if this can eventually happen in some cases, our identification strategy relies on the assumption of random distribution of spillovers among country sizes. In other words, we are supposing that the trade-network effects of an increase in C_{ijt} to not have any special tendency follow size similarity, so the averaged neighbors $\tilde{\jmath}$ randomly receive negative, null, and positive effects. Also, risks are minimized when using enough neighbors to construct the synthetic partners.

Given we analyze the decision in country i with respect to every partner j we prefer to use synthetic versions of j while using the actual country i. Thus, our main instrumental variables will be exports from i to $\tilde{\jmath}$ (*exp_synth_d)* and imports of i from $\tilde{\jmath}$ (*imp_synth_o)*, but we will use also the exports from a synthetic origin $\tilde{\imath}$ to the actual country j (*exp_synth_o)* as an additional instrument that allows testing for overidentification restrictions. As an additional strategy to avoid endogeneity because of simultaneity, we take two-period lags in all the time-varying explanatory variables.

Endogeneity could be also caused by omitted relevant variables, i.e. unobserved confounders that could affect both conflict and (lagged) trade patterns. Our approach to tackle this potential problem is twofold. On the one hand we include a large set of control variables in matrix $\boldsymbol{A}_{ijt}$ in equation (1), gathering the main theoretical explanations for conflict. On the other hand we check the robustness of our results to the inclusion of different kinds of fixed effects, like exporter and importer fixed effects or exporter and importer time-varying fixed effects.

Regarding the set of control variables in matrix $\boldsymbol{A}_{ijt}$, like in most of the empirical literature on international conflict we use a gravity-type specification, where the likelihood of conflict depends on

country size and geographic distance (Boulding, 1962; Hegre, 2008).[14] Distance is measured by the distance between capitals ($distcap_{ij}$), and as usual, it is complemented with a contiguity dummy variable (d_border_{ij}), signaling the existence of a common border between the two countries. Geographic variables are taken from CEPII Gravity database. Country sizes are measured with origin and destination GDPs in current U.S. Dollars (gdp_{it} and gdp_{jt}) taken from World Bank's World Development Indicators (although other sources had to be used to fill some missing countries especially relevant for conflict analysis.).

We are including the two typical liberal variables, measuring trade and democracy. Trade is supposed to measure interdependence, so high current bilateral trade flows mean higher opportunity costs in case of disruption of trade because of bilateral conflict. The opposing realists approach affirms that trade intensifies competition and can increase dependence on strategic goods, an argument strongly related to the substitutability measures included here. Our approach allows testing the significance and sign of these theoretically loaded coefficients once the main mechanisms linked to the content of the trade flows have been controlled for. A distinctive feature of our approach is that directedness of the model allows including separate effects for exports and imports, being thus possible to empirically test the usual restriction of equal coefficients.[15] Exports and imports are measured in current U.S. Dollars and come from CEPII – BACI database (Gaulier and Zignago, 2010).

Democracy variables are also important, as shown by the extensive literature on the "democratic peace" hypothesis. Also trade literature has shown that democracies tend to trade more than autocracies (Russett and Oneal, 2001; Bueno de Mesquita and Lalman 1992; Maoz and Russett, 1993; Ellis, Mitchell, and Prins, 2010). Joint democracy should be associated to less conflict, since in these cases disputes are expected to be diplomatically settled, and this pattern has been empirically observed (Barbieri, 1996; Goenner, 2004; Oneal and Russett, 1999). Finally, some evidence exists on the joint authoritarian dyads sharing this same pacifying effect (Peceny, Beer, and Sanchez-Terry, 2002). We use Polity IV data, where the $polity_i$ variable is a combined score of institutionalized democracy and autocracy in the country, resulting from the subtraction of the autocracy score from the democracy score. The resulting variables vary in a range from -10 to +10, so we add 11 to the result before taking logs.

The number of years of peace (years since the end of the last war) has been widely used since Beck, Katz, and Tucker (1998) recommended to introduce it in a natural cubic spline when estimating a nonlinear model for a binary dependent variable. As we have a linear model for a continuous variable we just include the variable $peaceyears_{ijt}$ linearly (and the inclusion of powers of the variable -see Carter and Signorino (2010) – keep the rest of the results unchanged). We use COW MID database (version 4.01) to compute the number of cumulated consecutive years of peace since 1816 for each dyad-year observation.

A final important issue has to do with the existence of internal conflicts or civil wars. Examples of domestic conflicts that produced interstate wars are abundant, the Arab Spring having added a lot of

[14] In a recent opposing view, Keshk, Reuveny, and Pollins (2010) have argued that distance is not important in conflict models using trade.

[15] The operationalization of dependence is an issue of debate: some authors use traded values while others argue in favor of the ratio of trade over the GDP (or total trade) of the country or countries. We use traded values since some flows can be perceived as strategically important (or important for some lobbying groups) even if their weight is insignificant in terms of country's GDP. Also, as shown by Goldsmith (2013), while GDP shares of bilateral trade can be relevant in the explanation of conflict onset they are hardly associated to escalation, while traded volumes can have a reasonable role both in conflict onset and escalation.

recent cases. Third countries' pacifying interventions are just one of the possible mechanisms of this causal relation, which also can be produced because domestic fights literally cross the border to contiguous countries, or because important domestic conflicts weaken the state capacity to defend the country against external attacks and the opportunity may be taken by rivals, to mention some. The relationship between these two kinds of conflict has been documented (Walt, 1996; Davies, 2002; Trumbore, 2003; Gleditsch, 2007; Schultz, 2010; Yonamine, 2013), and an extensive research shows also that internal conflict tends to disrupt trade (Long, 2008; Blomberg and Hess, 2004; Bayer and Rupert, 2004). In order to measure internal conflict in each country we build a set of variables completely analogous to the described international conflict variables, based on GDELT data and the use of the Goldstein scale. The only difference is that in the case of domestic conflict ($domC_{it}$ and $domC_{jt}$) all kinds of domestic actors are taken into account.

Other included variables are typical in the gravity models of trade literature, and we kept them in our model because of a possible association with conflict. A variable for common religion ($d\_comrelig_{ij}$) is probably the most important one from a theoretical point of view, especially after Huntington (1996). Nonetheless, Russett, Oneal, and Cox (2000) have found that country-pairs split across civilizational boundaries are no more likely to engage in conflict than other states. Also, we have included dummies for having been the same country in the past (d_smctry_{ij}) or having ever been in a common colonial relationship in which case our variables signal whether i was the hegemon and j the colony ($d\_heg\_to\_col$) or vice-versa ($d\_col\_to\_heg_{ij}$). All these dummy variables are provided by CEPII gravity datasets.

In sum, the estimable version of equation (1) is:

$$\begin{aligned}\ln(C_{ijt}) = \gamma_0 &+ \delta_1 \ln(complUS_{ijt-2}) + \delta_2 \ln(complDS_{ijt-2}) + \alpha_1 \ln(substUS_{ijt-2}) \\ &+ \alpha_2 \ln(substDS_{ijt-2}) + \beta_1 \ln(rivalUS_{ijt-2}) + \beta_2 \ln(rivalDS_{ijt-2}) \\ &+ \gamma_1 \ln(X_{ijt-2}) + \gamma_2 \ln(M_{ijt-2}) + \gamma_3 \ln(gdp_{it-2}) + \gamma_4 \ln(gdp_{jt-2}) \\ &+ \gamma_5 \ln(polity_{it-2}) + \gamma_6 \ln(polity_{jt-2}) + \gamma_7 \ln(domC_{it-2}) + \gamma_8 \ln(domC_{jt-2}) \\ &+ \gamma_9 peaceyears_{ijt-2} + \gamma_{10} \ln(distcap_{ij}) + \gamma_{11} d\_border_{ij} \\ &+ \gamma_{12} d\_comrelig_{ij} + \gamma_{13} d\_smctry_{ij} + \gamma_{17} d\_heg\_to\_col_{ij} \\ &+ \gamma_{18} d\_col\_to\_heg_{ij} + \varepsilon_{ijt}\end{aligned} \quad (12)$$

A final concern comes from the fact that having a panel structure it is possible to control for unobserved heterogeneity, assuming that $\varepsilon_{ijt} = \eta_{ij} + u_{ijt}$ is a composite error term including a specific directed country-pair component.[16] In order to control for η_{ij} we also estimate the model including country-pair fixed effects, which slightly alters the parameter being identified. While importer and exporter fixed effects (XMFE), or even importer and exporter time-varying fixed effects (XMTVFE) preserve the cross-section identification, showing the effects of the regressors on the expected level of conflict for different dyads, the country-pair fixed effects (CPFE) will lead to identification of a Within estimator identifying the parameter vector based on time variation for each dyad. In every estimation we also include year fixed effects.

[16] Equation (12) leaves aside some popular variables, like relative power variables or major power dummies (which signal a few large and powerful countries particularly prone to participate in conflicts). In our econometric specification these time-unvarying country-specific variables will be subsumed within origin and destination fixed effects. Finally, the inclusion of formal alliances and preferential trade agreements variables is as relevant as problematic, since several papers show a reverse causality issue, where different kinds of RTA are more probable among potentially conflictive countries (Vicard, 2008; Martin, Mayer, and Thoenig, 2010).

Our database includes 149 countries over the period 1995-2013 (see the list of countries in Appendix 4), which means 22,052 directed country pairs in 19 years.[17]

5 Results

5.1 Determinants of conflict and the role of trade patterns

The baseline estimations of equation (12) are presented in Table 1, where the first column reports the OLS results, while the following columns are the IV estimations. We use exports to synthetic destinations and imports from synthetic origins as instruments for exports and imports, as well as exports from a synthetic origin in order to test overidentification restrictions. Columns 3 to 5 include and combine the mentioned fixed effects.

Results clearly show that trade patterns are relevant to explain bilateral militarized conflict. Trade complementarity positively affects the level of conflict sent against a partner, both when the partner is evaluated as a provider of imports or as a destination market for exports. By definition, observed trade flows require complementarity, hence our result means that once actual imports and exports have been controlled for, the remaining complementarity (e.g. goods exporter by one country and imported by the other but not traded between them) could bring about higher conflict. These effects are also present in the within-dyad estimations, meaning that for a given country-pair, an increase in a partner's complementarity (both upstream and downstream) will favor higher conflict.

The degree of substitutability of a trade partner has to be interpreted in terms of the liberal notions of (inverse) exit costs or (direct) outside options. Our results show that the easiest to substitute a partner the lower the conflict level, or in other words, countries will send higher levels of conflict when their partners are hard to substitute as imports' providers or as destination markets. This finding brings support to the realist approach, showing that countries tend to resort to the use of force in order to deal with their vulnerabilities. The within-dyad estimator shows that this effect is also important in choosing the time for a conflict, promoting higher hostility when the partner is more difficult to substitute.

Downstream rivalries are also significant as a cause of conflict when the cross-section dimension is considered, telling that dyads selling the same products to the same markets tend to have higher levels of conflict. However, evidence shows that upstream rivalry does not increase conflict but, instead, is pacifying. This casts doubts on the adequacy of calling the variable as "rivalry" since in fact shows how often the two partners meet in third markets. In this regard, when two countries tend to have similar providers for similar imported products they will be likely to have less conflict between them. Thus, what we called upstream rivalry could be, in fact, a variable showing different kinds of similarity (cultural, economic, etc.) between partners. Moreover, this is a purely cross-country effect, and the within-dyad results show no effects when two countries' match in upstream markets increase. Contrarily, when a given dyad start to meet in new downstream markets the level of conflict between them will decrease.

[17] All the estimations are carried out in Stata 14.

Table 1

Determinants of International Conflict: Baseline Results

OLS and IV estimations using different fixed effects

	OLS	IV				
VARIABLES	**Pooled**	**Pooled**	**Pooled + XMFE**	**Pooled + TVXMFE**	**Panel**	**Panel + TVXMFE**
Upstream complementarity *(second lag in logs)*	1.242*** *[0.136]*	1.598*** *[0.157]*	0.598* *[0.346]*	1.182 *[1.202]*	0.677** *[0.264]*	8.712*** *[3.185]*
Downstream complementarity *(second lag in logs)*	0.099 *[0.095]*	1.162*** *[0.129]*	1.614*** *[0.198]*	3.441*** *[0.600]*	0.857*** *[0.119]*	2.825*** *[1.093]*
Upstream substitutability *(second lag in logs)*	-2.614*** *[0.278]*	-4.060*** *[0.303]*	-2.490*** *[0.273]*	-2.284*** *[0.387]*	-0.780*** *[0.217]*	-0.968*** *[0.357]*
Downstream substitutability *(second lag in logs)*	-0.572*** *[0.128]*	-1.107*** *[0.143]*	-0.891*** *[0.154]*	-0.837** *[0.397]*	-0.434*** *[0.104]*	0.291 *[0.253]*
Upstream rivalry *(second lag in logs)*	-0.392*** *[0.094]*	-0.386*** *[0.097]*	-0.275*** *[0.102]*	-0.999*** *[0.211]*	-0.102 *[0.084]*	-0.432 *[0.287]*
Downstream rivalary *(second lag in logs)*	0.839*** *[0.091]*	0.139 *[0.109]*	2.820*** *[0.115]*	4.987*** *[0.167]*	-1.309*** *[0.129]*	-1.417** *[0.568]*
Exports *(second lag in logs)*	0.016*** *[0.002]*	-0.094*** *[0.012]*	-0.177*** *[0.034]*	-0.348*** *[0.129]*	-0.113*** *[0.027]*	-0.436* *[0.236]*
Imports *(second lag in logs)*	0.015*** *[0.002]*	-0.006 *[0.015]*	0.079** *[0.037]*	0.134 *[0.129]*	0.070** *[0.033]*	-0.452** *[0.227]*
Peace Years *(second lag)*	-0.007*** *[0.000]*	-0.007*** *[0.000]*	-0.006*** *[0.000]*	-0.005*** *[0.000]*	-0.005*** *[0.001]*	-0.003** *[0.001]*
Democracy in origin *(second lag in logs)*	0.273*** *[0.017]*	0.440*** *[0.023]*	-0.120*** *[0.027]*		-0.119*** *[0.026]*	
Democracy in destination *(second lag in logs)*	0.075*** *[0.018]*	0.178*** *[0.022]*	-0.155*** *[0.029]*		-0.152*** *[0.027]*	
GDP in origin *(second lag in logs)*	0.160*** *[0.005]*	0.314*** *[0.013]*	0.081*** *[0.021]*		0.048** *[0.019]*	
GDP in destination *(second lag in logs)*	0.079*** *[0.005]*	0.185*** *[0.013]*	-0.046*** *[0.018]*		0.046*** *[0.016]*	
Domestic conflict in origin *(second lag in logs)*	0.362*** *[0.008]*	0.358*** *[0.008]*	0.304*** *[0.008]*		0.296*** *[0.007]*	
Domestic conflict in destination *(second lag in logs)*	0.405*** *[0.007]*	0.403*** *[0.008]*	0.286*** *[0.007]*		0.287*** *[0.007]*	
Distance *(in logs)*	-0.655*** *[0.011]*	-0.818*** *[0.018]*	-0.827*** *[0.035]*	-0.944*** *[0.082]*		
Border	0.866*** *[0.059]*	0.988*** *[0.061]*	1.022*** *[0.064]*	1.064*** *[0.078]*		
Common religion	0.072*** *[0.015]*	0.120*** *[0.016]*	0.069*** *[0.016]*	0.089*** *[0.022]*		
Same country in the past	-0.463*** *[0.083]*	-0.262*** *[0.085]*	-0.226** *[0.088]*	-0.143 *[0.114]*		
Hegemon-to-colony	1.169*** *[0.110]*	1.283*** *[0.115]*	1.017*** *[0.119]*	1.123*** *[0.140]*		
Colony-to-hegemon	1.004*** *[0.114]*	1.114*** *[0.116]*	0.991*** *[0.115]*	1.103*** *[0.134]*		
Observations	372,910	372,910	372,910	372,910	372,910	372,910
Time FE	YES	YES	YES	NO	YES	NO
Origin & Destination FE	NO	NO	YES	NO	NO	NO
Origin & Destination TVFE	NO	NO	NO	YES	NO	YES
Country-Pair FE	NO	NO	NO	NO	YES	YES
Hansen J p-value		0	0.231	0.396	0.267	0.676
Underidentification K-P p-value		0	0	0.0002	0	0.0141
Weak Identif. K-P F Statistic		399.8	59.93	5.670	76.70	2.799
Weak Identif CD F Statistic		1501	159.9	18.18	147.2	6.059

Pair-clustered standard errors in brackets. Results obtained using *ivreg2* (Baum, Schaffer, and Stillman, 2010) and *reghdfe* (Correia, 2015).
*** p<0.01, ** p<0.05, * p<0.1

To test our instruments' performance we run overidentification tests checking if excluded instruments are distributed independently of the error term, i.e. they are valid instruments. This is done using the Sargan-Hansen J statistic, reported for every result in Table 1 (note that a rejection indicates that the instruments have been improperly excluded from the regression model). Additionally, being identified by the order and rank conditions, with weak instruments an equation may be effectively unidentified in a finite sample, so we need to test for the weakness of the instruments in our context even if we now that first stage F-tests are significant at the usual levels (Staiger and Stock, 1997). In each case we will also report under-identification tests as well as weak instruments tests, showing the instruments have a reasonably good performance in the model. [18] These results are robust to the use of different lags or event current values of time-varying explanatory variables, as shown in Table A5.1 in Appendix 5.

In sum, the full set of six trade-pattern variables say that countries evaluate their partners both as importers and exporters of different kinds of goods, having higher conflict with complementary partners, with countries with which trade is difficult to substitute, and with downstream rivals, while coincidence in provider markets tends to be pacifying.

The effects of aggregate values of imports and exports are also theoretically relevant results, and we obtain opposite effects of exports and imports on conflict, verifying the findings presented by Flores (2016). Countries tend to have higher levels of conflict with the origins of their imports and lower levels with the destinations of their exports. This seems to reflect a mercantilist approach on trade balance, since $(X - M)$ would be the true figure orienting leaders' decisions, instead of the liberal peace hypothesis of aggregate trade in both directions $(X + M)$ as the critical variable to be considered.

Other control variables have the expected signs and tend to be significant. The gravity forces are at work with the expected signs for distance (negative) and border (positive). Democracy variables show the usual pacifying effect (at least for the preferred specifications including some kind of fixed effects): democracies tend to have lower conflict levels with others and receive lower conflict from them. Domestic conflict is, as expected, associated with a higher level of interstate conflict. A common religion has a positive effect, a surprising result that requires further investigation. Finally, countries that shared colonial relationships, currently or in the past, tend to have more conflict, while countries that have been the same country in the past tend to be relatively peaceful to each other.

5.2 Frequency and intensity of conflict

Some dyads can have few actions of conflict with a very high hostility level; while others can maintain very frequent low-intensity actions for long periods. So far we considered the volume of conflict for each dyad-year observation, adding the scores of every action occurred in the period. This measure ignores the composition of conflict in terms of frequency of events and importance of the actions.

Table 2 shows that the main conclusions obtained for the volume of conflict hold for the frequency (count of events of pure conflict minus count of events of de-escalation) and the intensity (mean of GS scores for the observed events). The same set of instruments is used for these new IV estimations, and their performance stills acceptable.

[18] We test for weak instruments using Cragg-Donald Wald F statistics as well as Kleibergen-Paap rk Wald F statistic. In both cases the null hypothesis is that instruments are weak, and both tests allow for the presence of non-i.i.d. errors. We use Stock and Yogo (2005) critical values.

Table 2

Determinants of the frequency and intensity of conflict

IV estimations using different fixed effects

	Volume of events		Frequency of events		Intensity of events	
VARIABLES	**Pooled + TVXMFE**	**Panel**	**Pooled + TVXMFE**	**Panel**	**Pooled + TVXMFE**	**Panel**
Upstream complementarity *(second lag in logs)*	1.182 *[1.202]*	0.677** *[0.264]*	1.977** *[0.819]*	0.555*** *[0.173]*	-2.323*** *[0.645]*	0.043 *[0.143]*
Downstream complementarity *(second lag in logs)*	3.441*** *[0.600]*	0.857*** *[0.119]*	2.501*** *[0.411]*	0.432*** *[0.074]*	0.664** *[0.318]*	0.485*** *[0.067]*
Upstream substitutability *(second lag in logs)*	-2.284*** *[0.387]*	-0.780*** *[0.217]*	-1.569*** *[0.273]*	-0.485*** *[0.136]*	-0.703*** *[0.225]*	-0.472*** *[0.119]*
Downstream substitutability *(second lag in logs)*	-0.837** *[0.397]*	-0.434*** *[0.104]*	-0.748*** *[0.271]*	-0.264*** *[0.066]*	0.067 *[0.214]*	-0.350*** *[0.058]*
Upstream rivalry *(second lag in logs)*	-0.999*** *[0.211]*	-0.102 *[0.084]*	-0.782*** *[0.146]*	0.004 *[0.054]*	-0.138 *[0.113]*	-0.187*** *[0.048]*
Downstream rivalry *(second lag in logs)*	4.987*** *[0.167]*	-1.309*** *[0.129]*	3.592*** *[0.120]*	-0.538*** *[0.088]*	1.120*** *[0.084]*	-0.902*** *[0.067]*
Exports *(second lag in logs)*	-0.348*** *[0.129]*	-0.113*** *[0.027]*	-0.234*** *[0.088]*	-0.067*** *[0.017]*	-0.122* *[0.068]*	-0.053*** *[0.016]*
Imports *(second lag in logs)*	0.134 *[0.129]*	0.070** *[0.033]*	0.009 *[0.088]*	0.042** *[0.020]*	0.251*** *[0.069]*	0.032* *[0.019]*
Peace Years *(second lag)*	-0.005*** *[0.000]*	-0.005*** *[0.001]*	-0.004*** *[0.000]*	-0.005*** *[0.001]*	-0.001*** *[0.000]*	0.001*** *[0.000]*
Democracy in origin *(second lag in logs)*		-0.119*** *[0.026]*		-4.494*** *[0.858]*		-1.994*** *[0.700]*
Democracy in destination *(second lag in logs)*		-0.152*** *[0.027]*		-5.845*** *[0.912]*		-3.482*** *[0.694]*
GDP in origin *(second lag in logs)*		0.048** *[0.019]*		0.013 *[0.012]*		0.044*** *[0.011]*
GDP in destination *(second lag in logs)*		0.046*** *[0.016]*		0.016 *[0.010]*		0.055*** *[0.009]*
Domestic conflict in origin *(second lag in logs)*		0.296*** *[0.007]*		0.209*** *[0.005]*		0.081*** *[0.003]*
Domestic conflict in destination *(second lag in logs)*		0.287*** *[0.007]*		0.204*** *[0.005]*		0.077*** *[0.003]*
Distance *(in logs)*	-0.944*** *[0.082]*		-0.692*** *[0.055]*		-0.147*** *[0.045]*	
Border	1.064*** *[0.078]*		0.788*** *[0.057]*		0.192*** *[0.033]*	
Common religion	0.089*** *[0.022]*		0.054*** *[0.015]*		0.029** *[0.011]*	
Same country in the past	-0.143 *[0.114]*		-0.106 *[0.081]*		-0.108** *[0.055]*	
Hegemon-to-colony	1.123*** *[0.140]*		0.879*** *[0.103]*		0.116** *[0.054]*	
Colony-to-hegemon	1.103*** *[0.134]*		0.847*** *[0.098]*		0.152*** *[0.048]*	
Observations	372,910	372,910	372,910	372,910	372,910	372,910
Time FE	NO	YES	NO	YES	NO	YES
Origin & Destination FE	NO	NO	NO	NO	NO	NO
Origin & Destination TVFE	YES	NO	YES	NO	YES	NO
Country-Pair FE	NO	YES	NO	YES	NO	YES
Hansen J p-value	0.396	0.267	0.323	0.450	0.973	0.0851
Underidentification K-P p-value	0.0002	0	0.0002	0	0.0002	0
Weak Identif. K-P F Statistic	5.670	76.70	5.670	76.66	5.670	76.66
Weak Identif CD F Statistic	18.18	147.2	18.18	147.1	18.18	147.1

Pair-clustered standard errors in brackets. Results obtained using *ivreg2* (Baum, Schaffer, and Stillman, 2010) and *reghdfe* (Correia, 2015).
*** p<0.01, ** p<0.05, * p<0.1

Results for the frequency and intensity of actions are remarkably similar to those shown for the volume of conflict in Table 1, partially reproduced in the first two columns of Table 2. The main difference is the effect of upstream complementarity, where the positive impact on volumes can now be seen as two opposing effects: when a partner is more complementary as a provider the frequency of conflict events significantly increases while their intensity is significantly lower.

We performed a set of robustness checks extending the definition of conflict in our variable, taking the sums of GS scores for verbal actions (in addition to the material actions considered as far), and for non-official actors (in addition to the official actors considered as far). Table A5.2 in Appendix 5 shows that with slight variations in coefficients' values, and almost no variation in significance levels, it is possible to assert our results are robust to the kind of actions and actors considered.

Frequency and intensity of events are two different components of the volume of conflict. However, our results for complementarity, substitutability and rivalry effects could be biased due to the existence of a large proportion of country-pairs where the volume of conflict is null.

5.3 Extensive and intensive margins in conflict

A censoring problem is prevalent in our data, since 73% of the country-pairs in the sample have zero conflict. Estimation methods for limited or censored dependent variables in panel data have several limitations in the context of endogenous regressors, so in this section we briefly explore whether important differences exist in the role of our trade patterns variables when modeling the binary variable of existence of any degree of positive conflict (with a Linear Probability Model) and when modeling the level of conflict in uncensored observations. Additionally, to address the potential existence of unobserved effect causing correlation between the error terms in the selection equation and the equation in levels, we estimate a Heckman's selection model for the pooled samples.

Results show that no substantive difference exists in the role of our main variables when explaining the discrete existence of positive conflict or when explaining the level of conflict in the restricted sample. In both cases all the significant coefficients have the same sign than in previous results.

Table 3

Zero conflict and selection

IV estimations using different fixed effects

	Linear Probability Model		Restricted sample: positive conflict		Heckman's selection model	
VARIABLES	**Pooled + TVXMFE**	**Panel**	**Pooled + TVXMFE**	**Panel**	**Pooled + XMFE**	**Pooled + TVXMFE**
Upstream complementarity *(second lag in logs)*	-0.718*** *[0.268]*	0.003 *[0.063]*	0.948 *[1.327]*	-0.354 *[0.569]*	-0.841 *[0.584]*	2.283 *[1.735]*
Downstream complementarity *(second lag in logs)*	0.425*** *[0.133]*	0.217*** *[0.030]*	2.665*** *[0.538]*	-0.155 *[0.290]*	1.215*** *[0.287]*	2.425*** *[0.483]*
Upstream substitutability *(second lag in logs)*	-0.329*** *[0.091]*	-0.170*** *[0.053]*	-2.161*** *[0.749]*	-1.485*** *[0.522]*	-2.680*** *[0.539]*	-2.272*** *[0.723]*
Downstream substitutability *(second lag in logs)*	-0.016 *[0.089]*	-0.102*** *[0.025]*	-1.719** *[0.684]*	0.251 *[0.246]*	0.224 *[0.322]*	-1.533** *[0.701]*
Upstream rivalry *(second lag in logs)*	-0.100** *[0.047]*	-0.050** *[0.021]*	-0.928*** *[0.247]*	0.166 *[0.171]*	-0.245 *[0.154]*	-0.902*** *[0.233]*
Downstream rivalry *(second lag in logs)*	0.615*** *[0.035]*	-0.408*** *[0.030]*	2.108*** *[0.226]*	-0.056 *[0.237]*	1.748*** *[0.161]*	2.416*** *[0.204]*
Exports *(second lag in logs)*	-0.059** *[0.029]*	-0.023*** *[0.007]*	-0.260*** *[0.088]*	-0.012 *[0.061]*	-0.169*** *[0.049]*	-0.222** *[0.088]*
Imports *(second lag in logs)*	0.088*** *[0.029]*	0.015* *[0.008]*	0.108 *[0.112]*	0.116 *[0.075]*	0.219*** *[0.062]*	-0.001 *[0.145]*
Peace Years *(second lag)*	-0.000*** *[0.000]*	0.000*** *[0.000]*	-0.003*** *[0.000]*	-0.002** *[0.001]*	-0.003*** *[0.000]*	-0.003*** *[0.000]*
Democracy in origin *(second lag in logs)*	-0.104*** *[0.019]*			-0.213*** *[0.045]*	-0.173*** *[0.049]*	
Democracy in destination *(second lag in logs)*	0.114*** *[0.014]*			-0.423*** *[0.046]*	-0.294*** *[0.048]*	
GDP in origin *(second lag in logs)*	0.018*** *[0.005]*			-0.022 *[0.043]*	-0.047 *[0.043]*	
GDP in destination *(second lag in logs)*	-0.032 *[0.023]*			-0.039 *[0.033]*	-0.086*** *[0.033]*	
Domestic conflict in origin *(second lag in logs)*	0.092*** *[0.025]*			0.126*** *[0.012]*	0.162*** *[0.009]*	
Domestic conflict in destination *(second lag in logs)*	0.113*** *[0.022]*			0.135*** *[0.013]*	0.163*** *[0.012]*	
Distance *(in logs)*		-0.449 *[0.314]*	-0.752*** *[0.076]*		-0.480*** *[0.023]*	-0.596*** *[0.026]*
Border		-0.830*** *[0.311]*	0.513*** *[0.063]*		0.405*** *[0.048]*	0.500*** *[0.060]*
Common religion		0.018*** *[0.005]*	0.063** *[0.025]*		0.008 *[0.019]*	0.017 *[0.022]*
Same country in the past		0.018*** *[0.004]*	-0.022 *[0.094]*		-0.183** *[0.085]*	-0.069 *[0.085]*
Hegemon-to-colony		0.039*** *[0.002]*	0.674*** *[0.106]*		0.471*** *[0.085]*	0.632*** *[0.094]*
Colony-to-hegemon		0.038*** *[0.001]*	0.691*** *[0.095]*		0.497*** *[0.075]*	0.622*** *[0.085]*
Heckman's Lambda					-0.005 *[0.005]*	-0.036** *[0.017]*
Observations	372,910	372,910	102,942	100,041	102,860	102,847
Time FE	NO	YES	NO	YES	YES	NO
Origin & Destination FE	NO	NO	NO	NO	YES	NO
Origin & Destination TVFE	YES	NO	YES	NO	NO	YES
Country-Pair FE	NO	YES	NO	YES	NO	NO
Hansen J p-value	0.509	0.361	0.292	0.694	0.794	0.395
Underidentification K-P p-value	0.0002	0	2.18e-07	0	0	6.93e-05
Weak Identif. K-P F Statistic	5.670	76.66	9.885	17.03	26.66	6.134
Weak Identif CD F Statistic	18.18	147.1	27.39	52.83	73.34	16.10

Pair-clustered standard errors in brackets. Results obtained using *ivreg2* (Baum, Schaffer, and Stillman, 2010) and *reghdfe* (Correia, 2015). *** p<0.01, ** p<0.05, * p<0.1

6 Conclusions

This paper seeks to exploit two underemployed dimensions of trade flows in the assessment of the role of trade relations on interstate conflict. On one hand we have detailed information about the products being traded among countries, and on the other hand we know the whole structure of the international trade network. The main purpose of the preceding sections has been to combine these two dimensions to characterize some relevant dimensions of each trade flow.

The theoretical background for our approach is based on an extension of Li and Reuveny's (2011) expected utility model, a partial equilibrium analysis for the two-country case. The extension to the three-country case allows considering new channels through which a country i could gain or lose when increasing the level of conflict sent towards a country j. A direct consequence of extending LR's approach to three countries is that the model loses its intuitive and parsimonious results, giving rise to a complex system of equations where every supply and demand in each market could be affected by an increase of conflict from i to j. However, we are able to identify three specific mechanisms through which country i could have commercial gains or reduce his losses when increasing conflict against j. Firstly, if more peace (or more conflict) allows increasing trade, it is relevant to know the scope of potential trade between the two countries, which we measured with complementarity variables. Secondly, j could be substitutable as a trade partner, which in the extreme case of perfect substitutability will reduce bilateral losses to zero. Thirdly, conflict against j could be oriented to collecting benefits in third countries because of a withdrawal of j from that market.

Our main results show that countries evaluate their partners both as importers and exporters of different kinds of goods, having higher conflict with complementary partners, with countries with which trade is difficult to substitute, and with downstream rivals, while coincidence in provider markets tends to be pacifying.

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Appendix 1: Three-country version of the LR model

Country i's maximization problem is:

$$\begin{aligned} &\underset{C_{ij}, C_{ih}}{Max} && U(EC_i, C_{ij}, C_{ih}) \\ &s.t. && TS = \sum_{p=1}^{P} X_{pij} \cdot PX_{pij} - X_{pji} \cdot PX_{pji} + \sum_{p=1}^{P} X_{pih} \cdot PX_{pih} - X_{phi} \cdot PX_{phi} \end{aligned} \tag{A1}$$

The solution of this maximization problem can be found maximizing the Lagrangian $\mathcal{L}$ with respect to C_{ij}, C_{ih}, and the shadow price of the trade surplus constraint λ:

$$\begin{aligned} \mathcal{L} = \; & U\left(EC_i, C_{ij}, C_{ih}\right) \\ & + \lambda \left[-TS + \sum_{p=1}^{P} X_{pij} \cdot PX_{pij} - X_{pji} \cdot PX_{pji} \right. \\ & \left. + \sum_{p=1}^{P} X_{pih} \cdot PX_{pih} - X_{phi} \cdot PX_{phi} \right] \end{aligned} \tag{A2}$$

The three first order conditions are:

$$\frac{\partial \mathcal{L}}{\partial C_{ij}} = U_{C_{ij}} + \lambda \left[\sum_{p=1}^{P} X_{pij} \frac{\partial PX_{pij}}{\partial C_{ij}} - X_{pji} \frac{\partial PX_{pji}}{\partial C_{ij}} + X_{pih} \frac{\partial PX_{pih}}{\partial C_{ij}} - X_{phi} \frac{\partial PX_{phi}}{\partial C_{ij}} \right] = 0 \tag{A3}$$

$$\frac{\partial \mathcal{L}}{\partial C_{ih}} = U_{C_{ih}} + \lambda \left[\sum_{p=1}^{P} X_{pij} \frac{\partial PX_{pij}}{\partial C_{ih}} - X_{pji} \frac{\partial PX_{pji}}{\partial C_{ih}} + X_{pih} \frac{\partial PX_{pih}}{\partial C_{ih}} - X_{phi} \frac{\partial PX_{phi}}{\partial C_{ih}} \right] = 0 \tag{A4}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = \left[-TS + \sum_{p=1}^{P} X_{pij} PX_{pij} - X_{pji} PX_{pji} + \sum_{p=1}^{P} X_{pih} PX_{pih} - X_{phi} PX_{phi} \right] = 0 \tag{A5}$$

The usual economic interpretation of these first order conditions apply, and the detail for (A3) can be found in Li and Reuveny (2011) online appendix.

The computation of comparative statistics of the first order condition in C_{ij} will give, after some rearrangements and simplifications, the partial derivatives of C_{ij} with respect to exports and imports of a specific good $\tilde{p}$, the market in which we will analyze partial equilibrium results. To proceed we need to obtain the four partial derivatives of $(\partial \mathcal{L} / \partial C_{ij})$ with respect to $X_{\tilde{p}ij}$, $X_{\tilde{p}ji}$, $X_{\tilde{p}ih}$, and $X_{\tilde{p}hi}$:

Starting with the comparative statics with respect to $X_{\tilde{p}ij}$, we have:

$$\begin{aligned} U_{C_{ij}C_{ij}} \frac{\partial C_{ij}}{\partial X_{\tilde{p}ij}} + \lambda \Bigg[& \frac{\partial PX_{\tilde{p}ij}}{\partial C_{ij}} \\ & + \sum_{p=1}^{P} \left(X_{pij} \frac{\partial^2 PX_{pij}}{\partial C_{ij} \partial C_{ij}} \frac{\partial C_{ij}}{\partial X_{\tilde{p}ij}} + X_{pji} \frac{\partial^2 PX_{pji}}{\partial C_{ij} \partial C_{ij}} \frac{\partial C_{ij}}{\partial X_{\tilde{p}ij}} + X_{pih} \frac{\partial^2 PX_{pih}}{\partial C_{ij} \partial C_{ij}} \frac{\partial C_{ij}}{\partial X_{\tilde{p}ij}} \right. \\ & \left. + X_{phi} \frac{\partial^2 PX_{phi}}{\partial C_{ij} \partial C_{ij}} \frac{\partial C_{ij}}{\partial X_{\tilde{p}ij}} \right) \Bigg] = 0 \end{aligned} \tag{A6}$$

And rearranging:

$$\frac{\partial C_{ij}}{\partial X_{\tilde{p}ij}} = \frac{-\lambda \frac{\partial PX_{\tilde{p}ij}}{\partial C_{ij}}}{U_{C_{ij}C_{ij}} + \lambda \sum_{p=1}^{P} \left(X_{pij} \frac{\partial^2 PX_{pij}}{\partial C_{ij} \partial C_{ij}} + X_{pji} \frac{\partial^2 PX_{pji}}{\partial C_{ij} \partial C_{ij}} + X_{pih} \frac{\partial^2 PX_{pih}}{\partial C_{ij} \partial C_{ij}} + X_{phi} \frac{\partial^2 PX_{phi}}{\partial C_{ij} \partial C_{ij}} \right)} \tag{A7}$$

For country i the effect of exports to j on conflict to j depends on how conflict affects the price of exports from i to j, and also on how C_{ij} affects the other prices relevant for country i.

In an analogous manner we compute the other three comparative statics.

$$\frac{\partial C_{ij}}{\partial X_{\tilde{p}ji}} = \frac{-\lambda \frac{\partial PX_{\tilde{p}ji}}{\partial C_{ij}}}{U_{C_{ij}C_{ij}} + \lambda \sum_{p=1}^{P} \left(X_{pij} \frac{\partial^2 PX_{pij}}{\partial C_{ij} \partial C_{ij}} + X_{pji} \frac{\partial^2 PX_{pji}}{\partial C_{ij} \partial C_{ij}} + X_{pih} \frac{\partial^2 PX_{pih}}{\partial C_{ij} \partial C_{ij}} + X_{phi} \frac{\partial^2 PX_{phi}}{\partial C_{ij} \partial C_{ij}} \right)} \tag{A8}$$

$$\frac{\partial C_{ij}}{\partial X_{\tilde{p}ih}} = \frac{-\lambda \frac{\partial PX_{\tilde{p}ih}}{\partial C_{ij}}}{U_{C_{ij}C_{ij}} + \lambda \sum_{p=1}^{P} \left(X_{pij} \frac{\partial^2 PX_{pij}}{\partial C_{ij} \partial C_{ij}} + X_{pji} \frac{\partial^2 PX_{pji}}{\partial C_{ij} \partial C_{ij}} + X_{pih} \frac{\partial^2 PX_{pih}}{\partial C_{ij} \partial C_{ij}} + X_{phi} \frac{\partial^2 PX_{phi}}{\partial C_{ij} \partial C_{ij}} \right)} \tag{A9}$$

$$\frac{\partial C_{ij}}{\partial X_{\tilde{p}hi}} = \frac{-\lambda \frac{\partial PX_{\tilde{p}hi}}{\partial C_{ij}}}{U_{C_{ij}C_{ij}} + \lambda \sum_{p=1}^{P} \left(X_{pij} \frac{\partial^2 PX_{pij}}{\partial C_{ij} \partial C_{ij}} + X_{pji} \frac{\partial^2 PX_{pji}}{\partial C_{ij} \partial C_{ij}} + X_{pih} \frac{\partial^2 PX_{pih}}{\partial C_{ij} \partial C_{ij}} + X_{phi} \frac{\partial^2 PX_{phi}}{\partial C_{ij} \partial C_{ij}} \right)} \tag{A10}$$

Assuming that every bilateral market is independent from the others, most of the second derivatives included in the comparative statics equations would be null, except for the one that gathers de effect on the export price in the same direction than the conflict under study ($\frac{\partial^2 PX_{pij}}{\partial C_{ij} \partial C_{ij}}$ in equations A7 to A10). However, once bilateral demands and supplies are assumed to reflect what happens in other bilateral relations for the same product, the remaining second order derivatives are no longer null.

In the following system of linear demands and supplies for all the possible bilateral markets among three countries importing and exporting a product p, we assume that each country has a linear supply function for exports which is specific for each destination market and, analogously, each country has a linear demand function for imports specific for each origin country. As usual, demand and supply functions depend on the relevant prices and on incomes (Y_i, Y_j). Also, we assume that every function is shifted to the left by an increase in the conflict the own country has against the partner (meaning that the effect of received conflict from the partner is restricted to be zero). Finally, all demands and supplies are residual functions, meaning that the supply to a particular partner is what remains after sales to the third country.

$$\begin{aligned}
X_{pij}^S &= \gamma_0^i + \gamma_1^i PX_{pij} + \gamma_2^i Y_i - \gamma_3^i C_{ij} - \gamma_4^i X_{pih} \\
X_{pij}^D &= \delta_0^j - \delta_1^j PX_{pij} + \delta_2^j Y_j - \delta_3^j C_{ji} - \delta_4^j X_{phj} \\
X_{pih}^S &= \gamma_0^i + \gamma_1^i PX_{pih} + \gamma_2^i Y_i - \gamma_3^i C_{ih} - \gamma_4^i X_{pij} \\
X_{pih}^D &= \delta_0^h - \delta_1^h PX_{pih} + \delta_2^h Y_h - \delta_3^h C_{hi} - \delta_4^h X_{pjh} \\
X_{phj}^S &= \gamma_0^h + \gamma_1^h PX_{phj} + \gamma_2^h Y_h - \gamma_3^h C_{hj} - \gamma_4^h X_{phi} \\
X_{phj}^D &= \delta_0^j - \delta_1^j PX_{phj} + \delta_2^j Y_j - \delta_3^j C_{jh} - \delta_4^j X_{pij} \\
X_{pjh}^S &= \gamma_0^j + \gamma_1^j PX_{pjh} + \gamma_2^j Y_j - \gamma_3^j C_{jh} - \gamma_4^j X_{pji} \\
X_{pjh}^D &= \delta_0^h - \delta_1^h PX_{pjh} + \delta_2^h Y_h - \delta_3^h C_{hj} - \delta_4^h X_{pih} \\
X_{phi}^S &= \gamma_0^h + \gamma_1^h PX_{phi} + \gamma_2^h Y_h - \gamma_3^h C_{hi} - \gamma_4^h X_{phj} \\
X_{phi}^D &= \delta_0^i - \delta_1^i PX_{phi} + \delta_2^i Y_i - \delta_3^i C_{ih} - \delta_4^i X_{pji} \\
X_{pji}^S &= \gamma_0^j + \gamma_1^j PX_{pji} + \gamma_2^j Y_j - \gamma_3^j C_{ji} - \gamma_4^j X_{pjh} \\
X_{pji}^D &= \delta_0^i - \delta_1^i PX_{pji} + \delta_2^i Y_i - \delta_3^i C_{ij} - \delta_4^i X_{phi}
\end{aligned} \tag{A11}$$

From this system, a price equation for every flow can be obtained:

$$PX_{pij} = \frac{1}{\gamma_1^i + \delta_1^j}\left(\delta_0^j - \gamma_0^i + \delta_2^j Y_j - \gamma_2^i Y_i + \gamma_3^i C_{ij} - \delta_3^j C_{ji} - \delta_4^j X_{phj} + \gamma_4^i X_{pih}\right) \quad \text{(A12)}$$

$$PX_{pih} = \frac{1}{\gamma_1^i + \delta_1^h}\left(\delta_0^h - \gamma_0^i + \delta_2^h Y_h - \gamma_2^i Y_i + \gamma_3^i C_{ih} - \delta_3^h C_{hi} - \delta_4^h X_{pjh} + \gamma_4^i X_{pij}\right) \quad \text{(A13)}$$

$$PX_{phj} = \frac{1}{\gamma_1^h + \delta_1^j}\left(\delta_0^j - \gamma_0^h + \delta_2^j Y_j - \gamma_2^h Y_h + \gamma_3^h C_{hj} - \delta_3^j C_{jh} - \delta_4^j X_{pij} + \gamma_4^h X_{phi}\right) \quad \text{(A14)}$$

$$PX_{pjh} = \frac{1}{\gamma_1^j + \delta_1^h}\left(\delta_0^h - \gamma_0^j + \delta_2^h Y_h - \gamma_2^j Y_j + \gamma_3^j C_{jh} - \delta_3^h C_{hj} - \delta_4^h X_{pih} + \gamma_4^i X_{pji}\right) \quad \text{(A15)}$$

$$PX_{phi} = \frac{1}{\gamma_1^h + \delta_1^i}\left(\delta_0^i - \gamma_0^h + \delta_2^i Y_i - \gamma_2^h Y_h + \gamma_3^h C_{hi} - \delta_3^i C_{ih} - \delta_4^j X_{pji} + \gamma_4^h X_{phj}\right) \quad \text{(A16)}$$

$$PX_{pji} = \frac{1}{\gamma_1^j + \delta_1^i}\left(\delta_0^i - \gamma_0^j + \delta_2^i Y_i - \gamma_2^j Y_j + \gamma_3^j C_{ji} - \delta_3^i C_{ij} - \delta_4^i X_{phi} + \gamma_4^j X_{pjh}\right) \quad \text{(A17)}$$

This new system shows how an increase in conflict from i to j will produce changes in prices of other trade flows. Direct effects are reflected in equations (A12) and (A17) respectively shifting supply for exports to country j and demand for imports from country j to the left. The reduction in quantities X_{pij} will in turn make country i to offer more to country h (A13) and country j to demand more from country h (A14). Thus, PX_{pih} will fall while PX_{phj} will rise. On the other hand, the reduction in quantities X_{pji} will shift to the right the demand of country i for products form country h (A16) and the supply of exports from country j to country h (A15), producing an increase in PX_{phi} and a decline in PX_{pjh}.

Going back to the maximization problem in country i, only the four effects involving i are relevant, and these are the terms involved in the derivatives of equations (A7) to (A10). The algebraic expressions for these derivatives require finding the general equilibrium solution of the following system of equations:

$$\begin{aligned}
X_{pij} &= \frac{\gamma_0^i\delta_1^j + \gamma_1^i\delta_0^j}{\gamma_1^i + \delta_1^j} + \frac{\gamma_2^i\delta_1^j}{\gamma_1^i + \delta_1^j}Y_i + \frac{\gamma_1^i\delta_2^j}{\gamma_1^i + \delta_1^j}Y_j - \frac{\gamma_3^i\delta_1^j}{\gamma_1^i + \delta_1^j}C_{ij} - \frac{\gamma_1^i\delta_3^j}{\gamma_1^i + \delta_1^j}C_{ji} - \frac{\gamma_1^i\delta_4^j}{\gamma_1^i + \delta_1^j}X_{phj} - \frac{\gamma_4^i\delta_1^j}{\gamma_1^i + \delta_1^j}X_{pih} \\
X_{pih} &= \frac{\gamma_0^i\delta_1^h + \gamma_1^i\delta_0^h}{\gamma_1^i + \delta_1^h} + \frac{\gamma_2^i\delta_1^h}{\gamma_1^i + \delta_1^h}Y_i + \frac{\gamma_1^i\delta_2^h}{\gamma_1^i + \delta_1^h}Y_h - \frac{\gamma_3^i\delta_1^h}{\gamma_1^i + \delta_1^h}C_{ih} - \frac{\gamma_1^i\delta_3^h}{\gamma_1^i + \delta_1^h}C_{hi} - \frac{\gamma_1^i\delta_4^h}{\gamma_1^i + \delta_1^h}X_{pjh} - \frac{\gamma_4^i\delta_1^h}{\gamma_1^i + \delta_1^h}X_{pij} \\
X_{phj} &= \frac{\gamma_0^h\delta_1^j + \gamma_1^h\delta_0^j}{\gamma_1^h + \delta_1^j} + \frac{\gamma_2^h\delta_1^j}{\gamma_1^h + \delta_1^j}Y_h + \frac{\gamma_1^h\delta_2^j}{\gamma_1^h + \delta_1^j}Y_j - \frac{\gamma_3^h\delta_1^j}{\gamma_1^h + \delta_1^j}C_{hj} - \frac{\gamma_1^h\delta_3^j}{\gamma_1^h + \delta_1^j}C_{jh} - \frac{\gamma_1^h\delta_4^j}{\gamma_1^h + \delta_1^j}X_{pij} - \frac{\gamma_4^h\delta_1^j}{\gamma_1^h + \delta_1^j}X_{phi} \\
X_{pjh} &= \frac{\gamma_0^j\delta_1^h + \gamma_1^j\delta_0^h}{\gamma_1^j + \delta_1^h} + \frac{\gamma_2^j\delta_1^h}{\gamma_1^j + \delta_1^h}Y_j + \frac{\gamma_1^j\delta_2^h}{\gamma_1^j + \delta_1^h}Y_h - \frac{\gamma_3^j\delta_1^h}{\gamma_1^j + \delta_1^h}C_{jh} - \frac{\gamma_1^j\delta_3^h}{\gamma_1^j + \delta_1^h}C_{hj} - \frac{\gamma_1^j\delta_4^h}{\gamma_1^j + \delta_1^h}X_{pih} - \frac{\gamma_4^j\delta_1^h}{\gamma_1^j + \delta_1^h}X_{pji} \\
X_{phi} &= \frac{\gamma_0^h\delta_1^i + \gamma_1^h\delta_0^i}{\gamma_1^h + \delta_1^i} + \frac{\gamma_2^h\delta_1^i}{\gamma_1^h + \delta_1^i}Y_h + \frac{\gamma_1^h\delta_2^i}{\gamma_1^h + \delta_1^i}Y_i - \frac{\gamma_3^h\delta_1^i}{\gamma_1^h + \delta_1^i}C_{hi} - \frac{\gamma_1^h\delta_3^i}{\gamma_1^h + \delta_1^i}C_{ih} - \frac{\gamma_1^h\delta_4^i}{\gamma_1^h + \delta_1^i}X_{pji} - \frac{\gamma_4^h\delta_1^i}{\gamma_1^h + \delta_1^i}X_{phj} \\
X_{pji} &= \frac{\gamma_0^j\delta_1^i + \gamma_1^j\delta_0^i}{\gamma_1^j + \delta_1^i} + \frac{\gamma_2^j\delta_1^i}{\gamma_1^j + \delta_1^i}Y_j + \frac{\gamma_1^j\delta_2^i}{\gamma_1^j + \delta_1^i}Y_i - \frac{\gamma_3^j\delta_1^i}{\gamma_1^j + \delta_1^i}C_{ji} - \frac{\gamma_1^j\delta_3^i}{\gamma_1^j + \delta_1^i}C_{ij} - \frac{\gamma_1^j\delta_4^i}{\gamma_1^j + \delta_1^i}X_{phi} - \frac{\gamma_4^j\delta_1^i}{\gamma_1^j + \delta_1^i}X_{pjh}
\end{aligned} \quad \text{(A18)}$$

An analytical solution can be attained, where the six trade flows depend on the six bilateral conflicts and the three income variables. These equilibrium trade flows can then be used in the price equations (A12) to (A17) to obtain the derivatives. However the solutions are far too intricate to give an intuitive interpretation, and it suffices to mention that every derivative depends on all the parameters in the model.

Appendix 2: Trade complementarity measures

Anderson and Nordheim (1993) develop a measure of trade intensity, which can be decomposed in a complementarity index and an unexplained country bias term. Defining product p shares in the exports from the origin country ($x_i^p = X_i^p \,/\, X_j$), in the imports to the destination country ($m_j^p = M_j^p \,/\, M_j$), and in world total imports (net of country i imports: $t_W^p = (M_W^p - M_i^p) \,/\, (M_W - M_i)$), then the complementarity index is obtained as:

$$complAN93 = \sum_{p=1}^{P} \frac{x_i^p . m_j^p}{t_W^p} \tag{A3.1}$$

When $complAN93 > 1$ some complementarity exists between the products exported by i and those imported by j, and high values can be attained. Values near to zero indicate that the products i exports are very different from those j imports.

Michaely (1996) proposes a measure of complementarity that is being increasingly used (see e.g. UNCTAD, 2012). Using the same definitions of shares of product p in country i exports and country j imports, his index of compatibility is obtained as:

$$complM96 = 1 - \frac{1}{2}\sum_{p=1}^{P} \left| m_j^p - x_i^p \right| \tag{A3.2}$$

Table A3.1 shows that previous complementarity measures mostly show complementarity of the other country as a destination for exports, with significant but low correlation with the complementarity of the other country as a source for imports. Michaely's measure outperforms the others, while Anderson and Nordheim's seems to be the poorest in terms of predicting exports and imports. Even if our measures have an intermediate performance in predicting trade, they have the crucial advantage of decomposing the imports and exports sides of complementarity, and Table A3.1 results allow taking them as reasonable measures.

Table A3.1

Correlations among complementarity measures and with trade variables

	lcomplUS	lcomplDS	lcomplAN93	lcomplM96
lcomplUS	1			
lcomplDS	0.3954*	1		
lcomplAN93	0.0691*	0.3885*	1	
lcomplM96	0.1021*	0.3950*	0.5884*	1

Note: Correlations are calculated for the whole period 1995-2012, with products defined by HS 6 digit classification. Stars indicate significance at a 99% confidence level.

Appendix 3: CAMEO, Goldstein Scale and Conflict variable

Table A2.1 shows the CAMEO codes used in GDELT database, as well as the Goldstein Scale scores in each case and the frequency of observed events for the whole set of national, subnational and supranational actors. Some of the listed categories will be dropped when restricting our conflict variable to actions among official actors.

Table A2.1
Actions considered for the conflict variable and their Goldstein Scores

CAMEO Description	GS Score	Frequency (1979-2013)
Retreat or surrender militarily	**10**	7'802
Allow international involvement, not specified below	**9**	378
Receive deployment of peacekeepers	**9**	494
Receive inspectors	**9**	118
Allow humanitarian access	**9**	61
De-escalate military engagement	**9**	539
Declare truce, ceasefire	**9**	1'457
Ease military blockade	**9**	180
Demobilize armed forces	**9**	363
Return, release, not specified below	**7**	9'363
Return, release person(s)	**7**	15'410
Return, release property	**7**	749
Ease economic sanctions, boycott, embargo	**7**	1'442
Ease administrative sanctions, not specified below	**5**	2'892
Ease restrictions on political freedoms	**5**	37
Ease ban on political parties or politicians	**5**	8
Ease curfew	**5**	72
Ease state of emergency or martial law	**5**	2
Ease political dissent	**5**	323
Impose administrative sanctions, not specified below	**-5**	10'684
Impose restrictions on political freedoms	**-5**	1'304
Ban political parties or politicians	**-5**	309
Impose curfew	**-5**	312
Impose state of emergency or martial law	**-5**	255
Arrest, detain, or charge with legal action	**-5**	60'032
Expel or deport individuals	**-5**	3'855
Halt negotiations	**-7**	3'756
Expel or withdraw, not specified below	**-7**	398
Expel or withdraw peacekeepers	**-7**	9
Expel or withdraw inspectors, observers	**-7**	32
Coerce, not specified below	**-7**	1'601
Demonstrate military or police power, not specified below	**-7.2**	4'202
Increase police alert status	**-7.2**	524
Increase military alert status	**-7.2**	901
Mobilize or increase police power	**-7.2**	704
Mobilize or increase armed forces	**-7.2**	4'124
Impose embargo, boycott, or sanctions	**-8**	3'938
Use as human shield	**-8**	13
Attempt to assassinate	**-8**	316
Use tactics of violent repression	**-9**	1'600
Use unconventional violence, not specified below	**-9**	7'864
Abduct, hijack, or take hostage	**-9**	8'983
Sexually assault	**-9**	786
Torture	**-9**	1'477
Seize or damage property, not specified below	**-9.2**	590
Confiscate property	**-9.2**	1'355
Destroy property	**-9.2**	2'483

Table A2.1 (cont')

Correlations between complementarity measures and with trade variables

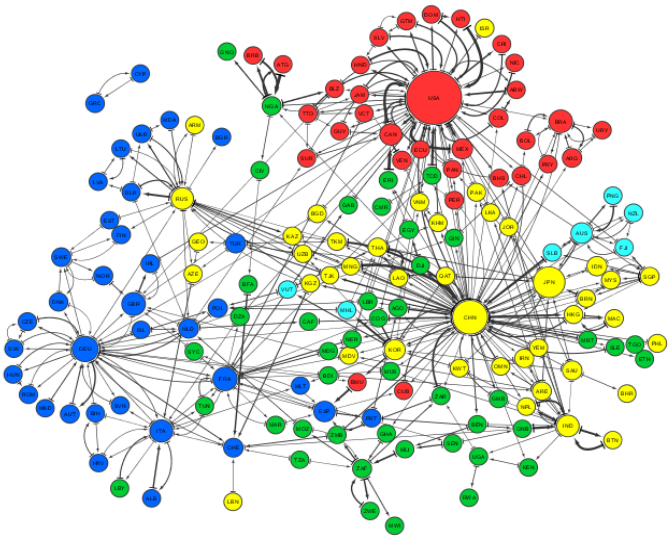
CAMEO Description	GS Score	Frequency (1979-2013)
Physically assault, not specified below	**-9.5**	4'942
Impose blockade, restrict movement	**-9.5**	1'409
Occupy territory	**-9.5**	7'242
Violate cease fire	**-9.5**	73
Engage in mass expulsion	**-9.5**	36
Kill by physical assault	**-10**	548
Conduct suicide, car, or other non-military bombing, NES	**-10**	1'689
Carry out suicide bombing	**-10**	302
Carry out vehicular bombing	**-10**	225
Carry out roadside bombing	**-10**	12
Assassinate	**-10**	3'618
Use conventional military force, not specified below	**-10**	77'945
Fight with small arms and light weapons	**-10**	18'493
Fight with artillery and tanks	**-10**	3'465
Employ aerial weapons, not specified below	**-10**	3'464
Engage in mass killings	**-10**	800
Engage in ethnic cleansing	**-10**	446

Using the sums of GS scores for the events found in each directed-dyad-year observation we can represent the obtained network structure, and also compare it with the trade relations network structure. In Figure A2.1 we assume a country *i* has a directed link to *j* if the bilateral trade flow share in the exports from *i* plus the share in the total imports of *j* is greater than 15% (this has the desired effect of giving higher weight to flows in which small countries are involved, since many countries would be isolated if absolute values were used instead).

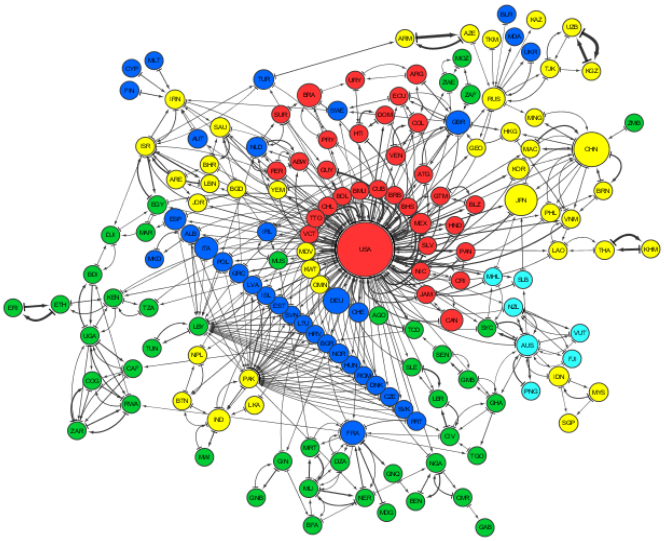
Figure A2.1

Network representations of conflict and trade relations (average 2010-2012)

Trade Network



Conflict Network



As expected, both networks have very different structures, being the conflict network much more centralized both in terms of sources and targets of conflict. Also, the United States and Europe play a crucial role in the network.

Appendix 4: Sample of countries

Afghanistan (AFG)
Angola (AGO)
Albania (ALB)
United Arab Emirates (ARE)
Argentina (ARG)
Armenia (ARM)
Australia (AUS)
Austria (AUT)
Azerbaijan (AZE)
Burundi (BDI)
Benin (BEN)
Burkina Faso (BFA)
Bangladesh (BGD)
Bulgaria (BGR)
Bahrain (BHR)
Bosnia and Herzegovina (BIH)
Belarus (BLR)
Bolivia (BOL)
Brazil (BRA)
Bhutan (BTN)
Central African Republic (CAF)
Canada (CAN)
Switzerland (CHE)
Chile (CHL)
China (CHN)
Ivory Coast (CIV)
Cameroon (CMR)
Congo (COG)
Colombia (COL)
Costa Rica (CRI)
Cuba (CUB)
Cyprus (CYP)
Czech Republic (CZE)
Germany (DEU)
Djibouti (DJI)
Denmark (DNK)
Dominican Republic (DOM)
Algeria (DZA)
Ecuador (ECU)
Egypt (EGY)
Eritrea (ERI)
Spain (ESP)
Estonia (EST)
Finland (FIN)
Fiji (FJI)
France (FRA)
Gabon (GAB)
United Kingdom (GBR)
Georgia (GEO)
Ghana (GHA)
Guinea (GIN)
Gambia (GMB)
Guinea-Bissau (GNB)
Equatorial Guinea (GNQ)
Greece (GRC)
Guatemala (GTM)
Guyana (GUY)
Honduras (HND)
Croatia (HRV)
Haiti (HTI)
Hungary (HUN)
Indonesia (IDN)
India (IND)
Ireland (IRL)
Iran (IRN)
Iraq (IRQ)
Israel (ISR)
Italy (ITA)
Jamaica (JAM)
Jordan (JOR)
Japan (JPN)
Kazakhstan (KAZ)
Kenya (KEN)
Kyrgyzstan (KGZ)
Cambodia (KHM)
South Korea (KOR)
Kuwait (KWT)
Laos (LAO)
Lebanon (LBN)
Liberia (LBR)
Libya (LBY)
Sri Lanka (LKA)
Lithuania (LTU)
Latvia (LVA)
Morocco (MAR)
Moldova (MDA)
Madagascar (MDG)
Mexico (MEX)
Macedonia (MKD)
Mali (MLI)
Myanmar (MMR)
Mongolia (MNG)
Mozambique (MOZ)
Mauritania (MRT)
Mauritius (MUS)
Malawi (MWI)
Malaysia (MYS)
Niger (NER)
Nigeria (NGA)
Nicaragua (NIC)
Netherlands (NLD)
Norway (NOR)
Nepal (NPL)
New Zealand (NZL)
Oman (OMN)
Pakistan (PAK)
Panama (PAN)
Peru (PER)
Philippines (PHL)
Papua New Guinea (PNG)
Poland (POL)
North Korea (PRK)
Portugal (PRT)
Paraguay (PRY)
Qatar (QAT)
Romania (ROM)
Russia (RUS)
Rwanda (RWA)
Saudi Arabia (SAU)
Senegal (SEN)
Singapore (SGP)
Solomon Islands (SLB)
Sierra Leone (SLE)
El Salvador (SLV)
Suriname (SUR)
Slovakia (SVK)
Slovenia (SVN)
Sweden (SWE)
Syria (SYR)
Chad (TCD)
Togo (TGO)
Thailand (THA)
Tajikistan (TJK)
Turkmenistan (TKM)
Trinidad and Tobago (TTO)
Tunisia (TUN)
Turkey (TUR)
Tanzania (TZA)
Uganda (UGA)
Ukraine (UKR)
Uruguay (URY)
United States of America (USA)
Uzbekistan (UZB)
Venezuela (VEN)
Yemen (YEM)
South Africa (ZAF)
Dem Rep Congo (ZAR)
Zambia (ZMB)
Zimbabwe (ZWE)

Appendix 5: Robustness checks

Table A5.1

Robustness Checks I: Lags in explanatory variables

IV estimations using different fixed effects

	No lags		First lags		Third lags	
VARIABLES	**Pooled + TVXMFE**	**Panel**	**Pooled + TVXMFE**	**Panel**	**Pooled + TVXMFE**	**Panel**
Upstream complementarity *(corresponding lag in logs)*	3.000** *[1.247]*	1.228*** *[0.247]*	1.784 *[1.195]*	0.640** *[0.253]*	1.119 *[1.125]*	0.470* *[0.269]*
Downstream complementarity *(corresponding lag in logs)*	3.388*** *[0.612]*	0.694*** *[0.112]*	3.364*** *[0.584]*	0.636*** *[0.115]*	2.891*** *[0.563]*	0.539*** *[0.123]*
Upstream substitutability *(corresponding lag in logs)*	-2.610*** *[0.381]*	-0.952*** *[0.192]*	-2.359*** *[0.380]*	-0.779*** *[0.196]*	-1.876*** *[0.368]*	-0.576** *[0.230]*
Downstream substitutability *(corresponding lag in logs)*	-1.368*** *[0.399]*	-0.506*** *[0.093]*	-1.021*** *[0.386]*	-0.418*** *[0.098]*	-0.437 *[0.360]*	-0.299*** *[0.108]*
Upstream rivalry *(corresponding lag in logs)*	-1.060*** *[0.199]*	-0.255*** *[0.077]*	-1.004*** *[0.199]*	-0.092 *[0.079]*	-0.862*** *[0.202]*	-0.146* *[0.088]*
Downstream rivalry *(corresponding lag in logs)*	4.812*** *[0.164]*	-1.318*** *[0.119]*	4.894*** *[0.162]*	-1.390*** *[0.125]*	5.117*** *[0.162]*	-0.874*** *[0.134]*
Exports *(corresponding lag in logs)*	-0.287** *[0.130]*	-0.044* *[0.023]*	-0.321*** *[0.124]*	-0.070*** *[0.024]*	-0.254** *[0.121]*	-0.090*** *[0.030]*
Imports *(corresponding lag in logs)*	-0.029 *[0.131]*	-0.019 *[0.028]*	0.073 *[0.126]*	0.053* *[0.030]*	0.103 *[0.121]*	0.098*** *[0.035]*
Peace Years *(corresponding lag)*	-0.005*** *[0.000]*	-0.008*** *[0.001]*	-0.005*** *[0.000]*	-0.006*** *[0.001]*	-0.005*** *[0.000]*	-0.004*** *[0.001]*
Democracy in origin *(corresponding lag in logs)*		-0.048* *[0.025]*		-0.077*** *[0.025]*		-0.127*** *[0.027]*
Democracy in destination *(corresponding lag in logs)*		-0.070** *[0.027]*		-0.099*** *[0.028]*		-0.172*** *[0.028]*
GDP in origin *(corresponding lag in logs)*		0.006 *[0.017]*		-0.001 *[0.017]*		0.045** *[0.020]*
GDP in destination *(corresponding lag in logs)*		0.019 *[0.014]*		0.014 *[0.015]*		0.045*** *[0.017]*
Domestic conflict in origin *(corresponding lag in logs)*		0.427*** *[0.007]*		0.337*** *[0.007]*		0.272*** *[0.008]*
Domestic conflict in destination *(corresponding lag in logs)*		0.446*** *[0.007]*		0.341*** *[0.007]*		0.248*** *[0.008]*
Distance *(in logs)*	-1.057*** *[0.083]*		-0.977*** *[0.082]*		-0.865*** *[0.073]*	
Border	1.103*** *[0.082]*		1.073*** *[0.079]*		1.029*** *[0.073]*	
Common religion	0.112*** *[0.021]*		0.096*** *[0.021]*		0.074*** *[0.020]*	
Same country in the past	-0.042 *[0.116]*		-0.112 *[0.114]*		-0.191* *[0.108]*	
Hegemon-to-colony	1.232*** *[0.142]*		1.168*** *[0.140]*		1.078*** *[0.133]*	
Colony-to-hegemon	1.169*** *[0.138]*		1.130*** *[0.134]*		1.053*** *[0.128]*	
Observations	416,500	416,500	394,666	394,666	351,096	351,096
Time FE	NO	YES	NO	YES	NO	YES
Origin & Destination FE	NO	NO	NO	NO	NO	NO
Origin & Destination TVFE	YES	NO	YES	NO	YES	NO
Country-Pair FE	NO	YES	NO	YES	NO	YES
Hansen J p-value	0.715	0.574	0.755	0.0818	0.463	0.0919
Underidentification K-P p-value	0.0003	0	0.0002	0	0.0002	0
Weak Identif. K-P F Statistic	5.280	92.49	5.788	86.73	5.486	68.45
Weak Identif CD F Statistic	17.42	181.0	18.86	167.0	17.09	127.7

Pair-clustered standard errors in brackets. Results obtained using *ivreg2* (Baum, Schaffer, and Stillman, 2010) and *reghdfe* (Correia, 2015).
*** p<0.01, ** p<0.05, * p<0.1

Table A5.2

Robustness Checks II: Operationalization of interstate conflict

IV estimations using different fixed effects

	Material actions All actors		**All actions Official actors**		**All actions All actors**	
VARIABLES	**Pooled + TVXMFE**	**Panel**	**Pooled + TVXMFE**	**Panel**	**Pooled + TVXMFE**	**Panel**
Upstream complementarity *(second lag in logs)*	0.955 *[1.206]*	0.722*** *[0.271]*	0.308 *[1.222]*	0.622** *[0.266]*	0.201 *[1.221]*	0.715*** *[0.272]*
Downstream complementarity *(second lag in logs)*	3.351*** *[0.601]*	0.804*** *[0.122]*	3.367*** *[0.609]*	0.791*** *[0.120]*	3.263*** *[0.609]*	0.763*** *[0.122]*
Upstream substitutability *(second lag in logs)*	-2.265*** *[0.388]*	-0.669*** *[0.221]*	-1.854*** *[0.391]*	-0.936*** *[0.221]*	-1.822*** *[0.392]*	-0.799*** *[0.226]*
Downstream substitutability *(second lag in logs)*	-0.677* *[0.397]*	-0.430*** *[0.106]*	-0.567 *[0.403]*	-0.462*** *[0.104]*	-0.424 *[0.403]*	-0.470*** *[0.106]*
Upstream rivalry *(second lag in logs)*	-0.954*** *[0.212]*	-0.081 *[0.087]*	-0.941*** *[0.215]*	-0.148* *[0.084]*	-0.897*** *[0.215]*	-0.142* *[0.086]*
Downstream rivalry *(second lag in logs)*	4.999*** *[0.168]*	-1.274*** *[0.131]*	5.171*** *[0.168]*	-1.490*** *[0.130]*	5.152*** *[0.168]*	-1.489*** *[0.131]*
Exports *(second lag in logs)*	-0.336*** *[0.129]*	-0.113*** *[0.028]*	-0.348*** *[0.131]*	-0.098*** *[0.028]*	-0.330** *[0.131]*	-0.100*** *[0.028]*
Imports *(second lag in logs)*	0.158 *[0.129]*	0.093*** *[0.034]*	0.201 *[0.131]*	0.068** *[0.033]*	0.215 *[0.131]*	0.086** *[0.034]*
Peace Years *(second lag)*	-0.005*** *[0.000]*	-0.005*** *[0.001]*	-0.005*** *[0.000]*	-0.004*** *[0.001]*	-0.005*** *[0.000]*	-0.004*** *[0.001]*
Democracy in origin *(second lag in logs)*		-6.133*** *[1.356]*		-4.292*** *[1.368]*		-5.283*** *[1.395]*
Democracy in destination *(second lag in logs)*		-8.043*** *[1.395]*		-6.962*** *[1.373]*		-7.970*** *[1.400]*
GDP in origin *(second lag in logs)*		0.046** *[0.020]*		0.036* *[0.019]*		0.037* *[0.020]*
GDP in destination *(second lag in logs)*		0.055*** *[0.016]*		0.041** *[0.016]*		0.057*** *[0.016]*
Domestic conflict in origin *(second lag in logs)*		0.302*** *[0.007]*		0.293*** *[0.007]*		0.298*** *[0.007]*
Domestic conflict in destination *(second lag in logs)*		0.294*** *[0.007]*		0.277*** *[0.007]*		0.284*** *[0.007]*
Distance *(in logs)*	-0.918*** *[0.082]*		-0.895*** *[0.084]*		-0.875*** *[0.084]*	
Border	1.021*** *[0.077]*		0.969*** *[0.076]*		0.929*** *[0.076]*	
Common religion	0.089*** *[0.022]*		0.091*** *[0.022]*		0.092*** *[0.022]*	
Same country in the past	-0.168 *[0.114]*		-0.189* *[0.114]*		-0.202* *[0.114]*	
Hegemon-to-colony	1.100*** *[0.139]*		1.063*** *[0.135]*		1.043*** *[0.135]*	
Colony-to-hegemon	1.077*** *[0.134]*		1.100*** *[0.129]*		1.071*** *[0.128]*	
Observations	372,910	372,910	372,910	372,910	372,910	372,910
Time FE	NO	YES	NO	YES	NO	YES
Origin & Destination FE	NO	NO	NO	NO	NO	NO
Origin & Destination TVFE	YES	NO	YES	NO	YES	NO
Country-Pair FE	NO	YES	NO	YES	NO	YES
Hansen J p-value	0.343	0.291	0.249	0.283	0.245	0.315
Underidentification K-P p-value	0.000184	0	0.000184	0	0.000184	0
Weak Identif. K-P F Statistic	5.670	76.66	5.670	76.66	5.670	76.66
Weak Identif CD F Statistic	18.18	147.1	18.18	147.1	18.18	147.1

Pair-clustered standard errors in brackets. Results obtained using *ivreg2* (Baum, Schaffer, and Stillman, 2010) and *reghdfe* (Correia, 2015).
*** p<0.01, ** p<0.05, * p<0.1