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On *Economic Interdependence and War* †

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In this article, we review the book Economic Interdependence and War *by Dale C. Copeland, and take this opportunity to describe and discuss the current debate on the topic from an interdisciplinary perspective. We also provide novel insights on the measurability of dependence expectations' effects on conflict, using the interaction with geography and endowment asymmetries. (JEL* D74, D84, F14, F51, Q34*)*

1. *Introduction*

The main question addressed in Copeland (2015) is whether economic interdependence between great powers has a significant effect on the probability of conflict between them. In this article, we will review the insights of this book on the entire literature and provide a critical analysis, pointing out in which direction the qualitative analysis could be integrated or replaced by appropriate quantitative studies.

In the international-relations literature there are two main opposite views: the *liberal* view, where economic ties play the role of opportunity costs of conflict, and the *realist* view, according to which trade dependence implies uncertain future security, hence increasing incentives to avoid such dependence with force. The book proposes an alternative trade-expectations theory: a positive outlook on future trade and investments reduces the incentives to go to war, while negative expectations imply, given standard commitment problems, a potential preventive or preemptive war incentive. When two countries are highly interdependent today but one of them feels vulnerable in the future due to whatever source of negative future shocks, the war incentives may exist, while the liberal theory would typically focus exclusively on the opportunity-cost value of the current level of interdependence.

Given the difficulty to evaluate quantitatively the role of expectations, Copeland (2015) focuses on forty conflict events among major powers from 1790 to 1991 and tries to evaluate qualitatively the role of expectations. A red thread that connects the qualitative findings in almost all these cases is the connection between fear and decline in commercial power. Hence, the realist focus on military power may be misleading: security studies should focus also on commercial power dynamics.

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In Copeland (2015), states are seen as security maximizers, like in the realist perspective, but security comes primarily from commercial power, which is the liberal component of the theory. We consider this insight a very important one. However, we will argue that the qualitative studies yield results that are biased against liberal theory. A quantitative study of bilateral dependence interacted with geographic and resource asymmetry can yield a complementary indirect measure of the role of expectations without such a bias. The analysis that we propose maintains the key role of commercial power and security maximization, while eliminating the selection bias of the qualitative studies.

In section 2, we will describe the conceptual and qualitative contributions of the book, highlighting strengths and weaknesses. In section 3, we will propose a methodology through which the various perspectives discussed in the book can be nested together and tested, and future research can be redirected. Section 4 concludes.

2. Economic Interdependence and War: *A Synthesis*

The plan of this section is straightforward: we first describe, in our own terms, the interesting view of the previous literature endorsed in Copeland's book; then we move to describe the book's main conceptual points and methodological decisions, opening some questions that will be then addressed in section 3.

2.1 *Conceptual Frameworks*

The useful description of the main schools of thought on interdependence and war offered in Copeland (2015) can be summarized with the following table:

	Welfare	Security
Commercial Power	*Liberal Theory*	*Trade Expectations*
Military Power	*Neo Marxist*	*Realist Theory*

- **Liberal Theory:** A dependent state, in the liberal welfare maximization logic, has no interest in starting a war with its trade partner, given the goal of welfare maximization. Even the less dependent state has no interest in war because commercial power is viewed as the main instrument for welfare maximization. Hence, security in the liberal thinking is a byproduct of the fact that both traders refrained from war for welfare reasons. Hence the location top left in the matrix.
- **Realist Theory:** For a realist scholar, on the other hand, leaders focus on maximizing the security of their own state, and with this primary concern in mind, interdependence is basically a risk factor for war, as it makes the state vulnerable. The main instrument for reducing vulnerability is military power, hence the objective/instrument combination in the bottom-right cell.
- **Neo-Marxist:** Neo-Marxist theorists draw from both liberal and realist scholars. They assume that capitalist trading states are more likely to start a war in a peripheral state to find raw materials at a cheap price, an export market for their own goods, and a place to invest their surplus capital. If neo-Marxists agree with liberal scholars when they say that capitalistic sectors are driven by material gains, they also implicitly agree with realism affirming that the need for secure trade and investment ties makes groups worry about their future control over their economic partners for security reasons, hence the location in the bottom-left cell.
- **Trade Expectation Theory:** States are primarily concerned about security, like in realism theory, but the main driver of security is the expectation of safe commercial power. Like realist scholars such as Robert Gilpin (1977, 1981, and 1987) and Klaus Knorr (1975),

> Copeland makes the case that trade has always been consistent with the security concern. Growing economic systems do not only need to trade with peripheral states in order to get access to raw materials, but also need a big market where their mass-produced goods can be sold to make profit. Great powers surely have labor and capital to foster their economic development, but they usually have either land or market-expansion needs. Excluding a radical change of technology, adding more capital and labor without the adequate materials will add to production rates, but at increasingly slower rates of growth. Therefore, and considering the uneven geographical distribution of raw materials, it is apparently the fact that (either by necessity or willingness) great powers do trade a lot, and not just with each other.

2.2 *Trade-Expectations Theory*

Copeland (2015) aims to bridge the gap between the liberal and the realist approaches with a more dynamic and comprehensive stance. Both states *i* and *j* in each dyad are assumed to benefit from trade, but let's assume without loss of generality that *j* gains marginally more from the exchange. Should this exchange finish, then both *i* and *j* will suffer the consequences, but *j* will receive greater damage. We could then call *j* a *more dependent* state. In choosing between an aggressive or a peaceful stance, *j* must take into account the overall expected benefit it will receive from trade versus the value of possible conflict.

Trade expectations can of course be endogenous: *i* may send signals that help *j* understand the will to pursue a peaceful free trade forever, and *j* has all the interest in keeping a nonaggressive stance toward *i* to continue along the path of peaceful trade and confirming *i*'s willingness to trade. All these considerations add up to a dilemma that states must resolve. In other words, part of forming expectations involves expectations about the ability and willingness of the other actors to keep the cooperative promises versus temptations to defect, and hence commitment problems arise.

Copeland introduces six primary factors that can change *i*'s calculations of the trade-off between being a reliable trade partner versus reducing or ending trade with *j*:

1. *j*'s relations with other great powers
2. Domestic instability in other small states that both *i* and *j* need, causing intervention
3. Another great power acting against a third party, forcing *i* to intervene
4. *i*'s fear of *j*'s economic growth, either because of the gains made through trade or economic dynamism
5. *i*'s depletion of raw materials and need to look for them elsewhere
6. Economic decisions of *i*'s executive branch are not welcomed by the legislature

This is a (nonexhaustive) list of external shocks or commitment problems, internal to *i* or related to expected strengthening of *j*, all things that *j* needs to take into account when forming expectations about the future relationship with *i* in case of no aggression today. Given the high degree of endogeneity of such considerations and the multidimensionality of these concerns, there is obviously no measure of such expectations that could be used to directly test the theory. The methodology proposed in Copeland (2015) is then to consider all the major conflicts involving great powers, offering a qualitative analysis of the state of expectations prior to each of

those events. What we will argue instead in section 3 is that good progress can be made on the quantitative evaluation of at least half of these factors, namely 1, 4, and 5.

2.3 *Qualitative Analysis*

The goal of the qualitative analysis is to analyze each major great-power conflict event using the different competing theories, to then see how often a theory works better than its rivals.

Each case is constituted by a period marked by a particularly salient event, a clear set of great powers, and a geographical focus.[1]

Copeland finds that a quarter of cases have almost nothing to do with economic interdependence; half of the cases have a moderate to strong incidence of economic interdependence; and one-quarter display a clearly relevant role of economic interdependence. Considering the thirty cases in which economic interdependence was important, the trade-expectations theory is found to be consistent with the observations in almost all, whereas the realist theory is consistent with roughly one-third of the cases, and the liberal theory is, according to Copeland, consistent with the observations in only one-tenth of cases.

The problem, in our opinion, is that qualitative studies suffer from selection biases and low generalizability. In fact, even if the book considers all the major conflict events between great powers, obviously it cannot consider all the similar situations where conflict did not occur. This selection bias is particularly relevant vis-à-vis liberal theory: given that such a theory views trade as mainly an opportunity cost of war, the cases where one finds a war event in conjunction with economic interdependence must indicate that other factors were crucial, but in the universe of nonconflict events, one could imagine that economic interdependence was crucial for reducing the incentives to go to war. Thus, only looking at conflict events cannot possibly be an adequate study of the relevance of liberal theory.

2.4 *Quantitative Evidence in the Literature*

Liberals and realists disagree not only about theory but also about empirical analysis. Liberals such as Oneal and Russett (1997, 1999) (see also Russett and Oneal 2001) showed that increased interdependence is associated with a reduction of likelihood of militarized conflict between states, while realists like Barbieri (1996, 2002) demonstrated that with a different conceptualization of the independent variable (i.e., considering also the vulnerability component of interdependence), interdependence had no effect on conflict. The primary reason for these different results is the choice of variables: Oneal and Russett use the ratio of trade to GDP as an indicator of interdependence, whereas Barbieri focuses on three indices: salience, symmetry, and interdependence. State i's trade share with j is calculated as $TradeShare_i = \frac{DyadicTrade_{ij}}{TotalTrade_i}$, and with this intermediate measure the three Barbieri's variables are constructed as follows: dyadic salience ($Salience_{ij} = \sqrt{TradeShare_i \times TradeShare_j}$) measures the extent to which trade partners are dependent on a given trading relationship; symmetry ($Symmetry_{ij} = 1 - |TradeShare_i - TradeShare_j|$) indicates the equality of dependence; $Interdependence_{ij} = Salience_{ij} \times Symmetry_{ij}$. They find that symmetry acts as a war risk-reducing factor, while salience and interdependence, in various econometric specifications, are conflict risk-increase factors.[2]

[1] If a dramatic event involves new great powers or has a clear different geographic focus, it is treated as a distinct case period by the author.

[2] We will elaborate more in section 3 on how to push further on a rich quantitative analysis of the role of different types of asymmetries.

Gelpi and Grieco (2003b) show that interdependence effects switch sign or become insignificant when interacted with democracy.[3] Hegre (2000) and Mousseau (2003, 2009) found that trade dependence helps to reduce the probability of armed conflict when both powers are highly developed, and contract-enforcement institutions further increase the opportunity-cost effect.

The positive conflict risk-reduction effects of symmetry, democracy, development, and contract enforcement highlighted in the above-mentioned papers can indeed constitute indirect evidence that trade expectations matter. For example, contract-enforcement capabilities give rise to expectations about the future commercial environment in which they will operate. They will have fewer reasons to start a (preventive) war and be less interested in exercising pressure on their trading partners. Another work that proposed quantitative analysis broadly in line with Copeland's argument is McDonald (2009): low trade barriers and the fact that the state-owned firms are a small part of the entire economy constitute a source of positive expectations and peace (capitalist peace). In this scenario, a state cannot afford to start a military conflict, both because it will lack the economic resources and because private business interests will oppose such a decision. On the contrary, the likelihood of an armed conflict is higher with a protectionist system and a large scale of the economy in the hands of the state.

In a nutshell, the existent empirical quantitative studies that relate (though indirectly) to trade-expectations theory are the works that confirm that economic interdependence plays a positive role when the institutions and markets generate commitment to cooperation and trust that the other is interested in the same game. In the next section, we aim to integrate this indirect evidence found already in the quantitative political-science literature with some recent insights from international economics and economics of conflict, showing that a fruitful empirical methodology and interesting results can be obtained by taking into account the composition of trade and its interaction with geography and natural resources.

[3] A trade-expectations theory proponent would read the results of Gelpi and Grieco as follows: two democratic states with high trade are likely to have positive expectations about long-term commerce.

3. *Bilateral versus Multilateral Trade and the Role of Geography*

An important distinction (not emphasized enough in Copeland's book) is the distinction between bilateral trade and global trade. An increase in bilateral trade between two countries, everything else constant, has potentially both the liberal and realist vulnerability effects discussed in the book, whereas an increase in trades outside the pair (multilateral openness) actually reduces the salience of the bilateral trades, hence inducing potential effects of opposite sign—a consideration connected with factor (1) in the list given in section 2.2. In the next subsection, we describe the importance of this distinction using a recent and influential article by Martin et al. (2008), and we will argue, introducing a new ratio variable, that what really matters is the ratio of bilateral over multilateral openness.

Next, in subsection 3.2, we will show that the explicit consideration of geographic and resource asymmetries can further qualify the correlation between economic dependence and conflict—a direct consideration of factor (5) in the list of factors mentioned in section 2.2. In subsection 3.3, we propose an additional value-added analysis that could also help to disentangle the various effects discussed for aggregate variables in the literature—in connection with factor (4) in the list of factors mentioned in section 2.2.

3.1 *Bilateral Dependence*

Martin, Mayer, and Thoenig (2008) analyze, theoretically and empirically, the distinction between bilateral and multilateral openness. They obtain the prediction that the probability of escalation should be lower for countries that trade more bilaterally because of the opportunity cost associated with the loss of trade gains. Countries more open to global trade have a higher probability of war because multilateral trade openness decreases bilateral dependence to any given country and the cost of a bilateral conflict.[4]

They define bilateral openness between country i and country j as $\left(\frac{m_i^j}{y_i}+\frac{m_j^i}{y_j}\right)$, where m_i^j denotes the imports of i from j and y_k is the total GDP of country k; they define instead multilateral openness as $\left(\sum_{k\neq j,i}\frac{m_i^k}{y_i}+\frac{m_j^k}{y_j}\right)$. They focus on the opposite sign of the impact that these two variables have on the probability of war onset (negative for the first and positive for the second).

In our view, these two variables can be usefully combined in a unique variable: define *bilateral dependence* as

$$BD_{ij} \equiv \frac{m_i^j + m_j^i}{\sum_k m_i^k + \sum_k m_j^k}.$$

In this way, bilateral dependence is a number in $[0,1]$, and bilateral independence is 1 minus that. The two effects studied (theoretically and empirically) by Martin, Mayer, and Thoenig (2008) affect bilateral dependence in the same way, since the effects being of opposite sign push in the same direction if one is on the numerator and the other on the denominator. Greater bilateral dependence reduces war, or, greater bilateral independence increases war (especially for contiguous countries).

Martin, Mayer, and Thoenig (2008) specification can be simplified with the following logit model:

$$\begin{aligned}\Pr(Conflict_{ij,t}) = {} & \gamma_0 + \gamma_1 BO_{ij,t-4} \\ & + \gamma_2\, MO_{ij,t-4} \\ & + \gamma_3\, Distance \\ & + \gamma_4\, (BO \times Distance)_{ij,t-4} \\ & + \gamma_5\, (MO \times Distance)_{ij,t-4} \\ & + Z_{ij}\end{aligned}$$

where BO represents the bilateral openness and MO indicates multilateral openness, both lagged four periods; and Z is a set of country-pair controls, some of them simultaneous at time t and some other lagged at $t-4$ as well.[5] First, the probability of escalation turns out to be lower for countries that have higher levels of bilateral trade because of the opportunity cost associated with the loss of trade gains ($\gamma_1 < 0$). Secondly, countries more open to multilateral trade have a higher probability of war because this global trade reduces the cost of a bilateral conflict ($\gamma_2 > 0$). Finally, both effects turn out to be mediated by distance ($\gamma_4 > 0$ and $\gamma_5 < 0$).

Borrowing data of national and bilateral trade from Barbieri et al. (2009, 2012), we

[4] These two testable implications rely on the assumption (about which they provide empirical support) that the opportunity cost of war is much higher for countries where at least one of them is heavily dependent on the other in terms of imports or exports, with respect to the case in which most trade activities are outside the pair. The work by Martin, Mayer, and Thoenig (2008) is also interesting in terms of the role of expectations, although in an opposite way with respect to Copeland: they study the effect of expectations of conflict on the trade relationship between two countries.

[5] For a detailed description of the control variables, please refer to the Martin, Mayer, and Thoenig (2008) paper.

TABLE 1
Replication of Martin, Mayer, and Thoenig (2008) using *Bilateral Dependence*

	(1)	(2)	(3)	(4)
Bilateral dependence	−0.265***	−0.423***	−2.544***	−0.918**
	(0.103)	(0.123)	(0.362)	(0.386)
Distance	−0.0820	0.143	−0.527***	−0.828***
	(0.131)	(0.255)	(0.103)	(0.0911)
Bilateral dependence × distance			0.354***	0.128**
			(0.0459)	(0.0529)
Observations	6,596	3,649	219,697	219,697
Pseudo R^2	0.171	0.184	0.317	0.556
Sample	Contiguous pairs	Contiguous pairs and < 1,000 km	Full	Full
Time dummies	No	No	No	Yes
Dyadic war lags	No	No	No	Yes
Additional controls	No	No	No	Yes

Notes: Dependent variable: militarized interstate dispute (MID), defined the occurrence in a specific country pair of "display of force," "use of force," or "war" (see Correlate Of War project for further details). Method: logit with robust standard errors clustered a the country-pair level. See note 6 for additional controls. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

are able to compute our measure of bilateral dependence and replicate the Martin, Mayer, and Thoenig (2008) analysis. The resulting specification is the following logit:

$$\Pr(Conflict_{ij,t}) = \eta_0 + \eta_1\, BD_{ij,t-4} + \eta_2\, Distance + \eta_3\, (BD \times Distance)_{ij,t-4} + Z_{ij}.$$

Table 1 replicates the first four columns of the benchmark results of the Martin, Mayer, and Thoenig (2008) paper, strictly following their empirical setting, but altering the trade variables. In the first three columns, we present very simple estimates of the direction of the bilateral dependence variable on the probability of militarized interstate dispute (MID). In column 1, we restrict our sample to contiguous pairs of countries. In column 2, the sample is further restricted to contiguous pairs with a bilateral weighted distance below 1,000 km. In column 3, we use the full sample of country pairs, adding as in the original paper an interaction term between distance and our measure of bilateral dependence. In column 4, which is identified as the preferred pooled regression by the authors, a comprehensive list of controls that could potentially affect both trade and conflicts is included.[6] Time dummies, together with a

[6] Additional controls (see the Martin, Mayer, and Thoenig 2008 paper for a detailed description): a dummy for dyads showing zero trade by the IMF (see it as a control for the trade costs interpreted as fixed costs); index of similarity in language; existence of a potential trade area; number of GATT/WTO members in the dyad; colonial relationship; common colonizer; sum of the areas of the two countries (in log); political regime; UN vote correlation

set of twenty different dummies equal to one when the dyad was in war in previous periods (in order to control for the overall potential coevolution of conflicts and international trade over time) are included. In all these specifications, the coefficient of bilateral dependence is negative and strongly significant. For the first three columns its significance is at the 1 percent level, and 5 percent for the last column. These results provide evidence in support of the significant role of our variable, in line with the liberal view. The role of our variable of interest is mediated by distance as in the original paper ($\eta_3 > 0$), showing a positive and significant effect at the 1 percent and 5 percent levels respectively for the interaction term between bilateral dependence and distance in columns three and four.

In summary, these results on the peace-inducing effects of bilateral dependence give more support to liberal theory than what is suggested by Copeland's qualitative analysis, but warning that it is important to define it correctly, taking into account the opposite effects of global trade. In what follows, we merge this insight with other data that can be used to proxy the likelihood of negative versus positive expectations.

3.2 *The Role of Geographic and Resource Asymmetry*

Recent literature shows how resource endowments and their geographic location play a key role in interstate conflicts. In particular, Caselli, Morelli, and Rohner (2015), studying all contiguous country pairs in the years 1946–2001, outline how conflicts are more likely when at least one country in the dyad has natural resources, when the latter are closer to the border, and in cases of resource endowment for both countries in the dyad, when they are located asymmetrically with respect to the border.

The analysis proposed by Caselli, Morelli, and Rohner (2015) can be described with a linear probability model that takes the form:

$$\begin{aligned}\Pr(Conflict_{ij,t+1}) = {} & \delta_0 + \delta_1\, One_{ij,t} \\ & + \delta_2 (One \times Dist)_{ij,t} \\ & + \delta_3\, Both_{ij,t} \\ & + \delta_4 (Both \times MinDist)_{ij,t} \\ & + \delta_5 (Both \times MaxDist)_{ij,t} \\ & + Z_{ij} + u_{ij,t},\end{aligned}$$

where *One* is a dummy variable taking value 1 if one country in the dyad has oil, *Both* takes value 1 if both countries in the dyad have oil, *Dist* is the distance of the oil from the border, *MinDist* is the minimum of the distances of the oil from the border in the two countries, and, intuitively, *MaxDist* is the oil distance from the border in the country of the dyad whose oil is further from the border.

In the Caselli, Morelli, and Rohner (2015) framework, bilateral trade (over the sum of the GDP of the countries in the pair) is one of the additional control variables in the vector of controls *Z*.[7] Interestingly, this variable

(lagged by four years); dummy for military alliance; distance to the nearest current war which does not include a country of the dyad; total number of MIDs (excluding their potential bilateral MID) in which the countries in the dyad are involved at time *t*.

[7] All specifications control for the average and the absolute difference of land areas in the dyad, intercept, and annual time dummies. Additional controls (see the Caselli, Morelli, and Rohner 2015 paper for a detailed description): average and absolute difference of GDP per capita; average and absolute difference of population; average and absolute difference of fighting capabilities; average and absolute difference of democracy scores; dummy for one country having civil war; dummy for both countries having civil war; bilateral trade over GDP; dummy or country being OPEC member; dummy for both countries being OPEC member; genetic distance between the populations

TABLE 2
Replication of Caselli, Morelli, and Rohner (2015) using *Bilateral Dependence*

	(1)	(2)	(3)	(4)	(5)	(6)
One	0.0344	0.0886***	0.0809**	0.126***	0.0726*	0.150***
	(0.0283)	(0.0315)	(0.0391)	(0.0347)	(0.0393)	(0.0457)
One × Dist	−0.0512*	−0.0973***	−0.0884**	−0.123***	(0.0407)	(0.0432)
	(0.0285)	(0.0281)	(0.0426)	(0.0340)	−0.0846**	−0.154***
Both	0.0297	0.0497*	0.0566**	0.0771**	0.0249	0.0538*
	(0.0205)	(0.0271)	(0.0267)	(0.0301)	(0.0207)	(0.0317)
Both × MinDist	−0.0436	−0.0906***	−0.0184	−0.0630**	−0.0959**	−0.124***
	(0.0349)	(0.0288)	(0.0350)	(0.0319)	(0.0425)	(0.0354)
Both × MaxDist	−0.0165	0.00217	−0.0676	−0.0210	0.0396	0.0397
	(0.0364)	(0.0289)	(0.0490)	(0.0436)	(0.0451)	(0.0377)
Bilateral dependence	−0.0040***	−0.0043***	−0.0036**	−0.0035**	−0.0041***	−0.0045***
	(0.0015)	(0.0015)	(0.0014)	(0.0014)	(0.0015)	(0.0016)
Observations	11,076	11,076	11,076	11,076	11,076	11,076
R^2	0.094	0.164	0.095	0.161	0.098	0.166
Type oil	All	All	Offshore	Offshore	Onshore	Onshore
Country FE	No	Yes	No	Yes	No	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable: MID, defined the occurrence in a specific country pair of "use of force" or "war" (see Correlate Of War project for further details). Method: ordinary least squares with robust standard errors clustered a the country-pair level. See footnote 7 for controls and additional controls. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

turns out not to be significant in any of the specifications where it is used (as simple control) by the authors. If we substitute this variable with our measure of bilateral dependence, we can perfectly replicate all results of Caselli, Morelli, and Rohner (2015), but obtaining a strongly significant role for bilateral dependence in all specifications.[8]

Table 2 replicates columns two, four, six, eight, ten, and twelve of the original paper, namely all specifications for their baseline results where the full set of controls (and, therefore, also bilateral trade) are embedded in the estimation equation. The bilateral dependence variable displays a negative and significant coefficient (significant at the 1 percent level) for the regression considering all sources of oil and onshore, while for offshore type of oil the significance is at the 5 percent level.[9]

So far we have shown that bilateral dependence and asymmetry in resources (both in

of the two countries; dummy for membership of the same defensive alliance; dummy for historical inclusion in the same country, kingdom, or empire; dummy for having been in a colonial relationship; and years since the last hostility in the dyad.

[8] Capitalizing again on the Barbieri, Keshk, and Pollins (2009) and Barbieri and Keshk (2012) data, we compute our measure of bilateral dependence in the Caselli, Morelli, and Rohner (2015) sample.

[9] Note that all R^2 values increase with respect to the original paper when including our variable.

terms of endowments and geographic location) play opposite roles with respect to the probability of hostility, with bilateral dependence decreasing the probability of conflict and asymmetry in resources increasing it.[10] One implication of these results actually lends support, in our view, to the trade-expectations view in Copeland (2015): if one restricts attention to dyads with high asymmetry, one country in the dyad is expected to have more incentive (if the occasion could come) to alter the peaceful status quo that has such a country at a disadvantage, and this induces potential fear in the advantaged country, hence reducing the peace-keeping potential advantages of bilateral dependence.

Studying under what conditions the asymmetry effect can dominate the bilateral dependence effect or vice-versa seems to be an important research agenda.

3.3 *Value-Added Analysis*

An important development in international trade that could be useful for a quantitative analysis of the relationship between economic interdependence and war is the study of global value chains. Surplus production processes are broken into ever finer activities and tasks, and data now exist on the international dispersion of these activities and tasks across borders. UNCTAD (2013) estimates that nowadays, 75 percent of world trade flows are somehow correlated to the international production networks set up by multinational business groups (MBGs), either in the form of intragroup flows (30 percent of world trade flows approximately), international outsourcing between a multinational enterprise and another company (15 percent), or arm's length international transactions involving an MBG affiliate (30 percent). Given the key role of MBGs, there is scope for further research on trade expectations quantitative analysis based on the expectations of just a few relevant players. The increasing importance of multinational production networks implies that a large part of tradeable goods consists of intermediate goods, crossing borders multiple times before being absorbed into the generation of domestic goods, or being incorporated in the production of exports. This change in paradigm, from countries and sectors specializing in the production of final goods and services to the international fragmentation of production processes, has important consequences. Traditional measures of gross exports and openness are outdated in a world dominated by trade in intermediates.[11] With a rising integration in international production and, as a consequence, an increasing share of foreign intermediate goods incorporated in exports, value-added measures should be preferred in order to correctly measure the contribution of foreign and domestic production factors to a country's exports and the true contribution of exporting activities to GDP.

The UNCTAD/Eora Trade in Value Added dataset is the multiregion input–output (MRIO) table at the world level

[10] Barbieri (1996) already had the intuition that symmetry must matter, but could only consider symmetry in terms of aggregate trade variables, whereas we have used multiple sources of heterogeneity. We are able to take into account not only trade, but also resources. In so doing, we create a proxy of fear and expectations of adjacent states that relates to factor (5) in Copeland's list.

[11] Gross exports statistics account multiple times for intermediate goods that cross international borders more than once, overestimating total exports, which incorrectly include double counting caused by repeated export at different production stages. Koopman et al. (2014) were among the first to identify the "double-counting" problem embedded in gross exports statistics due to the emergence of global value chains and international production integration. The authors developed a theoretical framework to isolate different value-added components in gross exports statistics. Due to reduced data availability, they improved the existing intercountry input–output tables in order to perform the theoretical value added decomposition and disentangle value-added contributions to exports originated from different sources. They estimate that in their sample, approximately 25 percent of gross exports are constituted by foreign inputs or domestically produced inputs that return home after exporting, providing a first measure of double counting in gross exports statistics.

that can be used to estimate value added in trade.[12] In particular, the innovation with respect to national input–output tables is that the MRIO tables break down the use of products according to their origin: first, splitting the flows of products between domestically produced or imported; second, distinguishing intermediate and final use; third, indicating the origin of every imported product. Therefore, using a MRIO table can allow us to see the relationship between all producers and consumers in all regions covered. This dataset is the only one covering all countries of the world. There are three key country variables we can derive, for each year, from this dataset: DVA, FVA, and DVX (defined below). The sum of them, for each country-year, gives the country's total export. A very simplified explanation of these three variables can be:[13]

- Domestic Value Added (DVA) over total export indicates how autonomous a country is in the production of the intermediates needed for producing its export;
- Foreign Value Added (FVA) over total export measures a country's upstream dependence, meaning how dependent the country is on imports of other countries (or, said in other words, how much the export of a country is dependent on foreign input);
- Indirect Value Added Exports (DVX) over total export is a measure of the level of downstream dependence of a specific country, meaning how much other countries depend on the country's input for the production of their exports.

There is no theoretical nor empirical study yet using these data in relation to conflict incentives, thus the goal of the following considerations is to convince the readers that this possibility is very promising for future research. The analysis below is therefore preliminary and simply meant to illustrate another possibility to proxy expectations with structural data on different types of asymmetry. We believe that the relative weight of bilateral dependence and geographic asymmetry effects mentioned in the previous section can also depend on this production structure.

The first step is to create, for each country-year, the three indexes mentioned above. Considering that the UNCTAD/Eora dataset covers the period from 1990 onward, the number of observations of our previous sample from Caselli, Morelli, and Rohner (2015), which covers the period 1956–2001, will decrease significantly, from around 24 thousand observations to roughly 10 thousand. For this reason, and to ease the interpretation of results, we choose to create a comprehensive index of resource asymmetry, taking value 1 when only one country in the dyad has oil *and* the resource is located close to the border.[14] The corresponding set of situations displays the highest level of asymmetry in terms of resources. We can then replicate the results of table 2, but restricting our sample to those observations for which we have data also on the value-added trade, and using this more synthetic variable for resource asymmetry:

$$\Pr(Conflict_{ij,t+1}) = \beta_0 + \beta_1 ReA_{ij,t} + \beta_2 BD_{ij,t} + Z_{ij} + u_{ij,t}$$

[12] See Lenzen et al. (2012, 2013) and UNCTAD (2013) for further details.

[13] For further details, see the Technical Annex of "Global Value Chains and Development—Investment and Value Added Trade in the Global Economy," United Nations Publications (2013).

[14] More precisely, this variable is 1 if only one country has oil and its distance from the border is below the median of the distribution of the distance of resources from the border in the whole sample.

TABLE 3
Full and Restricted Sample with Value Added Trade data

	(1)	(2)
Resource asymmetry	0.076***	0.142***
	(0.0202)	(0.0465)
Bilateral dependence	−0.0031**	−0.0078***
	(0.0014)	(0.0024)
Observations	11,076	3,648
R^2	0.157	0.255
Sample	All sample	Subsample with VAT data
Type oil	All	All
Country FE	Yes	Yes
Additional controls	Yes	Yes

Notes: Dependent variable: MID, defined the occurrence in a specific country pair of "display of force," "use of force," or "war" (see Correlate Of War project for further details). Method: logit with robust standard errors clustered at the country-pair level. See footnote 7 for controls and additional controls. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

where *ReA* is the dummy variable for resource asymmetries just described, *BD* is the bilateral dependence, and *Z* is the same vector of controls proposed by Caselli, Morelli, and Rohner (2015), but replacing the bilateral trade one. In the first column of table 3, we show that our two measures of interest push in opposite directions with respect to the probability of conflict in the complete sample, showing a coefficient positive and significant at the 1 percent level for the resource-asymmetry variable and negative and significant at the 5 percent level for the bilateral dependence one. In the second column we restrict to the subsample for which we have also information of value-added trade data, and we confirm the significance and directions of our variables, in particular observing that in this restricted sample, both of them are significant at the 1 percent level.

An interesting preliminary way to exploit the value-added trade data is to study a measure of *FVA asymmetry*, computed as $\frac{|FVA_i - FVA_j|}{TotalExport_i + TotalExport_j}$. This measure captures the level of asymmetry in terms of FVA between the countries in the dyad, for each year. Replicating column 2 of table 3, but this time dividing the sample in dyads characterized by a particularly high level (low level) of FVA asymmetry (respectively above and below the median of the FVA asymmetry distribution), we can observe in table 4 that for dyads characterized by a particularly high level of asymmetry in FVA between the countries, the positive and significant role of the asymmetry in resources dominates with

TABLE 4
FVA Asymmetry

	(1)	(2)
Resource asymmetry	0.0636	0.266***
	(0.0401)	(0.0761)
Bilateral dependence	−0.0117***	−0.0049
	(0.00397)	(0.0038)
Observations	2,089	1,559
R^2	0.299	0.401
Sample	Low FVA asymmetry	High FVA asymmetry
Type oil	All	All
Country FE	Yes	Yes
Additional controls	Yes	Yes

Notes: Dependent variable: MID, defined the occurrence in a specific country pair of "use of force" or "war" (see Correlate Of War project for further details). Method: logit with robust standard errors clustered at the country-pair level. See footnote 7 for controls and additional controls. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

respect to the bilateral dependence one, which turns out to be not significant. The situation is completely reversed, showing a negative and significant (at the 1 percent level) role of the bilateral dependence and a non-significant role for resource asymmetry, for dyads where the FVA asymmetry is particularly low. This is, again, a set of results that suggest the great sensitivity of the sign of interdependence effects on war probability when the fear of asymmetries varies, in line with the intuition in Copeland's (2015) book.

In future research, we plan to build on these preliminary observations and construct theoretical models and instruments for a precise study of the causality channels, but for the purpose of this article, the above table should suffice to see the potential richness of the implications of considering all these structural and geographic data together.

4. *Conclusions*

In economics as well as in political science, the relationship between economic interdependence and conflict has been extensively discussed. Copeland (2015) is a refreshing book on this subject, most of all because it offers a possibility to reconcile and balance the traditional realist and liberal insights at the level of broad intuitions. Precisely because we believe that many insights in the book are correct, we have offered in this article a critical evaluation of the existing qualitative and quantitative studies on the subject, proposing a number of fruitful ways to exploit new data for the same balancing and reconciling goal that inspired the book.

Geographic asymmetries, asymmetries in natural resource endowments, and asymmetries in the structure of production are

observable types of asymmetries that *all* reduce the peace effects of bilateral dependence. The intuition for these findings is, we believe, in line with the discussion in Copeland about the role of vulnerability.

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