Trade Concentration and Interstate Conflict

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Existing studies of the trade-conflict relationship focus primarily on dyadic trade and its implications for the opportunity cost of conflict. Most states maintain economic relations with numerous partners, yet few studies have examined the effects of extradyadic trade on dyadic conflict. In an influential discussion of economic interdependence, Albert Hirschman ([1945] 1980) draws attention to the importance of both direct trade ties and the extent to which a state's total trade is monopolized by any one trading partner. Building on this notion, we present and test a theoretical argument about the conflict-reducing implications of third-party trade. The findings provide support for our prediction that greater concentration of trade outside the dyad is associated with a reduced risk of interstate hostility and violent disputes.

The most commonly cited argument for why trade leads to peace is that the interruption of commerce due to conflict generates opportunity costs. Trade is mutually beneficial to the states involved, giving trading partners incentives to keep disputes from escalating into violent conflicts. While this is well-explored in the literature, most studies focus only on the impact of *dyadic* trade. Yet states (and dyads) are embedded in a network of economic relations. Few states have such specialized trade relationships that they rely on only one market for their export goods or one supplier for their imports.[1]

We argue that the structure of trade outside the dyad influences the likelihood of conflict within the dyad. The pacifying effect of commerce arises not only from opportunity costs associated with more or less trade between potential belligerents. It is also determined by whether either state has access to alternative trading partners. As states become more integrated into global markets, they trade at greater volume but likely also acquire more numerous trading partners. This proliferation of trade ties increases the number of alternative export markets and import sources each state has available and may diminish the importance of any particular dyadic trade relationship. If opportunity costs drive the commercial peace, the structure of extradyadic trade should matter as well.

To test this proposition, we introduce a measure of extradyadic trade concentration that draws directly on Hirschman's ([1945] 1980) influential discussion of market structure. Our findings indicate that the concentration of trade outside the dyad influences conflict propensity within the dyad. When states have few alternatives to their existing trade, the risk of violent conflict declines. Moreover, this effect is largely independent of the size of the dyadic trade relationship with a potential opponent.

The Trade-Conflict Debate

The relationship between commerce and armed conflict among states has occupied scholars for a long time. The literature traces its roots from Kant and de Montesquieu to Hobson and Hirschman and now includes at least three distinct waves of empirical scholarship in the past 25 years (Keshk, Pollins, and Reuveny 2004). Scholars have advanced a number of competing arguments about the nature of the relationship. Optimistic views draw on the work of classical liberals to conclude that trade should have a dampening effect on armed conflict (Polachek 1980; Oneal and Russett 1997, 1999). Others argue that trade should enhance rather than reduce the

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[1]Replication data and results for the robustness checks are available at http://katja.kleinberg.net/index_files/Research.htm.

probability of violent confrontation (Barbieri 1996, 2002). Finally, some scholars are skeptical of both views and suggest instead that trade has no observable impact on conflict, either because economic relations are only marginally important to the "high politics" of international security (Buzan 1984), or because states can anticipate conflicts and preemptively adjust their trade relations (Morrow 1999).

Recent contributions to the literature have focused not only on providing support for these competing views, but have also sought to reconcile their seemingly contradictory findings. Some scholars use sophisticated empirical techniques to disentangle what might be a process of simultaneous causation (Keshk, Pollins, and Reuveny 2004; Polachek 1992; Reuveny and Kang 1998). While trade may diminish the probability of armed conflict, conflict could also have a negative effect on trade relations (but see Barbieri and Levy 1999). No clear consensus has emerged thus far about the causal precedence between trade and conflict (Keshk, Pollins, and Reuveny 2004; Hegre, Oneal, and Russett 2010). Another front in the trade-conflict debate has developed over how to conceptualize and measure the main concepts of interest—conflict and economic (inter-)dependence (Barbieri and Peters 2003; Gartzke and Li 2003a; Hegre 2005).

What most of the large-N empirical studies have in common is a focus on bilateral economic relations. With few exceptions (e.g., Gartzke, Li, and Boehmer 2001), scholars have tested theoretical predictions regarding direct trade links between potential opponents. Studies assume, implicitly or explicitly, that interstate conflict will become less likely as the importance of dyadic trade increases. Opportunity costs are a constraining factor on states' foreign policy because these states cannot easily shift their dyadic trade to alternative markets or suppliers and, even when it is possible, states incur short-term adjustment costs and long-term efficiency losses (Keohane and Nye 1989). However, few studies explicitly consider the conditions under which shifting trade away from potential opponents will be more or less difficult.

Whether driven by profit concerns or by a desire to avoid excessive dependence on any single trading partner, states often maintain ties with numerous suppliers and markets to satisfy their needs. Over time, they also adjust their trade relations with any particular partner, sometimes gradually in response to changes in supply and demand, sometimes abruptly in response to political developments. The implementation of economic sanctions is one example of the latter. Because there are many actual and potential trading partners for each state in the international system, it stands to reason that the extent and nature of trade outside the dyad should influence interactions within the dyad, including conflict.

A few studies have begun to examine the importance of extradyadic trade in greater detail. Crescenzi (2003), for example, builds on Hirschman's arguments about trade and influence to develop a model of strategic interaction in which exit costs, driven by international market conditions and asset specificity, affect the likelihood of different types of interstate conflict. Most recently, scholars have drawn on network analysis to derive a realistic representation of global economic relations (Maoz 2006, 2009). Echoing classical liberal accounts, Dorussen and Ward (2010) find that embeddedness in trade networks is associated with more peaceful relations, due to the greater flow of information associated with increased trade. These studies represent a promising departure from the narrow dyadic focus, and we seek to further this line of inquiry.

Trade Concentration, Opportunity Cost, and Conflict Involvement

In the most commonly cited formulation of the liberal peace, the argument begins with the notion that trade between states is (mutually) beneficial. In general, specialization due to trade is thought to allow for greater consumption and to facilitate economic growth at the national level. Within states, firms and individuals involved in international trade realize welfare gains. These actors in turn develop a stake in the continuation and expansion of trade. To the extent that armed conflict with a particular trading partner would jeopardize welfare gains, governments and societal actors have incentives to avoid conflict. In part through concerns about welfare losses and, depending on regime type, through concerns about the political repercussions associated with such losses, trade thus pacifies interstate relations. Arguments derived from this general proposition often center on the salience of the particular dyadic trade relation, suggesting that more intensive trade is associated with greater prospective losses from conflict. Larger opportunity costs in turn generate greater constraints on the foreign policy of trading states.

Opportunity costs arise not simply because conflict may result in the loss of dyadic trade but also

from the difficulty of replacing lost trade with alternative suppliers and markets (Hirschman [1945] 1980; Keohane and Nye 1989). In principle, a potential belligerent can avoid the costs of trade interruption by diverting its dyadic trade to third states. If a state is able to shift quickly and cheaply from one trading partner to equally beneficial trade with another partner, the opportunity costs of dyadic conflict will be low and the associated constraints on belligerent actions will be small. Trade diversion will be more difficult (or impossible) and significantly more costly when suitable alternative trading partners are few in number (or nonexistent) than when they are numerous. The availability of substitutes for dyadic trade will affect the size of the prospective opportunity costs of belligerence toward a trading partner and with it the likelihood of interstate conflict.

Consider a state that stands to lose a significant portion of its overall income from trade if commerce with a particular market ceases. While the volume of its dyadic trade suggests a significant constraint on conflict behavior, such a state may nevertheless incur relatively few costs from loss of trade if there are viable alternative markets. All else equal, opportunity costs and the associated constraint will be more limited than they would be if the state had fewer alternative trading partners. The same argument applies to states that maintain relatively little trade with a potential opponent. They may still incur significant losses if there are few markets for their goods outside the dyad, and again the constraining influence of trade depends in part on the availability of alternatives.

One way to think about the concentration of trade outside the dyad would be as a raw count of current trading partners. However, raw counts do not properly describe situations in which one or a few trading partners outside the dyad command a disproportionate share of another state's trade. We suggest instead a measure of trade concentration that depends on the number of states with whom one trades *and* the more or less equal distribution of one's trade among these states (Hirschman [1945] 1980, 98). For purposes of illustration, consider a case where State A is a member of the dyad A-B. In addition to whatever trade it conducts with B, State A also maintains trade ties with States C, D, and E, accounting for 75, 15, and 10% of A's *extradyadic* trade, respectively. Despite the existence of three trading partners outside the dyad, State A's trade is highly concentrated. Considering the predominance of State C in State A's overall trade, it may be more

accurate to say that State A effectively has only one extradyadic trading partner. Alternatively, if State A's extradyadic trade is distributed equally among C, D, and E, the concentration of its extradyadic trade is lower.[2] The distribution of a state's trade among more numerous trading partners has consequences for the opportunity costs that will arise when any one dyadic relationship is disrupted.

Potential belligerents will find it more difficult to divert dyadic trade at low cost when their extradyadic trade is highly concentrated. A larger, more diverse marketplace composed of roughly equally important trading partners can offer greater choice and better terms of exchange in replacing lost income from a particular dyadic relationship. One reason for this is the greater potential for competition for the trade that will be freed up by disengagement from the current trading partner. Moreover, if a state's trade with one or two partners is already extensive, it may not be feasible to expand trade flows much beyond current levels. More numerous trading partners, each holding a smaller share, may represent untapped potential for more trade. Finally, when trade is highly concentrated, a potential belligerent will be also be more dependent on the political good will of its few trading partners outside the dyad than when extradyadic trade concentration is low. In a broader sense, the opportunity costs of belligerence also increase with the extent to which substitute trading partners can extract political concessions in return for their cooperation.

As suggested by the liberal argument, the opportunity costs that arise as conflict disrupts dyadic trade relations should have a constraining effect on the belligerence of trading states. On the one hand, decision makers will have to consider the impact on firms and individuals who may see their incomes from trade decline. To the extent that decision makers rely on support from segments of the economy that may be significantly harmed, conflict involvement could be politically costly. On the other hand, a restructuring of trade relations could hurt national economic performance, providing additional incentives to avoid militarized conflict. Economic opportunity costs and the resulting political constraints on belligerent behavior should increase with both the value of dyadic trade and the dearth of viable alternatives to it.

We calculate our measure by adapting Hirschman's original index of market concentration (Hirschman [1945] 1980, 98–99). For each member state in each

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[2]A parallel argument applies of course to the extradyadic trade of State B.

dyad, we calculate the sum of its squared trade shares with every other state. We then subtract its squared trade share with the other member of the dyad from that sum. The final measure is the square root of this result.

$$Extradyadic\ Trade\ Concentration_{ij} =$$
$$\sqrt{\sum \left(\frac{trade_{ij}}{trade_i}\right)^2 - \left(\frac{trade_{ij}}{trade_i}\right)^2} \quad (1)$$

Trade concentration, measured here at the dyad level, ranges between 0 and 1. When a country's extradyadic trade is completely monopolized by another state, the variable takes a value of 1. In principle, the variable will approach a value of 0 when there is an infinite number of trading partners each accounting for an infinitely small share of the state's trade. In practice, its lower bound is constrained by the finite number of states in the international system and other variables driving the presence of trade between states. In the analysis to follow we employ a weak-link assumption, which posits that the least constrained state in the dyad drives the likelihood of dyadic conflict (Dixon 1994; Oneal and Russett 1997). We therefore include the lower level of exdradyadic trade concentration in the dyad. In our sample, described in greater detail in the next section, the extradyadic trade concentration measure ranges from 0.01 to 0.97.

Why focus on the concentration of *existing* rather than *potential* extradyadic trade? On the one hand, we argue that existing trade outside the dyad gives trading partners a way to use opportunity costs to exercise influence over a potential belligerent. On the other hand, a state that faces the prospect of losing a particular trading partner can shift trade toward other states with whom it already maintains trade ties. Of course, the threatened state could also try to replace lost trade by developing completely new suppliers and markets. States probably do both to some degree, but we assume that, on average, shifting trade to existing partners is (at least in the short run) easier, less costly, and less fraught with uncertainty than developing new trade relations. For one, states are already familiar with the laws, customs, and common business practices of current trading partners, while new trade relations may require a learning curve. Other practical advantages include the fact that appropriate shipping routes may be established already. Most importantly, current trading partners will have had opportunities to built trust through past interactions. Knowledge and reputation are valuable commodities in international business and

neither is acquired instantaneously. There are likely to be other sources of inertia in trade relations that also generate a bias in favor of current trading partners.

This approach to capturing trade interdependence beyond the dyad has important advantages. One alternative would be to use trade openness (the proportion of a state's GDP that derives from trade) as a measure of opportunity costs. While greater openness may indicate that any particular dyadic relationship is less important to a state's trade, it does not allow the researcher to distinguish in a straightforward way between more and less concentrated trade outside the dyad. Another option, which captures concentration more directly, would be the use of data on import price elasticity to measure market structure (Crescenzi 2003). Unfortunately, the availability of such data remains limited, and its relationship to more widely used data on trade dependence is not entirely straightforward. Using Hirschman's index allows us to evaluate the influence of dyadic trade and that of trade with third parties separately while still using a single source of trade data that is available for many more countries and years. Moreover, the distinction between dyadic and extradyadic trade is clear-cut as for each state dyadic trade is by definition excluded from the trade concentration measure. Finally, the measure captures not only the presence and extent of trade outside the dyad, it also accounts for the fact that this extradyadic trade is not monolithic but affecting, and affected by, the interests of a number of different states.

Figure 1 shows the average concentration of extradyadic trade for all states in the international system included in this study. Trade concentration has declined steadily over the past 50 years, as technological change and a decline in transportation costs have lead to a dramatic growth in world trade. The expansion and diversification of trade relationships, with states developing new markets for their goods, is part and parcel of this development. This study seeks to uncover some of its consequences for interstate relations.

Our discussion of trade concentration so far suggests that states whose current trade outside the dyad is highly concentrated, i.e., those who have effectively fewer trading partners, will have fewer opportunities for substitution and face higher adjustment costs. We expect trade concentration to have an independent and significant effect on the probability of conflict. Specifically, *we expect the concentration of extradyadic trade to be negatively related to the likelihood of armed conflict in the dyad.*

FIGURE 1 **Average Concentration of Extradyadic Trade, 1948–2001**
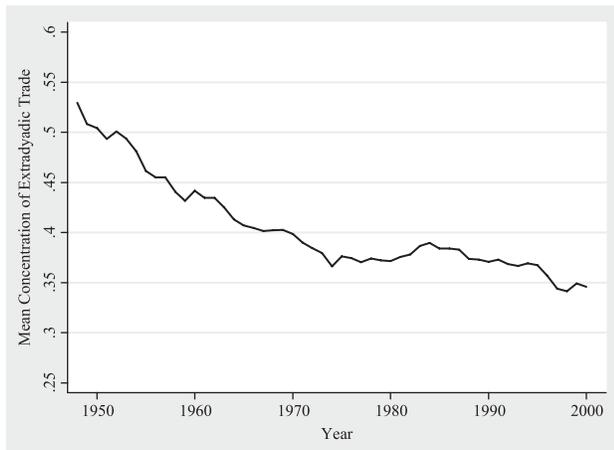
Research Design

We test the impact of trade concentration on interstate conflict using a standard model of trade and conflict. The point of this study is not to challenge the liberal argument but to examine whether trade beyond the dyad contributes to an explanation of the commercial peace. To this end and for purposes of comparison, we rely on what we consider a standard model in the literature and employ an expanded version of the widely used data compiled by Russett and Oneal (2001; see also Oneal and Russett 2005). We closely follow their model specification, with a few exceptions. Most notably, the temporal domain of our analysis is limited to the period between 1948 and 2001. This is due to the construction of our main variables of interest, which we discuss in detail below. The unit of analysis is the nondirected dyad-year.[3]

Our dependent variable is the onset of a new militarized interstate dispute (MID) in the dyad in a given year. Because it is prevalent in this type of study, we include the onset of *any* MID regardless of its level of violence. However, many MIDs do not directly involve the use of force and instead consist of comparatively harmless violations of sovereign territory or mere threats of force. While these low-level disputes are interesting in their own right and sometimes carry the seed of future violence, it was the loss of life as well as treasure that initially motivated liberal arguments about trade and peace.

We therefore also test our argument separately on a subset of militarized disputes that involved casualties and are classified as fatal MIDs.

Two types of trade-related constraints form our main independent variables. First, in order to account for additional actors that function as economic constraints, we include our measure of trade concentration with respect to a state's extradyadic economic ties. The measure was constructed using the expanded trade data compiled by Gleditsch (2002), based on the calculation presented in equation (1) and discussed above. Second, we include a widely used measure of direct dyadic trade dependence. *Trade Dependence* is the sum of dyadic imports and exports relative to the total trade of a member of the dyad (Barbieri 1996). In using these indicators of economic constraint we again rely on the weak-link assumption. As bilateral trade accounts for a greater proportion of the less dyadically dependent state, conflict onset will become less likely. Similarly, as *Trade Concentration* of the less constrained state increases, the likelihood of dyadic conflict will decrease.

As a robustness check we repeated our analyses with another commonly used measure of dyadic economic dependence, dyadic trade divided by a state's GDP. This is the measure employed in the original studies by Oneal and Russett (1997, 1999, 2005). We again followed the weak-link assumption and included the lower level of dyadic trade dependence over GDP. None of the findings were changed in sign or significance. We present results for trade share-based measures instead because they follow directly from Hirschman's original conceptualization of dyadic dependence and trade concentration.

The study includes a set of control variables that have been shown to predict the onset of dyadic conflict. A significant number of studies indicate that the regime type of members of the dyad affects conflict propensity. Following Oneal and Russett (2005), we include the higher and lower polity2 scores in the dyad. These scores range from −10 for a full autocracy to 10 for a full democracy. *Democracy*$_{Low}$ should be negatively related to MID onset as more democratic dyads are expected to be less conflictual. In contrast, coefficients for *Democracy*$_{High}$ are expected to be positive as mixed dyads have been shown to be more likely to engage in violent confrontation.

States sharing similar interests will be less likely to engage in armed conflict with one another. Alliances are one means by which states express and formalize their shared interests, in particular with

[3]For a detailed discussion of the variables included in the standard model, readers should consult Russett and Oneal (2001).

regard to matters of security. To control for this possibility, we include a dummy, *Allies,* that takes a value of 1 if the states in the dyad share at least one alliance membership. Our expectation is that allied states will be less likely to experience MIDs than nonallied states.

Power, both in absolute and relative terms, plays a prominent role in realist theories of conflict. Our model includes two measures to control for the impact of capability on conflict. *Capability Ratio (log)* is the natural log of the more powerful state's capabilities divided by those of the less powerful state. An increase in the power preponderance of one state in the dyad should decrease the probability of conflict. To control for the absolute power of states in the dyad, the model includes a dummy, *Major Power Dyad,* that takes a value of 1 when either state in the dyad is a major power as defined by the Correlates of War project (Singer, Bremer, and Stucky 1972) and takes a value of 0 otherwise.

We further include the per capita GDP of the poorer state to control for the minimum level of development in the dyad. Existing research suggests that high levels of economic development are associated with lower probability of violent conflict (Bremer 1992; Hegre 2000; Peceny, Beer, and Sanchez-Terry 2002). We use the natural log of per capita GDP to account for the possibility that development has a diminishing marginal effect. One concern for our theoretical argument is that if extradyadic trade concentration is consistently low for less-developed countries, results for our main predictor may be spurious. The data on real GDP per capita used to create this variable are taken from Gleditsch (2002).

Finally, recent studies pay increasing attention to the geographic determinants of conflict. Direct contact, such as the presence of a shared border, should increase the opportunities for interaction and thereby multiply the opportunities for conflict. We therefore include an indicator of *Contiguity* that takes a value of 1 when the two states share a border or are separated by no more than 150 miles of water. It is plausible that it will be easier and less costly for states to materially affect neighboring states. To control for the ease of both communication and power projection within the dyad, we also include the logged distance (in miles) between capital cities. As *Distance (log)* increases, we expect conflict onset to become less likely. All substantive predictors are lagged by one year. Again following Oneal and Russett (2005), we further include *System Size* as an additional control for the number of states in the international state system. Finally, prior research indicates that dyads are

less likely to experience conflict the longer they have remained peaceful. We control for the possibility of temporal dependence in our data by including peace years and cubic polynomials following Carter and Signorino (2010).

Empirical Results

The binary nature of the dependent variables suggests a logistic regression model.[4] Table 1 presents results for the two dependent variables, the onset of any militarized interstate dispute (MID) in a given year and the onset of any fatal MID. Columns 1 and 3 represent a standard model of the trade-conflict relationship; Columns 2 and 4 contain a full model specification including our primary variable of interest, *Trade Concentration*. The results support the prediction derived from our theoretical argument. The availability of multiple trading partners outside the dyad indeed influences the probability of dyadic conflict. A greater concentration of extradyadic trade reduces the likelihood of both fatal militarized disputes and less violent confrontations. Put differently, the fewer alternative trading partners the less constrained state in the dyad has, the less likely we are to observe either type of conflict within the dyad. This effect is statistically significant in both cases.

Figure 2 presents graphically the impact of extradyadic trade concentration over the range of values in the sample for contiguous states, with the remaining continuous predictors held at their means and dichotomous predictors held at their mode. To clarify the substantive effects on conflict onset, Table 2 presents changes in the predicted probability of fatal disputes for all statistically significant predictors. We focus first on our main variables of interest. A standard deviation increase in the lower trade concentration in the dyad reduced the likelihood of a fatal MID by 23%. While this substantive effect may appear moderate, especially compared to the impact of contiguity and the presence of a major power in the dyad, it is roughly the same size as the impact of trade dependence within the dyad. As the minimum level of dependence on dyadic trade in the dyad

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[4]A number of recent studies employ modeling techniques that account for possible simultaneous causation between dyadic trade relations and conflict (Keshk, Pollins, and Reuveny 2004; Reuveny and Kang 1998). While this work has produced valuable insights, we currently have no corresponding theoretical expectations about the potentially reciprocal effect of dyadic conflict on the *concentration* of extradyadic trade.

TABLE 1   Onset of Militarized Interstate Disputes and Fatal Disputes, 1948–2001: Logistic Regression

	Any MID		Fatal MID	
	Standard Model	Full Model	Standard Model	Full Model
Dyadic Trade Dependence $_{Low}$	−8.062* (3.268)	−10.701** (3.481)	−20.844** (6.063)	−25.074** (6.541)
Extradyadic Trade Concentration $_{Low}$		**−3.051** (0.665)**		**−3.498** (1.044)**
Democracy $_{Low}$	−0.095** (0.012)	−0.092** (0.012)	−0.109** (0.023)	−0.106** (0.022)
Democracy $_{High}$	0.053** (0.008)	0.049** (0.008)	0.055** (0.013)	0.049** (0.012)
Economic Development (log) $_{Low}$	−0.091 (0.063)	−0.108† (0.060)	−0.361** (0.101)	−0.386** (0.097)
Capability Ratio (log)	−0.265** (0.043)	−0.273** (0.042)	−0.363** (0.059)	−0.365** (0.057)
Major Power Dyad	2.411** (0.166)	2.257** (0.166)	2.499** (0.234)	2.331** (0.243)
Allies	0.179 (0.143)	0.181 (0.138)	−0.046 (0.201)	−0.001 (0.191)
Contiguity	2.515** (0.161)	2.507** (0.156)	2.341** (0.247)	2.429** (0.235)
Distance (log)	−0.501** (0.065)	−0.505** (0.062)	−0.693** (0.101)	−0.703** (0.093)
System Size	0.005** (0.001)	0.003* (0.001)	0.001 (0.002)	−0.002 (0.002)
Peace Years	−0.339** (0.021)	−0.343** (0.021)	−0.239** (0.033)	−0.247** (0.033)
Peace Years^2	0.011** (0.001)	0.011** (0.001)	0.006** (0.002)	0.006** (0.002)
Peace Years^3	−0.001** (0.000)	−0.001** (0.000)	−0.001 (0.000)	−0.001 (0.001)
Constant	−1.146 (0.784)	0.322 (0.782)	1.556 (1.233)	3.385** (1.164)
N	427,394		427,179	
Wald χ^2	2662.91**	2872.60	1272.32	1349.70
(df)	13	14	13	14

Note: Numbers in parentheses are robust standard errors, clustered on dyad. Significance in two-tailed tests, **$p < 0.01$, *$p < 0.05$, †$p < 0.1$. Estimated coefficients of temporal controls omitted for space.

increases, the odds of conflict diminish. A standard deviation increase is associated with an 18% drop in the annual probability of a new fatal dispute.
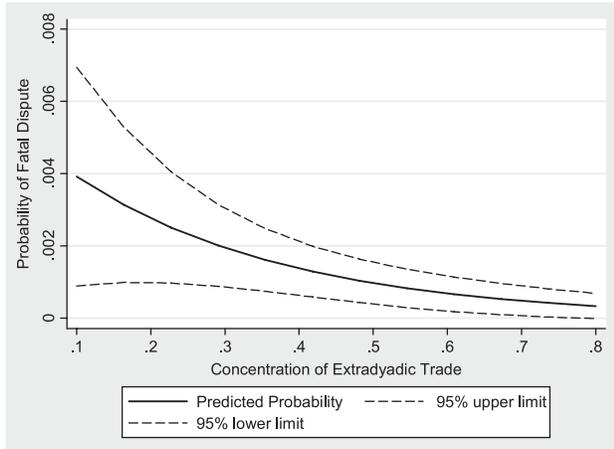
Figure 3 shows predicted probabilities of fatal conflict at different levels of dyadic trade. The top two lines represent the effect of trade concentration for dyads that do not maintain measurable dyadic trade and for dyads with mean levels of trade, respectively. The third line represents the effect of extradyadic trade concentration in dyads that engage in relatively high levels of bilateral trade (two standard deviations above the mean). As the commercial peace argument predicts and past studies have shown, states without significant trade relationships have consistently higher probabilities of conflict, while states with a greater minimum level of trade interdependence are distinctly less likely to become involved in conflict. In all three cases, however, the greater the minimum level of extradyadic trade concentration in the dyad, the less likely the dyad should be to experience a fatal dispute in the following year.[5]

[5]The findings hold when trading dyads and nontrading dyads are examined separately. In a sample of nontrading dyads, the effect of *Trade Concentration$_{Low}$* on Any MID-onset is attenuated ($p < 0.1$), but in both samples and for all outcomes the coefficients on *Trade Concentration$_{Low}$* remain negative and significant, indicating a consistent pacifying effect.

The remaining findings are consistent with previous research. Across all models we find support for the democratic peace hypothesis. Dyads that are overall more democratic appear to be less likely to engage in confrontations. For example, increasing the lower polity2 score in the dyad by one standard deviation from −4 (a moderate autocracy) to +2 (a weak democracy) decreases the odds of a fatal MID by close to 50%, all else equal. At the same time, the results for the higher level of democracy in the dyad indicate that mixed dyads are more likely to fight.

Realist arguments also receive solid support in our sample. A standard deviation increase in the capability imbalance between the states in the dyad decreases the odds of conflict onset by 43%. Although our analysis suggests that preponderance is pacifying, it also points to an important qualification. The presence of a major power in the dyad greatly increases the likelihood of conflict. Due to their superior capability and expansive foreign policy interests, major powers are bound to be more likely to become perpetrators as well as targets of armed conflict. Geography similarly emerges as a major risk factor in interstate relations. States appear to be much more likely to come into conflict with direct neighbors and states in their near abroad. Alliances appear to have no effect on conflict propensity in these models but additional tests reveal that dyadic

FIGURE 2 Change in Predicted Probability of Fatal Disputes (Table 1)

FIGURE 3 Change in Predicted Probability of Fatal Disputes: Trade Dependence and Concentration of Extradyadic Trade (Table 1)
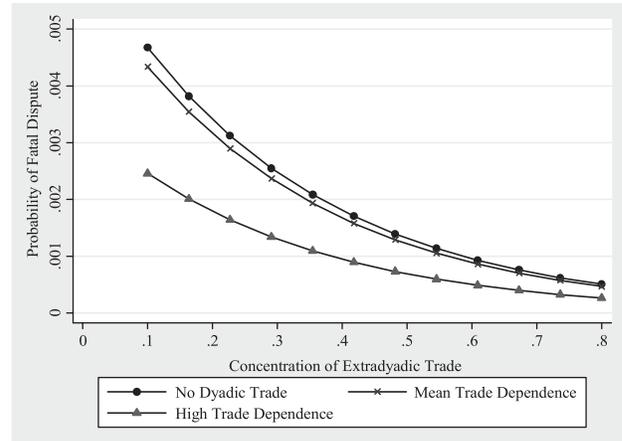
foreign policy similarity (Signorino and Ritter 1999) does have a dampening effect on the probability of MIDs and fatal MIDs.

Robustness Check

Although the Militarized Interstate Dispute data are widely used in the contemporary literature, they are not without critics. In particular, it has been suggested that low-intensity conflictual behavior is underreported (Kim and Rousseau 2005; Pevehouse 2004, 253). This is in part a function of the purpose for which the MID data were originally collected. An alternative, commonly employed in early studies of the commercial peace, is event-level data. The

TABLE 2 Changes in Predicted Probability of Fatal Dispute, 1948–2001

Baseline Probability* = 0.0019	Percent Change in Probability
Trade Dependence $_{Low}$ + SD	−18.5
Trade Concentration $_{Low}$ + SD	**−23.5**
Democracy $_{Low}$ + SD	−46.8
Democracy $_{High}$ + SD	+40.3
Economic Development (log) $_{Low}$ + SD	−27.9
Capability Ratio (log) + SD	−42.8
Major Power 0 → 1	+850.1
Contiguity 0 → 1	+905.3
Distance (log) + SD	−41.9

Note: *Based on Trade Dependence$_{Low}$, Trade Concentration$_{Low}$, Democracy scores, Capability Ratio (log), Distance (log), and remaining controls at mean values, Contiguity=1, Major Power Dyad=0, Allies=0.

Conflict and Peace Data Bank (COPDAB) is an extensive collection of observations of interstate interactions and includes a wide range of hostile (and cooperative) actions short of threats and uses of force (Azar 1993). It allows insight into whether the constraining effect of trade concentration holds even at lower levels of hostility. One drawback is the limited temporal domain of the COPDAB data, spanning only the period 1948–78. A separate test of the hypothesis using alternative data can nevertheless serve as a robustness check. If findings for the COPDAB data match those presented above, we should have greater confidence that the theoretical argument finds empirical support.

Taking advantage of the richness of the data, the dependent variable is an annual count of hostile actions by state i against j. The unit of analysis is the directed-dyad year. In principle, the COPDAB data offer daily observations of state interactions, but because only annual data are available for most of the predictors included in the analysis, observations of hostile actions are summed on an annual basis. Although some nuance is lost in the process of aggregation, the resulting counts still provide a sufficiently fine-grained measure of interstate conflict with which to demonstrate the robustness of our key finding.[6]

The main variable of interest here is the extradyadic trade concentration of the challenger state in

[6]COPDAB categories of hostile actions include mild/strong verbal discord, diplomatic-economic hostility, political-military hostility, small-scale military actions, and limited/extensive war.

the dyad. It is expected to have a negative and significant effect on the number of hostile actions directed at a target. We include measures of extradyadic trade concentration for both states in the dyad. To test the central proposition of the commercial peace, the analyses include measures of dyadic trade dependence for both states. We further include a set of control variables analogous to those used previously. *Democratic Challenger* and *Democratic Target* are binary indicators of the states' regime types. They take a value of 1 if the state is a consolidated democracy with a polity2 score greater than 5 and a value of 0 otherwise (Marshall and Jaggers 2002). To test the proposition that democratic dyads are more peaceful than autocratic or mixed dyads, we also include a dummy, *Democratic Dyad*, which takes a value of 1 if both states in the dyad are democracies as specified above. *Capability Ratio Challenger* accounts for the challenger state's power advantage vis-à-vis the target state. Two variables labeled *Economic Development* account for the (log-transformed) per capita GDP in the challenger state and the target state, respectively. As in the previous analyses, we include *Major Power Dyad*, *Distance (log)*, *Contiguity*, and *Allies* as dyad-level predictors along with controls for temporal dependence and system size.[7]

Table 3 presents the results of a negative binomial regression. The results confirm our expectations about the constraining effect of third parties in economic interdependence. Greater concentration of extradyadic trade on the challenger side is associated with a decrease in the annual amount of hostile activity. In this sample, a standard deviation increase in trade concentration (a change of approximately 0.13) is associated with a 10% decrease in the expected number of hostile actions. Contrary to expectations derived from the commercial peace argument, we find no evidence that greater dyadic trade dependence influences the amount of hostility between states using the COPDAB data. The findings further suggest that more economically developed states are more likely to become targets of hostilities.

Aside from the positive coefficient on *Allies*, the remaining predictors perform largely as expected. Democratic challengers are significantly less likely to target other democracies; the coefficient for *Democratic Dyad* is negative and significant. A major power

[7]All control variables were created using EUGene Version 3.204 (Bennett and Stam 2000).

TABLE 3 Event Count of Hostile Actions, 1948–1978 (COPDAB): Negative Binomial Regression

	Annual Hostility	
Dyadic Trade Dependence $_{Challenger}$	0.565	(0.456)
Dyadic Trade Dependence $_{Target}$	0.791	(0.608)
Extradyadic Trade Concentration $_{Challenger}$	**–0.739***	**(0.293)**
Extradyadic Trade Concentration $_{Target}$	0.088	(0.369)
Democratic Challenger	0.278**	(0.088)
Democratic Target	0.204*	(0.081)
Democratic Dyad	–0.835**	(0.144)
Economic Development (log) $_{Challenger}$	0.014	(0.035)
Economic Development (log) $_{Target}$	0.201**	(0.036)
Capability Ratio (log) $_{Challenger}$	–0.484	(0.107)
Major Power Dyad	1.789**	(0.114)
Allies	0.031	(0.084)
Contiguity	1.261**	(0.175)
Distance (log)	–0.105	(0.066)
System Size	–0.008**	(0.001)
Constant	–0.939	(0.621)
N	72,634	
Wald χ^2	1294.13	
(df)	15	

Note: Numbers in parentheses are robust standard errors, clustered on dyad. Significance in two-tailed tests, $**p < 0.01$, $*p < 0.05$.

in the dyad increases the amount of hostility compared to minor-power dyads. At the same time the greater the challenger's share of capabilities in the dyad, the less frequent hostility in a given year. States direct greater hostility toward neighbors than noncontiguous states and greater distance between the capitals of challengers and potential targets limits the number of hostile interactions.

The theoretical argument proposed in this study poses no direct challenge to the arguments or findings underpinning the commercial peace. The inclusion of a measure of extradyadic trade concentration does not appear to affect any of the widely cited findings for the standard trade-conflict model. But the statistically significant coefficients and, more importantly, the sizeable substantive impact on the probability of interstate conflict suggest that it plays a role in interstate relations. In this study we have found empirical support for a theoretical proposition that is intuitively plausible and that has significant implications both for further research and for policy.

Discussion

Our argument is that existing studies of the trade-conflict relationship are too narrowly focused on only one determinant of the potential costs of conflict: foregone dyadic trade. This leaves the relationship between opportunity costs and conflict underspecified because large-N studies have largely ignored circumstances under which existing dyadic trade can be shifted to other markets. We add our findings to a still small body of work that explicitly seeks explanations for the commercial peace beyond the dyad (Crescenzi 2003; Dorussen and Ward 2010; Gartzke and Li 2003b; Maoz 2006). Looking at the concentration of trade outside the dyad, we hypothesized that greater concentration of extradyadic trade makes dyadic conflict less likely because it affords potentially belligerent states fewer substitutes for dyadic trade. Empirical results for the post-WWII period support this contention, adding nuance to our understanding of the commercial peace.

Our findings have a number of implications for further research. The innovations driving global economic integration allow states to maintain relations with an increasingly large number of trading partners. While the liberal argument suggests that more trade should lead to more peaceful relations, our findings point toward an important caveat. In principle, as states diversify their trade relationships, they increase the number of alternative markets and suppliers available to them in case of conflict. This may remove one source of political constraint on belligerent behavior. States thereby also reduce the relative influence of any particular trading partner. Indeed, this is precisely Hirschman's prescription for states that seek to limit a potential opponent's power and influence over them ([1945] 1980, 31).

The concentration of trade outside the dyad could influence conflict behavior in another, related way. Recent studies have explored the influence of trade interests on the behavior of third party states as joiners of dyadic conflict (Aydin 2008) or potential mediators (Böhmelt 2010). Economic interests may well lead states outside the dyad to condone or participate in hostilities.[8] At the same time, extra-dyadic trade concentration could affect the extent to which trading partners outside the conflict dyad can exercise influence over a potential belligerent such that dyadic conflict can be avoided. Conflict involvement by a trading partner can have a destabilizing

effect on trade relationships, increase uncertainty in world markets, and, at a minimum, will likely alter the structure of trade of the belligerent state with substantive consequences for its trading partners. Assuming that at least some trading partners would prefer to avoid destabilization, they have incentives to try to exercise influence over the potential belligerent and push the state toward nonviolent dispute settlement. In the context of economic interdependence the most obvious way of doing this is by refusing to act as a substitute market or supplier, but other tactics can be imagined, e.g., economic sanctions.

One conclusion to be drawn is that as the international economy becomes more integrated and alternative markets and suppliers become more numerous, individual (dyadic) trade ties become less important as obstacles to international conflict. This, of course, assumes that the trading partners outside the dyad are willing to pick up the slack created by conflict. Economic incentives for doing so certainly exist. States willing and able to provide an economic exit to other states stand to gain materially from increasing their exports. Moreover, a state looking to restructure its trade relations in the face of conflict may be willing to grant particularly favorable terms, up to a point. States may also have political motives for acting as alternative markets and suppliers. For example, acting as a friend in times of need may be a path toward improving relations with some states at the expense of others.

Whether they act out of pure economic interest or political opportunism, states willing to provide exit options may be—intentionally or unintentionally—enabling conflict. At the same time, the trading partners of members of a conflictual dyad could seek to restrain the belligerent(s) by explicitly refusing to increase their trade shares. However, the ability of third parties to constrain belligerents will decrease as the number of third parties increases and gives rise to collective action problems. A consideration of trade concentration along these lines could inform the literature on cooperation in economic sanctions and on sanctions busting in particular (Kleinberg 2011).

One of the advantages of the measure of trade concentration we use is that it is a conceptually simple and easily calculable operationalization of the notion that actors external to a dyad of interest can influence conflict within it. It can be easily adapted to investigate a range of research questions in the trade-conflict debate. Here we have constructed the indicator using total trade flows. The findings suggest that this was a useful first cut. The next logical step is to disaggregate these flows and

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[8]We thank an anonymous reviewer for this suggestion.

examine the effects of imports and exports in isolation. While the loss of exports is widely considered to be a universal economic bad, the distributional effects of import interruptions are less clear-cut. Some losers from free trade stand to gain from conflict. As a consequence, state leaders may be more sensitive to the concentration of export markets than they are to the concentration of suppliers of imports, with systematic implications for the likelihood of conflict. Similar arguments have been proposed for different types of tradable goods (Dorussen 2006), suggesting further refinements of the trade concentration measure.

Trade can reduce interstate conflict. It can enhance prosperity, raise standards of living, and give leaders and their constituents one more reason to prefer peace to violent conflict. However, this article has shown that increasing global economic integration may not necessarily lead to more peaceful interstate relations. Models of the trade-conflict relationship will miss an important part of the picture unless scholars begin to look more intently beyond the dyad.

Acknowledgments

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