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Does Third-Party Trade Reduce Conflict? Credible Signaling versus Opportunity Costs*

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Abstract

The study of trade and conflict has largely focused on dyadic interdependence, or trade within discrete pairs of states. Yet, states may also be indirectly interdependent, by way of trade to third parties. This paper examines the influence of third-party trade on dyadic conflict initiation. I argue that certain structures of trade provide economically invested third parties with (1) an incentive to discourage dyadic conflict between a potential initiator and a potential target, and (2) the means to show disapproval of conflict by sending trade-based signals of resolve. The argument thus emphasizes the ability of third parties to introduce novel ex post information into bargaining dynamics, causing potential aggressors to reconsider their conflict strategies. Empirical analysis shows that, in fact, when a given dyad shares the sort of trade structures that enable costly signaling by third parties, the probability of conflict initiation declines substantially. In contrast, when third-party trade merely increases a potential initiator's opportunity costs for conflict, conflict behavior remains unchanged.

Keywords: trade and conflict; network analysis; bargaining theory; opportunity costs; militarized disputes

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The study of trade and conflict is now a well-established area of research (Barbieri and Schneider 1999; Mansfield and Pollins 2003). Much of this research focuses on dyadic interdependence, or trade within discrete pairs of states. Yet, the effects of trade are unlikely to be limited to dyads, especially given trends toward increased multinational production, intra-firm trade, and global value-added chains (Brooks 2005; Garrett 2000; Gartzke 2007). A number of recent studies explore the influence of "extra-dyadic" trade on conflict,[1] providing evidence that trade outside the dyad affects conflict just as much as, if not more than, trade within the dyad. However, extra-dyadic trade is complex and highly variegated, and scholars have not yet determined how its pacific effects might vary across different structures of trade.

In developing an answer to this puzzle, I focus on third-party trade, wherein a potential conflict initiator and a potential target share trade ties with a common intermediary. Drawing upon the literature on trade and credible signaling (e.g., Gartzke 2007; Gartzke, Li, and Boehmer 2001; Morrow 1999*a*, 2003; Stein 2003), I argue that third-party trade creates novel signaling opportunities for economically invested third parties. The analysis emphasizes a particular structure of trade, termed "third-party signaling ties," in which a given third party mutually depends on both the initiator and the target as valuable import/export markets and thus has strong incentives to discourage conflict between them. The third party's trade tie to the initiator provides an avenue of influence; by threatening actions or policies that endanger this tie—sanctions, quotas, embargoes, seizures, blockades, etc.—the third party credibly signals opposition to conflict. Sufficiently credible signals introduce ex post information about potential involvement by outside actors, which in turn alters the initiator's expected costs for war and lowers its likelihood of using force. This argument contrasts with the logic of opportunity costs, which ignores signaling dynamics and instead assumes that trade reduces conflict by lowering the potential initiator's ex ante resolve for conflict (Polachek and Xiang 2010; Polachek 1980; Russett and Oneal 2001). While this logic readily applies to dyadic relations, in a multilateral context it yields ambiguous conclusions. An economically integrated initiator might be constrained by the potential loss of multilateral trade ties, but, given its high level of access to substitute import and export markets, it might also be more willing to take political risks (Martin, Mayer, and Thoenig 2008). In light of this ambiguity, I expect third-party ties to

[1] See, for example, Dorussen and Ward (2010); Hafner-Burton and Montgomery (2009); Kinne (2012); Maoz (2009), as well as Aydin (2010); Peterson (2011).

have a greater impact through credible signaling than through opportunity costs.

Empirical analysis of credible signaling encounters nontrivial selection problems. I do not attempt to measure signaling directly but instead premise the analysis on the fact that signaling strategies constitute a key part of states' strategic environment (Morrow 1999*b*). Specific structures of foreign trade provide third parties with novel signaling mechanisms, which alters the strategic environment by allowing third parties to influence the actions of potential aggressors. By examining how changes in the strategic environment affect conflict behavior, we can draw inferences about the role of costly signaling. This approach avoids the selection problems of signaling by focusing on the underlying conditions that enable signaling in the first place.

The analysis also considers how the attributes of third parties themselves condition the effect of third-party signaling ties. Such attributes as intergovernmental organization (IGO) memberships, diplomatic missions, military capabilities, and overall willingness to use force may enhance third-party signaling by raising the aggressor's expected costs for conflict. Further, the argument offers testable implications regarding trade dependence of third parties on conflict initiators. If third parties do indeed engage in costly signaling, then uses of force should cause a decline in third-party trade and an increase in third-party sanctions. Taken as a whole, the results show that when third-party trade merely increases a potential aggressor's ex ante opportunity costs, it has little effect on conflict behavior. In contrast, when third-party trade provides third parties themselves with the incentive and capacity to signal resolve, conflict initiation declines substantially.

The paper proceeds in five parts. First, I briefly review the prevailing causal explanations for how trade affects conflict. Second, I connect these explanations to the special case of third-party trade and generate testable hypotheses. Third, I develop measures of third-party trade. Fourth, I subject the hypotheses, as well as their testable implications, to extensive empirical analysis. The fifth section concludes.

1 Opportunity Costs versus Costly Signaling

While there are numerous explanations for how trade might reduce conflict, most empirical research focuses on either opportunity costs or costly signaling.[2] According to the logic of opportunity costs, because conflict provokes trade diversion by firms and policy retaliation by states, higher levels of dyadic trade increase states' anticipated costs for conflict (Glick and Taylor 2010; Hegre, Oneal, and Russett 2010; Levy 2003; Li and Sacko 2002; Long 2008). Insofar as states—and the private actors within them—value foreign trade, they should exercise constraint in their relations with trade partners. Empirically, as dyadic trade increases, the probability of dyadic conflict should decline.

A prominent critique, developed by proponents of bargaining theories of war, argues that the effect of opportunity costs is indeterminate. In this view, conflict is a consequence of incomplete information about the resolve of opponents (Fearon 1995). Since trade is a known ex ante quantitity, it provides no ex post information about resolve. If trade reduces a potential target's willingness to fight, a rational challenger will simply increase its demands on the less resolved state, leaving the equilibrium probability of war unchanged. However, trade may deter conflict by enabling costly signaling. Policies and actions that threaten trade, such as economic sanctions, convey resolve. Thus, higher levels of dyadic trade reduce conflict by providing avenues for costly signaling that wouldn't otherwise exist.[3]

While these theories have been formulated primarily in dyadic terms, neither is inherently limited to dyads. Indeed, a growing body of research extends these and other logics to extra-dyadic trade ties.[4] Thus far, this research has focused primarily on how extra-dyadic ties increase opportunity costs or enhance costly signaling for dispute participants only. I instead consider the possibility that third parties themselves can exercise leverage over a potential aggressor by exploiting trade ties as signaling devices. By introducing novel information into the bargaining crisis, such costly signals affect the aggressor's choice of strategies.

[2]Dorussen and Ward (2010) and Böhmelt (2010) offer additional explanations, rooted in political community and mediation, respectively.

[3]See Gartzke, Li, and Boehmer (2001); Morrow (1999*a*, 2003); Stein (2003).

[4]See fn. 1.

Empirical analysis of credible signaling is complicated by observability and selection problems. Many signals, such as threats made behind closed doors, are unobservable. Further, those scenarios where signaling may seem most apparent—e.g., crisis escalation, sanctions imposition, etc.—are plagued by selection bias; credible signaling should have avoided the crisis in the first place (Drezner 2003; Krustev 2010). Assessments of credibility are also prone to post-hoc theorizing, where a particular signal's credibility depends on whether it succeeds in deterring conflict. Rather than attempt to measure the actual signaling activity of states, the analysis instead identifies empirical conditions that affect the availability of signaling mechanisms. Ultimately, signaling strategies are part of states' strategic environment (Morrow 1999*b*). I thus examine how states respond to structures of foreign trade that introduce new signaling mechanisms into that environment. This approach, which has been employed by Gartzke (2007) and others, is premised on the simple null hypothesis that if signaling has no effect, then adjusting the availability of signaling strategies while holding all else constant should make no difference in conflict behavior.

2 Triadic Structures and Conflict

At the simplest level, third-party trade involves a triad of three actors (i, j, k), with four possible "extra-dyadic" ties connecting i to j by way of k. Figure 1(a) illustrates these four ties, where i is the potential initiator (i.e., the challenger or sender), j is the potential target (i.e., the defender or receiver), and k is the third party of interest. As is standard in the trade-conflict literature, each tie defines a particular trade dependent relationship. For example, the $i \rightarrow k$ tie may be defined in terms of i's exports to k, or i's imports from k, or some combination of both imports and exports, weighted by i's gross domestic product. The central question is how, if at all, i and j's respective ties to k affect the probability of i initiating a threat, show, or use of militarized force against j. In a standard dyadic analysis, the probability of ij conflict depends solely on ij trade. Here, I hold dyadic trade constant in order to examine the effects of third-party trade.

[Figure 1 about here.]

2.1 Third-party trade and costly signaling

The logic of costly signaling requires that, in the context of a dispute, states take actions or enact policies that convey resolve (Fearon 1994, 1995). As typically formulated, this logic applies only to dispute participants. Signaling allows states that might otherwise fight to credibly show their willingness to fight, thus reducing the likelihood of imprudent demands that push states toward war. Adopting a triadic framework transfers this logic to third parties who are themselves not direct participants in a militarized confrontation but, due to commercial relations with both the initiator and the target, have an incentive to discourage conflict.

For a given k, the $k \rightarrow j$ tie establishes a commercial stake in the potential target. As Long (2008) shows, conflict often reduces trade volumes even for non-disputants. Similarly, Glick and Taylor find that, in the event of war, economic losses "to neutrals are of the same order of magnitude as losses to belligerents" (2010: 103). Conflict imposes transaction costs on traders, such as transportation delays, communication impediments, payment and credit problems, and loss of both physical and human capital (Li and Sacko 2002; Long 2008). Consequently, "Traders [...] prefer stability and eschew conflict" (Stein 2003: 114). Chary traders may seek alternative export and import markets, or they may demand risk premiums—either of which reduces trade volumes (Russett and Oneal 2001: 135). Notably, in response to the Yeonpyeong crisis in 2010, South Korean tourism—a trade in services—suffered an immediate decline, and large Japanese firms, including Sony and Honda Motors, temporarily suspended movement of personnel to the Korean peninsula (Hyo-sik 2010).

While the $k \rightarrow j$ tie provides the third party with an incentive to discourage ij conflict, the $k \rightarrow i$ tie provides a source of leverage over the aggressor. Varieties of conomic coercion—sanctions, seizures, embargoes, blockades, and other trade-damaging policies—are the most readily available mechanisms through which a third party can exercise influence. For brevity, the present analysis focuses only on sanctions; however, the logic of the argument applies to all manner of economic coercion, not only formal sanctions. Baldwin likens sanctions to Schelling's "threat that leaves something to chance"—i.e., an intentionally risky action meant to deter challengers (1985: 113). Recent analyses explicitly theorize economic sanctions as costly signals (e.g., Lektzian and Sprecher 2007; Schwebach 2000; Whang, McLean, and Kuberski 2013). Even when neutral third parties

refrain from direct intervention, they may employ sanctions or threats against belligerents in order to signal disapproval (Peterson and Drury 2011). Notable examples include US sanctions against India in 1971 (for conflict with Pakistan) and against Turkey in 1974 (for the invasion of Cyprus), or Soviet sanctions against China in 1979 (for the invasion of Vietnam).

States generally attempt to defuse nascent disputes using threats to sanction, short of full implementation (Drezner 2003). Indeed, in those situations where sanctions are most likely to be effective, they are least likely to be used, as the threat of their implementation is sufficient to change behavior (Morgan, Bapat, and Krustev 2009). Similarly, non-disputing third parties can signal resolve by issuing threats themselves, thereby introducing ex post information into a crisis. Aggressors who previously assumed their provocations would go unnoticed must revise their strategies in light of the potential new costs generated by the third party's signal.

The credibility of threats—which determines the quality of the information introduced into the strategic interaction—depends on the costliness of the signal itself (Baldwin 1985: 283). The $k \rightarrow i$ tie directly determines the third party's costs for punishing the potential initiator. Without this tie, threats are costless for k and would be viewed, correctly, as cheap talk. Thus, as the third party's tie to the aggressor grows stronger, its capacity for credible signaling increases. From a bargaining perspective, k's ability to credibly signal resolve depends entirely on this $k \rightarrow i$ tie. The signal must be costly for k *regardless of whether it also inflicts costs on the target.*[5] In principle, the tie from i to k has no bearing on k's signal of resolve—though, as discussed below, it may nonetheless condition the deterrent effect of that signal. The combination of the $k \rightarrow i$ tie and the $k \rightarrow j$ tie thus defines the *third-party signaling tie*, illustrated in Figure 1(b). While this particular triadic structure does not, of course, guarantee that signaling will occur, it provides a signaling device that would not otherwise exist. A third party without substantive ties to the target and the initiator lacks either the incentive to influence the initiator, the ability to do so, or both. I thus propose that the k third party's capacity for credible signaling increases as its mutual dependence on the initiator and target increases, which should in turn reduce occurrences of ij dispute initiation.

A possible counterargument is that while the $k \rightarrow i$ tie determines the costliness—and, thus, the

[5]On this point, see Fearon (1994); Gartzke, Li, and Boehmer (2001); Morrow (2003).

credibility—of k's signals, a strong tie may also reduce k's incentive to signal in the first place, due to the associated loss of trade. In fact, higher levels of $k \rightarrow i$ trade dependence should increase credible signaling overall. In bargaining, signals must exceed a minimum level of costliness in order to credibly communicate information (Fearon 1994; Kydd 2005). Below this threshold, signals are uninformative. While less trade dependent third parties face few constraints in threatening the initiator, their signals are unlikely to meet the minimal costs required for credibility and will thus have no impact on bargaining dynamics. Trade dependent third parties, on the other hand, may be more selective in their signaling, but those signals, when sent, are far more likely to be credible. In the former case, signals are abundant but uninformative; in the latter case, they are selective but credible. Only in the latter case do states possess the needed resources for credible signaling.

Of course, the international system consists of more than three states. In an n-actor system, each k third party represents a potential source of costly signaling. As a given i and j increase in the number of third-party signaling ties between them, and as those ties grow stronger, more third parties acquire both the incentive and the means to influence the potential initiator's conflict behavior. While these signals are not directly observed, an abundance of third-party signaling ties provides avenues of influence that would not otherwise exist. If signaling logic holds true, then, ceteris paribus, a strategic environment in which third parties have a greater capacity to express resolve should see fewer conflicts than when signaling mechanisms are otherwise absent. Thus,

> **Hypothesis 1** *The more third-party signaling ties shared by the potential initiator (i) and the potential target (j), and the stronger those ties are, the less likely i is to initiate militarized conflict against j*

2.2 The role of opportunity costs

An important counterargument is that aggressors are not deterred by third-party signals but are instead deterred by potential losses of third-party trade. In principle, the same ties that provide k with signaling mechanisms also increase i's opportunity costs. Gauging the initiator's costs for conflict first requires attention to the $i \rightarrow k$ tie; in a triadic framework, this tie comprises the

totality of i's extra-dyadic trade and is thus the only possible source of opportunity costs. While dyadic ij conflict could, in principle, imperil this tie in myriad ways, I focus in particular on the salient role played by k's trade relations with the prospective j target. As noted above, conflict disrupts trade even for neutral third parties, such as k. Disruptions in trade between k and j in turn pose risks for the initiator's own trade with the third party, particularly if i's exports to k involve intermediate goods that require j as an export market for partly finished or final goods, or, obversely, if k's imports from j are inputs to the manufacture of goods that k in turn exports to i. The $i \rightarrow k \rightarrow j$ and $i \rightarrow k \leftarrow j$ ties, illustrated in Figure 2, maximize i's potential trade-based costs for conflict and thus define *third-party opportunity costs*.

[Figure 2 about here.]

While the logics of opportunity costs and signaling are not mutually exclusive, I nonetheless expect a stronger effect for signaling ties. On the one hand, as others have noted,[6] trade—even with third parties—is a known ex ante quantity and should have little impact on bargaining dynamics. On the other hand, even taking opportunity-costs logic at face value, states must have a reasonable expectation that dyadic conflict will damage their trade relations. In a dyadic context, where conflict occurs between the trading states themselves, such a belief is justified. But in an extra-dyadic context, the economic impacts of conflict are substantially less certain, especially when third-party ties allow for trade diversion and market substitution. While opportunity-costs logic implies that having more partners increases an aggressor's costs for conflict, some argue that, in fact, states with more partners can more easily compensate for lost ties and divert trade elsewhere.[7] Consequently, rather than constraining aggressors, third-party trade emboldens them. This tension between the constraining and emboldening aspects of third-party trade makes the effect of opportunity costs inherently ambiguous. Thus,

Hypothesis 2 *Third-party opportunity costs have an indeterminate effect on conflict initiation*

[6] See fn. 3.

[7] Prominent examples include Hirschman (1980); Mansfield and Pevehouse (2000); Martin, Mayer, and Thoenig (2008). Also see Kinne (2012).

2.3 Theoretical refinements and testable implications

I argue that specific structures of foreign trade provide third parties with novel avenues for costly signaling. Because of this enhanced signaling capability, potential initiators should be less likely to militarize disputes. Here, I refine this argument by exploring its various assumptions and testable implications. In particular, I consider how the attributes of k third parties are likely to affect the credibility and overall deterrent impact of their signals. I also consider the implications of the argument for k's trade dependence on i; if third parties do in fact utilize their trade ties for costly signaling, then, in the event of militarized force, we should observe a decline in the third party's trade with the initiator and/or an increase in economic punishments.

The credibility of third-party signaling may vary according to the overall structure of k's foreign trade. Because states with highly diversified trade portfolios suffer fewer costs when severing individual trade ties, availability of substitute import and export markets may decrease the costliness—and, thus, the credibility—of k's signals. As Morrow (2003: 93) observes, "The side at risk of greater economic dislocation if trade is disrupted suffers higher costs, and so actions it takes to stop trade are more credible signals of resolve." This leads to the counterintuitive conclusion that less integrated third parties are in fact better equipped to convey credibility. A variety of metrics may be used to measure a given k's structure of foreign trade, including trade openness, total number of trade partners, and trade concentration. In general, I expect that as a third party's opportunities for trade substitution increase, mechanisms of costly signaling weaken accordingly, which in turn diminishes the third party's ability to deter aggressors. Thus,

> **Hypothesis 3** *The negative effect of third-party signaling ties on conflict initiation grows stronger as the third party's access to substitute import and export markets declines*

Yet, even if k's signal shows resolve, potential initiators may be unsure of the consequences of incurring k's disapproval. Why, exactly, does a third-party signal deter aggressors? I again consider specific attributes of k, focusing on two general categories of influence: (1) k's capacity for drawing additional actors into the dispute, and (2) k's likelihood of intervening in the dispute directly. In the first category, key considerations include k's total intergovernmental organization (IGO)

memberships and number of diplomatic missions. States increasingly coordinate punishment of aggressors through multilateral channels, such as IGOs or diplomatic networks. Drawing upon organizational and diplomatic resources, a third party can intensify international scrutiny of a conflict. Further, a particularly motivated third party can use these resources to appeal for and mobilize costly multilateral punishments or even direct intervention. The specter of multilateral punishment raises the aggressor's ex post costs for conflict. Of course, the k third party must nonetheless signal resolve in order for these costs to factor into the initiator's strategic calculations; thus, the $k \rightarrow i$ trade tie remains essential. Diplomatic and organizational resources simply enhance the deterrent impact of k's signals by increasing the probability that militarization will meet with unacceptably costly consequences.

Hypothesis 4 *The negative effect of third-party signaling ties on conflict initiation grows stronger as the third party's IGO memberships and diplomatic ties increase*

The second category of interest concerns the third party's capacity for deterring the potential initiator via prospective interventions. For a given i, the consequences of displeasing a militarily weak or pacifist k may be trivial; even if such a third party shows substantial resolve, the signal will have little deterrent effect. In contrast, a show of resolve by a powerful third party, and/or by a third party with a documented history of dispute involvement, is far more ominous. Ceteris paribus, powerful states are better equipped to intervene in disputes directly (Corbetta and Dixon 2005). And states with a proclivity for dispute initiation may simply be more inclined to intervene overall. As above, the $k \rightarrow i$ trade tie remains essential insofar as it allows the third party to credibly signal disapproval. However, the deterrent impact of that signal should increase according to the military capabilities and conflict propensity of the third party.

Hypothesis 5 *The negative effect of third-party signaling ties on conflict initiation grows stronger as the third party's military capabilities and willingness to use force increase*

Finally, the argument offers testable implications about the impact of conflict on third-party trade.

If third parties do in fact utilize trade ties as signaling mechanisms, we should observe at least two outcomes. First, in the event of militarized conflict, where economic threats fail to prevent a dispute outbreak, extra-dyadic trade should decline. That is, if trade dependent third parties are in fact committed to deterring conflict, then implementation of economic punishments will decrease the strength of trade ties. If proved true, this implication provides ex post evidence of the credibility of third-party threats. Second, the argument implies not only a reduction in trade, but also a correlation between conflict and third-party economic punishments. That is, we should observe that shows, threats, or uses of force directly increase sanctioning activity by economically invested third parties. While these implications do not directly address the threats that often precede sanctioning, they emphasize the fact that, if economically invested third parties actually intend to change behavior through signaling, they must respond accordingly to uses of force. Thus:

Hypothesis 6 *Dyadic conflict reduces the strength and/or number of third-party signaling ties between the initiator and the target*

Hypothesis 7 *Dyadic conflict increases the probability of economic sanctions by trade-dependent third parties against the initiator*

3 Measuring Third-Party Trade Dependence

Empirical analysis must determine whether third-party ties affect i's probability of initiating a militarized dispute against j. Measuring third-party trade requires aggregation of third-party ties across all those k countries with whom i and j mutually trade (cf. Dorussen and Ward 2010). The starting point is the $n \times n$ trade matrix, $\mathbf{W}$, where each w_{ij} entry indicates the strength of i's trade tie with j, such that

$$w_{ij} = \left(\frac{\text{Imports}_{ij} + \text{Exports}_{ij}}{\text{GDP}_i} \right)^{1/2}. \quad (1)$$

For a given year of data, **W** encapsulates each state's trade with every other state in the system.[8] Since each matrix entry is weighted by row's GDP, $w_{ij} \neq w_{ji}$. A given w_{ij} matrix entry is thus a directed measure of i's trade dependence on j. This directionality is essential, as it allows for distinctions between the various ties illustrated in Figure 1. Further, operationalizing the matrix in terms of both import and export data allows for states to send costly signals—or incur opportunity costs—via severance either of their import or export ties. (Using only imports or exports yields comparable results.)

I derive measures of third-party trade directly from this **W** matrix. To capture third-party signaling ties between i and j, we must consider both w_{ki} and w_{kj} trade. Specifically, the larger the value of the $w_{ki}w_{kj}$ product, the stronger the signaling tie. If $w_{ki}w_{kj} = 0$, then no signaling tie exists. To measure the full extent of third-party signaling, I sum the value of these $w_{ki}w_{kj}$ ties across all the k third parties with whom i and j mutually trade. Thus, the statistic

$$\sum_{k=1}^{n} w_{ki}w_{kj}, i \neq j \neq k, \tag{2}$$

yields the sum total of third-party signaling ties between i and j. The primary limitation of Eq. 2 is that it cannot differentiate between ij dyads that share a large number of weak $w_{ik}w_{kj}$ ties and ij dyads that share a small number of strong $w_{ik}w_{kj}$ ties. That is, it does not consider the actual *number* of third parties with whom i and j mutually trade but instead sums the total *value* of that third-party trade. Certainly, stronger trade ties increase the credibility of signals. But signals are sent by specific actors. The deterrent effect of third-party trade depends not just on the value of trade, but also on the number of states that could potentially punish the aggressor. Each third party is a potential source of an informative costly signal. The greater the number of k third parties capable of imposing economic punishments, the more likely i is to exercise constraint.

[8]Trade data are from Gleditsch (2002). The square-root transformation reduces the influence of outliers. I use this transformation, rather than the more common log transformation, for two reasons. First, many observations contain zero values, for which the log transformation is undefined. Second, and more importantly, because the log transformation severely compacts the data, it creates extremely high correlations between the various measures of third-party trade, making it impossible to estimate the effects of these variables without risk of multicollinearity. The results are nonetheless generally robust to the log transformation.

I thus generate a dichotomized version of the $\mathbf{W}$ matrix, denoted $\mathbf{W^D}$, where

$$w_{ij}^{D} = \begin{cases} 1 & \text{if } w_{ij} > 0 \\ 0 & \text{if } w_{ij} = 0, \end{cases} \tag{3}$$

and $w_{ki}^{D} w_{kj}^{D} = 1$ indicates simply that a third-party signaling tie exists between i and j, regardless of that tie's value.[9] The statistic

$$\sum_{k=1}^{n} w_{ki}^{D} w_{kj}^{D}, i \neq j \neq k, \tag{4}$$

yields a count of the total number of third parties with whom the initiator and target share third-party signaling ties, each of which represents a potential source of signaling.

In general, Eq. 2 gives greater weight to k third parties that exhibit high trade-to-GDP ratios in their trade ties (e.g., trade dependent states), while Eq. 4 gives greater weight to k third parties with numerous trade partners (e.g., large trading states). Considering the $\mathbf{W}$ and $\mathbf{W^D}$ matrices together allows us to capture two key aspects of third-party trade: (1) the actual value, in terms of trade-to-GDP ratios, of costly signaling ties between i and j, and (2) the total number of third parties involved. Following Kinne (2012), I balance these two aspects of trade using a tuning parameter, denoted α. Formally, for a given ij dyad, third-party signaling ties are measured as:

$$\text{3rd-party signaling ties } (ij) = \left(\sum_{k=1}^{n} w_{ki} w_{kj} \right)^{1-\alpha} \times \left(\sum_{k=1}^{n} w_{ki}^{D} w_{kj}^{D} \right)^{\alpha} \times \frac{1}{n-2}, i \neq j \neq k \tag{5}$$

where $n-2$ standardizes the measure across multiple years of data. When $\alpha = 0$, Eq. 5 ignores the number of ties between i and j, taking account only of the strength of third-party signaling ties. When $\alpha = 1$, the measure instead ignores the strength of third-party ties and considers only the number of ties. Setting $\alpha = 0.5$ strikes a balance between these two extremes.[10]

[9] Increasing the threshold for $w_{ij} = 1$ does not substantially alter the results.

[10] The results are robust to variations in α of ± 0.3.

As discussed above, we must also control for third-party opportunity costs. I focus on the structures identified in Figure 2. In practice, measures of the two structures are highly correlated and yield comparable empirical results. I thus focus on the $i \rightarrow k \rightarrow j$ tie, which others have used to capture third-party trade (Dorussen and Ward 2010: 35). Following the same procedure as in Eq. 5, I operationalize third-party opportunity costs as follows:

$$\text{3rd-party opportunity costs } (ij) = \left(\sum_{k=1}^{n} w_{ik} w_{kj}\right)^{1-\alpha} \times \left(\sum_{k=1}^{n} w_{ik}^{D} w_{kj}^{D}\right)^{\alpha} \times \frac{1}{n-2}, i \neq j \neq k. \quad (6)$$

Importantly, Eqs. 5 and 6 differ only in their denominators. That is, Eq. 5 incorporates k's dependence on i, while Eq. 6 incorporates i's dependence on k, as defined by their respective GDPs, and both incorporate k's dependence on j. I exploit this similarity to ensure empirical differentiation between opportunity costs and signaling. In multiple regression, the shared variation between the two measures has no impact on the estimated independent effect of each. Incorporating both effects into the same model thus allows us to assess the impact of third-party signaling ties when opportunity costs are not a potential confounding factor, and vice versa.[11]

A nontrivial concern with these measures is that, because they are based on k's trade dependence on i and j, they may be biased toward economically underdeveloped third parties, whose trade-to-GDP ratios are likely to be high; such states would not seem to be influential signalers. Consideration of k's individual attributes, as discussed by Hypotheses 4 and 5, partially ameliorates these concerns. As well, Eq. 4 emphasizes number of trade ties rather than trade-to-GDP ratios, which further removes bias toward small states. Even so, I subjected the measures to extensive face validity checks. Based on the measure of third-party signaling ties, relevant k third parties tend to be heavily integrated, globally influential economic actors. For example, for France and West Germany in the 1950s, the most relevant third parties are Belgium, Netherlands, Luxembourg, Austria, and Nordic states like Norway, Denmark, and especially Sweden. For China and the United States in the 1990s, key third parties include South Korea, Singapore, Malaysia, Ireland, and Japan. Iran and Israel's

[11] Of course, other measures, such as trade openness, can also be used to capture i's third-party opportunity costs. I explored numerous possibilities, but none fundamentally altered the results. See the online appendix.

third-party ties include Netherlands, Belgium, Singapore, South Korea, Greece, Switzerland, South Africa, and Turkey. In short, the measures do not disproportionately favor economically weak third parties.

[Figure 3 about here.]

Figure 3 illustrates the two measures for the Americas in the year 2000.[12] The proximity of nodes indicates the extent to which countries are tied together by third-party trade. In Figure 3(b), for example, the close proximity of Guatemala (GUA), El Salvador (SAL), and Honduras (HON) indicates that these three countries share more opportunity-costs ties with one another than with anyone else. Notably, the graphs reveal substantial similarities, showing that, as suggested above, opportunity costs and signaling ties often overlap. Nonetheless, notable differences emerge. For example, in Figure 3(b), the US and Canada share many ties with one another but are relatively isolated from others. With signaling ties, however, the US and Canada are proximate not only to one another, but also to Mexico (MEX), Colombia (COL), and even Brazil (BRA). Some countries shift dramatically between graphs. For example, Cuba (CUB) is relatively isolated in its opportunity-costs ties but shares third-party signaling ties with Panama (PAN), Dominican Republic (DOM), Ecuador (ECU), and, to a lesser extent, Venezuela (VEN).

4 Empirical Analysis

The statistical analysis covers the period 1950–2001 and utilizes a directed-dyad-year unit of observation. The dependent variable is dichotomous, equal to one if i initiates a militarized interstate dispute (MID) against j in the current year, zero otherwise. Using directed dyads allows for explicit consideration of the directionality of trade dependence (cf. Bennett and Stam 2000; Hegre 2004; Morrow 1999*b*). For these data, "initiation" does not necessarily mean that i bears responsibility for the dispute; rather the initiator is merely the first state to threaten, show, or use militarized

[12]The full international system is too large to display in an MDS graph. I choose the Americas simply because these countries vary substantially in their structures of foreign trade.

force (Maoz 2005). This data construction fits well with the hypotheses. If third parties signal resolve with sufficient credibility, then potential initiators should be unlikely to militarize disputes.

The estimation primarily relies on binary logit models with robust standard errors clustered on directed dyads. The use of naïve binary logit for dyadic conflict data has recently been criticized, rightly, for ignoring such data issues as unobserved heterogeneity and non-independent observations (e.g., Green, Kim, and Yoon 2001; Neumayer and Plümper 2010; Ward, Siverson, and Cao 2007). Since the goal of this analysis is to test the effects of novel independent variables, not to develop new models of dyadic conflict, I generally adopt current standards in the field. Nonetheless, I later incorporate fixed- and mixed-effects models to account for data complexities.

The baseline model includes a standard battery of control variables. Full descriptions—including descriptive statistics, pairwise correlations, and collinearity diagnostics—are available in the online appendix. The controls include:[13]

- Country i's trade dependence on j, defined as the log-transformed ratio of i's trade with j to i's GDP (Gleditsch 2002). This variable is essential in distinguishing the dyadic from the extra-dyadic effects of trade.
- The lower of i and j's Polity IV scores (Jaggers and Gurr 1995).
- The sum of i and j's log-transformed Correlates of War CINC scores (Singer 1987; Singer, Bremer, and Stuckey 1972). This variable specifies a gravity model of conflict, which yields a better fit and more predictive power than "major powers" models (Hegre 2008).[14]
- A military alliance dummy variable that equals one if i and j share an entente, neutrality pact, or defense treaty, and equals zero otherwise (Gibler and Sarkees 2004).
- A dummy variable that equals one if i and j are geographically contiguous or separated by less than 400 miles of water, and equals zero otherwise (Stinnett et al. 2002).
- The log-transformed distance between i and j's capital cities (Gleditsch and Ward 2001).

[13]The online appendix includes robustness checks for numerous additional controls.

[14]The results are highly robust to controls for major powers and relative capabilities. See the online appendix.

- A peace-years control, from which I generate a cubic spline with three interior knots (Beck, Katz, and Tucker 1998).
- A control for system size (Raknerud and Hegre 1997).

4.1 Main Results

I first separately estimate the effects of third-party opportunity costs and signaling ties. As shown by the first two columns of Table 1, each measure yields a negative, statistically significant estimate. Unsurprisingly, these measures correlate at about 0.8. This high correlation means that the apparent impact of third-party signaling ties may in fact be due to opportunity costs, or vice versa. Model 3 thus includes both measures. The estimate for opportunity costs is now insignificant, while the estimate for signaling ties remains negative and is significant at the $p < 0.05$ level. This finding suggests that potential initiators are in fact not deterred by the prospect of lost third-party trade, but are instead deterred by costly signals from economically invested third parties.

[Table 1 about here.]

This possibility is reinforced by examining the predicted probabilities associated with each measure. Figure 4 plots changes in the probability of initiation across values of the triadic variables. As shown in Figure 4(a), when estimated in separate models, the signaling ties and opportunity costs variables appear to have comparable effects; when increased from its minimum to its maximum value, the former variable reduces the probability of conflict initiation by over 85%, while the latter reduces the probability of initiation by about 70%. However, when combined in the same model, as illustrated in Figure 4(b), the effect of opportunity costs virtually disappears, while signaling ties continue to reduce the probability of conflict initiation by nearly 80%.

[Figure 4 about here.]

Models 4 and 5 modify the logit model to account for unobserved heterogeneity. Model 4 employs fixed-effects logit (Green, Kim, and Yoon 2001). Since this method drops all dyads that do not

experience $i \rightarrow j$ conflict in the period under analysis, the sample is dramatically reduced.[15] Regardless, the estimates mirror those from previous models. Signaling ties reduce conflict while opportunity costs have no effect. Substantively, this within-panel estimation indicates that pairs of states that accumulate more and stronger signaling ties over time grow less likely to initiate militarized force against one another. The accumulation of ties that merely increase opportunity costs, however, has no effect on militarized force.

Dyadic data may also contain unobserved heterogeneity across individual initiators (i) and targets (j). To account for this possibility, following the suggestion of Beck and Katz (2001), I employ random effects analysis. Specifically, I estimate a mixed-effects logit model with crossed random effects for initiator (ζ_i) and target (ζ_j).[16] As shown in the last column of Table 1, the estimates for the random effects are highly significant, which suggests that the mixed-effects model is more efficient than the simple logit model. More importantly, the estimated effect of signaling ties is not only significant in the expected direction but is also substantially more precise than in the pooled logit model. The estimate for opportunity costs, on the other hand, remains insignificant.

4.2 Additional Hypotheses and Testable Implications

The results thus far indicate that when a potential initiator's trade is structured such that third parties acquire an enhanced capability for credible signaling, ij dispute initiations decline. On the other hand, when third-party trade merely increases the initiator's opportunity costs, it has no effect. Exploring the testable implications of the theory sheds further light on these results.

Hypotheses 3, 4, and 5 involve attributes of the k third parties to whom i and j are mutually tied. To test these hypotheses, I condition the measure of third-party signaling ties, defined in Eq. 5, on the attributes of k. Specifically, I distinguish between k third parties that exceed the mean on some relevant unit attribute, and third parties that fall below the mean. For example, to test the

[15] I also estimated a linear probability model, which retains the full sample (Martin, Mayer, and Thoenig 2008; Wooldridge 2002). The estimate for signaling ties was negative and significant at $p < 0.001$, while the estimate for opportunity costs was *positive* and significant at $p < 0.001$.

[16] Mixed-effects models are sensitive to highly correlated covariates. I thus drop the cubic splines—which are highly correlated by intention—and include only the peace-years variable.

impact of k's level of trade openness, I derive two disaggregated measures of third-party signaling ties: one based on ties to k third parties of above-average openness, the other based on ties to third parties of below-average openness. To fully test H3, I also apply this technique to k's total number of trade partners and to the inverse of k's trade concentration.[17] H3 predicts that third parties with fewer opportunities for trade substitution send more credible signals. Thus, I anticipate that when third parties fall below the mean in either trade partners, trade openness, or trade concentration, dispute initiations by i against j should decline.

[Figure 5 about here.]

I estimate three separate models (one each for trade partners, openness, and concentration), in each case replacing the measure of third-party signaling ties with the two disaggregated measures. Controls are the same as for Model 1. The left-hand panel in Figure 5 illustrates the key results. As anticipated, when the initiator's third-party partners are easily able to divert trade—i.e., they are more trade open, have more partners, and/or have less concentrated structures of foreign trade—signaling ties have virtually no impact on the initiator's conflict behavior. In contrast, when trade ties involve third parties with limited access to substitute import and export markets, the potential initiator's probability of initiating militarized force significantly declines. Third parties can better signal resolve if they face nontrivial costs for doing so (Morrow 2003).

H4 and H5 involve attributes of k that increase the initiator's potential costs for conflict. Combined with appropriate mechanisms of credible signaling, these attributes should lower i's probability of dispute initiation. Specifically, when economically invested third parties exhibit above-average levels of IGO membership, diplomatic activity, military capabilities, or conflict involvement, the initiator faces greater costs for militarization. I employ the same approach here as for the tests of H3.[18] As illustrated by the right-hand panel of Figure 5, the results are generally as expected. Ties to states that exhibit above-average levels of IGO membership have a slightly stronger effect

[17] All measures use trade data from Gleditsch (2002). Trade concentration is calculated according to the index developed by Hirschman (1980).

[18] Data on IGO membership, capabilities, and MIDs are from the same sources as in the main model. Diplomacy data are from Bayer (2006). The "Conflict Propensity" attribute is defined as the number of MIDs initiated by k in the last three years.

than do ties to states that exhibit below-average levels of membership—though neither estimate is statistically significant. Ties to diplomatically active third parties, on the other hand, do in fact significantly reduce dispute initiations ($p < 0.05$), while ties to less diplomatically active states have no effect. Power and conflict propensity exercise the strongest influence. Ties to militarily powerful third parties dramatically reduce dispute initiations, while ties to weaker states have no effect. Similarly, ties to more conflict-prone states significantly reduce dispute initiations, while ties to more pacific states have no effect. Overall, the greater the third party's capacity to alter the potential initiator's costs for conflict, the greater the deterrent effect of third-party trade.

Finally, H6 and H7 specify additional implications of the signaling argument. If economically invested third parties do in fact engage in costly signaling, then conflict should decrease the volume and/or number of third-party signaling ties. I test this implication by regressing the measure of signaling ties (Eq. 5) on multiple lags of the MID dependent variable. Following Hegre, Oneal, and Russett (2010), I specify a gravity model of trade, with GDP, population, regime type, contiguity, and military alliances as controls. The estimation also incorporates dyadic fixed effects and robust standard errors. The key estimates, shown in Figure 6(a), are negative, as expected. The MID lags lead to a decline in third-party signaling ties. However, given the strong correlation between the respective measures of signaling ties and third-party opportunity costs, we must separate the impact of conflict on the former category from its impact on the latter. I employ a two-stage model, regressing signaling ties on opportunity costs and capturing the residuals. Large values of the residuals indicate dyads that share many signaling ties but few third-party opportunity costs. I then incorporate these residuals as the dependent variable in the gravity model. The results, shown in Figure 6(b), reveal that the MID lags remain negative and highly significant. Dyadic conflict does indeed reduce third-party signaling ties, distinct from any impact on opportunity-costs ties.[19]

[Figure 6 about here.]

H7 argues that dyadic disputes not only reduce signaling ties, but also encourage sanctions from economically invested k third parties. To test this implication, I construct a variable that measures,

[19]Using the same approach, I also tested the effect of MIDs on third-party opportunity costs. The estimates were statistically insignificant.

for a given year, the number of discrete sanction events by k against i, where k is defined as any state that occupies the third-party role in a signaling tie between i and j.[20] We must determine whether conflict initiation by i against j increases the probability of sanctions by k against i. Figure 6(c) shows the key results. Estimates for all the MID lags are positive, and the $t-1$ lag is statistically significant at better than $p < 0.01$, indicating that, consistent with H7, dispute initiations effectively increase the probability of sanctioning by economically invested third parties. This finding confirms that even when third parties share valuable trade ties with the initiator, they are willing to put these ties in peril by implementing costly punishments. Overall, the testable implications of the argument are strongly supported by the data.

5 Conclusion

This analysis extends the logic of costly signaling to the case of third-party trade. Rather than focusing on signaling by dispute participants, I explore the possibility that economically invested third parties use their trade ties to discourage militarization. The analysis identifies particular structures of trade that are likely to affect availability of signaling mechanisms for third parties, and shows that when a given ij pair of states shares a strategic environment in which economically invested third parties have ample opportunities for costly signaling, conflict initiations by i against j decline. Extensive analysis of additional hypotheses and testable implications confirms these results. The online appendix further shows that the results are highly robust to a wide variety of alternative model specifications.

A prominent explanation for the trade-conflict relationship, rooted in opportunity costs, finds little support in this analysis. Indeed, opportunity costs appear to matter only when signaling is excluded from the model. But in that case, given the high correlation between signaling ties and opportunity costs, we cannot be sure which of the effects is actually responsible for the results. Substantively, these findings suggest that potential initiators are not greatly deterred by the prospect of lost third-

[20] I standardize this measure by the number of states in the system for each year. Sanctions data are from Morgan, Bapat, and Krustev (2009). I also control for the capabilities ratio between i and j, the democracy ratio between i and j, the presence of an ij military alliance, and the trade dependence of i on j. See online appendix for full results.

party trade. A key dilemma of opportunity-costs logic is that, when expanded to the multilateral level, the effects of trade become increasingly ambiguous. If multilateral trade lowers the costs of diversion and substitution, then extra-dyadic ties are just as likely to embolden aggressors as constrain them (Hirschman 1980; Kinne 2012; Martin, Mayer, and Thoenig 2008).

In contrast, the evidence for costly signaling is strong. In all models, the measure of signaling ties yields statistically significant estimates in the hypothesized direction. Substantively, when a potential initiator and a potential target's third-party ties are structured in such a way that third parties acquire new mechanisms of costly signaling, conflict initiation is much less likely, irrespective of the initiator's ex ante third-party opportunity costs. Nonetheless, these results do not directly assess the signaling activity of third parties. An important avenue for future research, then, is to focus more directly on the observability and selection problems inherent to costly signaling, perhaps at the level of qualitative case-study analysis. In any case, the results of the present study provide important new evidence of a hitherto unrecognized signaling dynamic.

More generally, the analysis confirms that third-party trade substantially impacts conflict behavior, above and beyond the effects of dyadic trade. This finding is consistent with growing evidence on the influence of multilateral trade on conflict (Aydin 2010; Dorussen and Ward 2010; Hafner-Burton and Montgomery 2009; Kinne 2012; Maoz 2009; Peterson 2011). In fact, in most of the models, dyadic trade is statistically insignificant. At the same time, the analysis shows that some forms of multilateral trade more effectively reduce conflict than others. In the realm of third-party trade, at least, mechanisms of signaling appear to more strongly deter conflict than does the prospect of lost commerce. This conclusion is intuitively sensible; for a prospective initiator, the costs created by the involvement of third parties in a dispute—for example, via appeals for multilateral attention or even coordinated interventions—are likely to be far more substantial than any costs associated with foregone trade.

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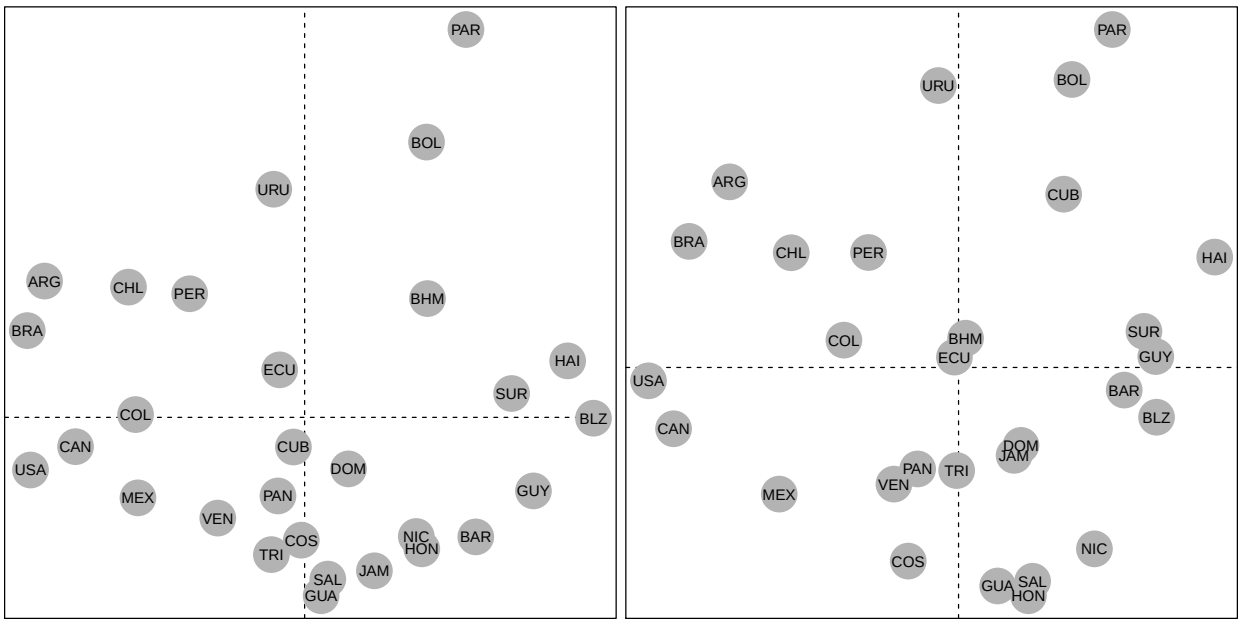
(a) Possible third-party ties (b) Third-party signaling tie

Figure 1: Types of third-party trade ties. State i is the initiator of conflict, j is the target of conflict, and k is the third party. Arrows/ties indicate trade dependence of one state on the other.

Figure 2: Third-party opportunity-costs ties. State i is the initiator of conflict, j is the target of conflict, and k is the third party. Arrows/ties indicate trade dependence of one state on the other.



(a) Signaling ties (b) Opportunity-costs ties

Figure 3: Third-party trade ties in the Americas, year 2000. Proximity of nodes indicates extent of third-party trade. Node positions determined by multidimensional scaling, with slight jittering to increase readability.

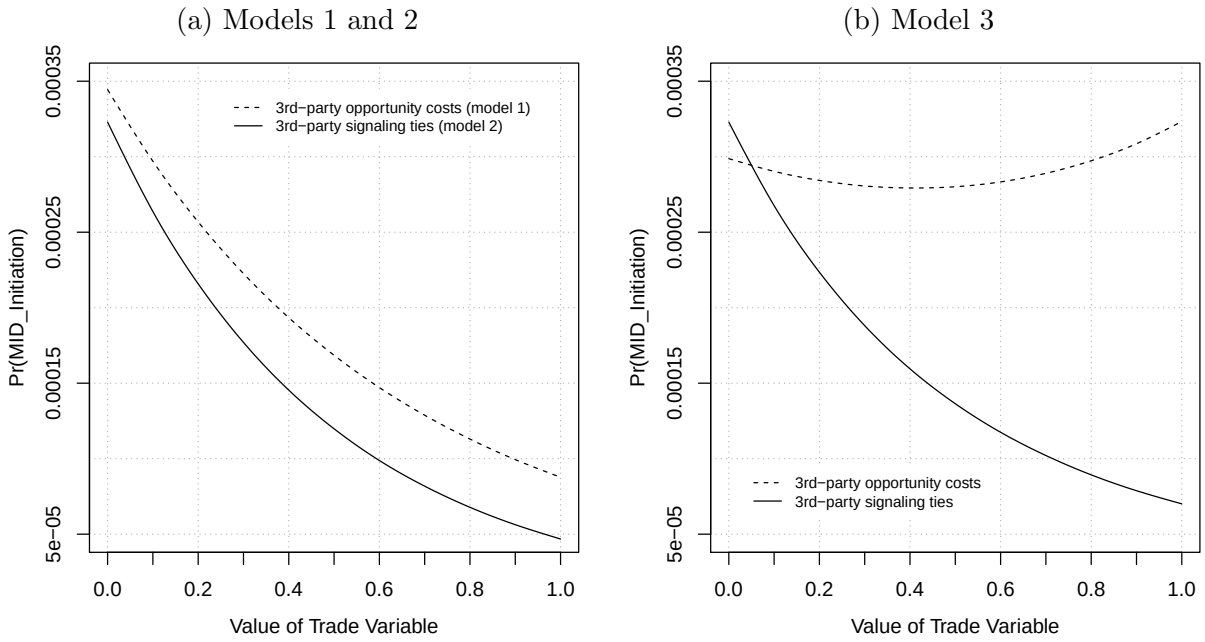


Figure 4: Predicted probability of dispute initiation across levels of third-party trade. To facilitate comparison, measures of third-party trade standardized between zero and one. Control variables (not shown) held at respective means.

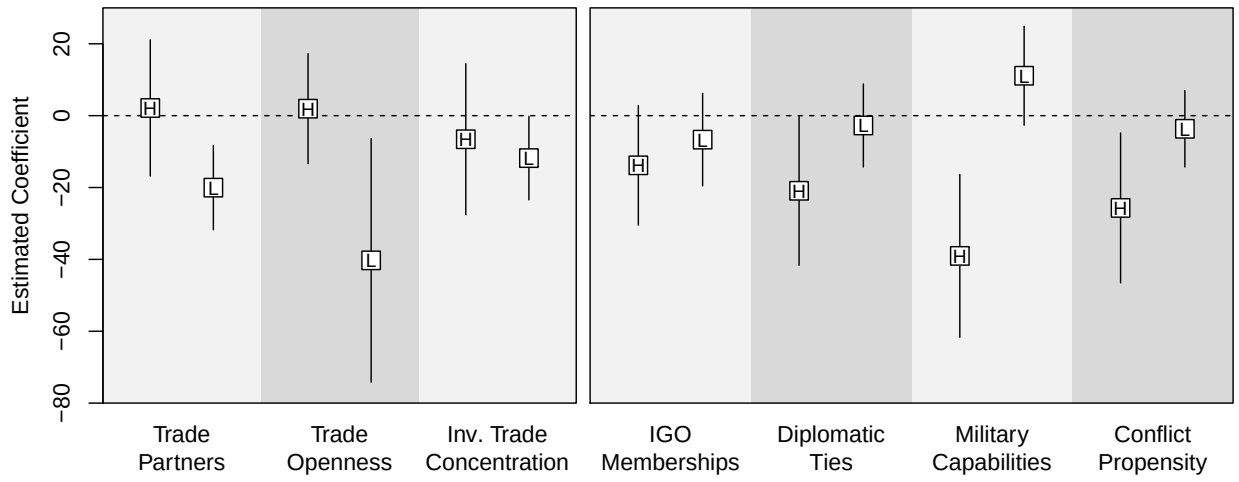


Figure 5: Estimated effect of third-party signaling ties on conflict initiation, conditional on third-party attributes. "H" indicates that third parties fall above the mean on the relevant attribute. "L" indicates that third parties fall below the mean. Squares are point estimates. Lines are 95% confidence intervals. Full results in online appendix.

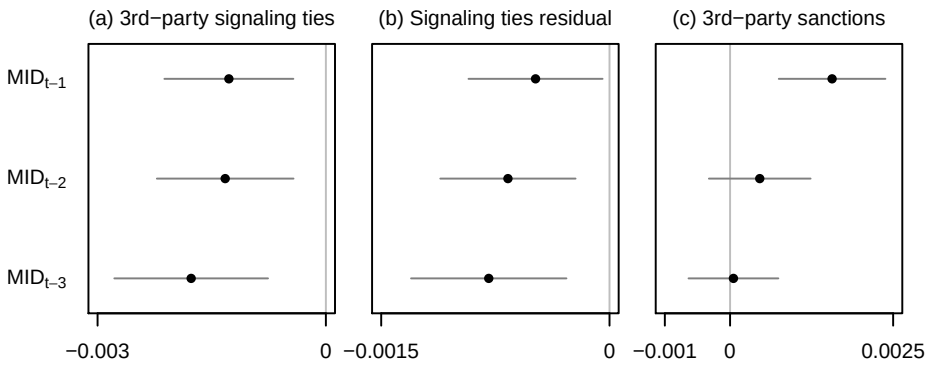


Figure 6: Estimated effect of conflict initiation on third-party signaling ties and $k \rightarrow i$ economic sanctions. Dots are point estimates. Lines are 95% confidence intervals. Fixed-effects panel estimation with robust standard errors. Full results in online appendix.

Table 1: Directed Dyad-Year Estimates of $i \rightarrow j$ Dispute Initiation, 1950–2001

	(1) MID[a]	(2) MID[a]	(3) MID[a]	(4) MID[b]	(5) MID[c]
3rd-party opportunity costs	-13.07**		-2.330	17.06	5.912
	(4.470)		(7.605)	(8.903)	(6.261)
3rd-party signaling ties		-10.18***	-9.136*	-25.13***	-16.51***
		(2.393)	(4.383)	(5.288)	(3.339)
Democracy (low)	-0.0319***	-0.0276***	-0.0275***	0.0418***	.0005
	(0.00728)	(0.00707)	(0.00709)	(0.00797)	(0.00675)
Trade dependence	-0.000282	-0.00270	-0.00175	-0.0284***	-0.0124*
	(0.00886)	(0.00814)	(0.00878)	(0.00812)	(0.00591)
Capabilities $(i + j)$	0.378***	0.401***	0.401***	0.152**	0.369***
	(0.0213)	(0.0232)	(0.0235)	(0.0502)	(0.0291)
Military alliance	0.0236	0.0521	0.0515	-0.251	-0.359***
	(0.116)	(0.117)	(0.117)	(0.137)	(0.0892)
Contiguity	1.824***	1.866***	1.858***	0.520	2.001***
	(0.194)	(0.197)	(0.192)	(0.323)	(0.145)
Distance	-0.685***	-0.674***	-0.678***		-1.059***
	(0.0570)	(0.0577)	(0.0573)		(0.0472)
ζ_i					1.157***
					(0.0928)
ζ_j					0.780***
					(0.0618)
Constant	5.330***	5.471***	5.520***		5.869***
	(0.613)	(0.637)	(0.621)		(0.603)
N	943152	943152	943152	26185	943152
Pseudo-R^2	0.344	0.345	0.345	0.058	
Log-likelihood	-7776.5	-7769.2	-7769.1	-4192.5	-7435.9
Method	Logit	Logit	Logit	FE Logit	ME Logit

Coefficients for peace years, cubic splines, and system size not shown

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a] Robust standard errors in parentheses, clustered on dyads.

[b] Standard errors in parentheses. 29,274 dyads dropped due to no positive outcomes.

[c] Standard errors in parentheses. Log-likelihood based on Laplacian approximation with one integration point per level. Cubic splines excluded. χ^2 of LR test = 1359; Prob > χ^2 = 0.00.