Extended Trade Dependence, Alliance Network Centrality, and Conflict Initiation

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Abstract

According to the idea of extended dependence (Chen, 2021), in a directed dyad setting, a challenger's trade dependence on a target's defensive allies decreases the likelihood that the challenger initiates military conflict. The deterrence works because the target's allies are both willing and able to impose severe economic punishment on the challenger. We refine this argument by introducing *conditional extended dependence*. We argue that for extended dependence to deter a potential challenger *ex ante*, the target's allies must overcome two challenges. First, the potential challenger must believe those allies would credibly follow through with the threat of sufficiently harmful economic punishment. Second, the target's allies successfully coordinate collective action to prevent the challenger from finding substitute markets. Extended dependence is more likely to fulfill these conditions when a "significant" state is centrally positioned within the target's alliance network and exerts substantial leverage over other allies. Our empirical analysis demonstrates that extended dependence deters Militarized Interstate Dispute (MID) initiations *conditionally* between 1951 and 2012, but *unconditionally* from 1870 to 1950. We trace this distinction to changes in the alliance system over time and to the declining reliability of defensive alliances, necessitating collective action among allies for deterrence to work in the post-1950 period.

Keywords: alliance, trade, conflict

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Introduction

Does trade reduce interstate military conflict and promote peace? A vast body of literature in International Relations has explored this question theoretically and empirically. Scholars have produced mixed findings regarding whether dyadic trade dependence reduces military conflict. Although most studies show that bilateral trade dependence is negatively associated with dyadic conflict (Polachek, 1980; Russett & Oneal, 2001; Gartzke et al., 2001), some scholars show an indeterminate or positive relationship (e.g., Keshk et al., 2004; Barbieri, 1996; Copeland, 2014).[1] While the relationship between dyadic interdependence and conflict has not been fully settled, scholars have recently shifted their attention to the impact of third-party or extra-dyadic trade.

Many studies find that extra-dyadic trade or embeddedness in global trade networks and communities reduces interstate conflict (Maoz, 2009; Dorussen & Ward, 2010; Lupu & Traag, 2013; Kinne, 2012, 2014). Other studies further suggest that the effects of third-party trade are more nuanced and often conditional. For example, Peterson (2011) argues that because trade gains have security externalities, third-party trade reduces the likelihood of dyadic conflict initiation for politically similar dyads but increases it for politically dissimilar dyads. Kleinberg et al. (2012) argue that when two states have few alternatives to their dyadic trade, as reflected in a high concentration of extra-dyadic trade, the risk of dyadic military dispute onset declines. Feldman et al. (2021) suggest that because naval power improves a state's ability to substitute trade partners, the pacifying effect of third-party trade on dyadic conflict initiation increases with a rise in the potential target's naval power

[1] The literature is too large to be comprehensively reviewed here. For surveys of the literature, see Mansfield & Pollins (2001) and Mansfield & Pollins (2009).

but decreases with a rise in the initiator's naval power. Thus, the effect of third-party trade depends on the intentions of the two countries within a dyad and their outside options.

One possibility these studies do not consider is that a third party could directly intervene on behalf of the target, thus deterring the initiator. Chen (2021) investigates this possibility and advances a novel argument called "extended dependence." The premise of extended dependence is that the rising costs from trade disruption imposed by the target's *defensive allies* could be so severe as to deter the challenger. As Chen (2021, 246) argues, "trade with a potential target's allies promotes peace because those states may reduce trade with the challenger following military intervention, punish it by imposing economic sanctions, or undermine its ability to access alternative markets." Thus, under extended dependence, in the directed dyad setting, a challenger's trade dependence on a target's defense-pact allies decreases the likelihood that the challenger initiates military conflict.[2] The novelty of extended dependence is that it connects dyadic conflict initiation with third-party trade and security alliance coherently, specifying both the allies' incentive to intervene due to security obligations and their economic leverage over the challenger.

The question we raise in this article is: under what circumstances is extended dependence more likely to deter the challenger, or, in other words, under what conditions is extended dependence more likely to work? We argue that for extended dependence to deter a potential challenger from initiating military conflict, the target's allies must overcome two challenges. First, the potential challenger must believe that the third-party allies would credibly follow through with the threat of sufficiently harmful economic punishment, often against the

[2]The extended dependence variable is formally operationalized as "the sum of the challenger's trade volume with the target's allies divided by the challenger's GDP" (Chen, 2021).

economic interests of those allies themselves. Second, the target's allies must successfully coordinate collective action to prevent the potential challenger from finding substitute markets. In our conception, extended dependence is more likely to fulfill these conditions when a "significant" state is centrally positioned within the target's alliance network and exerts adequate leverage over other allies to orchestrate collective action. In other words, the effectiveness of extended dependence depends on the degree to which this "significant" state is centrally positioned within the target's alliance network and possesses strong influence over other allies. Our empirical analysis demonstrates that extended dependence deters Militarized Interstate Dispute (MID) initiations *conditionally* between 1951 and 2012 but *unconditionally* from 1870 to 1950. We trace the source of this distinction to the changing nature of the alliance system over time and the declining reliability of defensive alliances, making collective action among the target's allies increasingly necessary for deterrence against potential challengers in the post-1950 period.

The rest of the article proceeds as follows. We first explain why it is usually difficult for third parties to deter military conflicts through trade because of credibility and collective action problems, and lay out the conditions under which third-party allies may credibly deter hostile states from initiating military conflicts through extended dependence. Then, we test our theoretical expectation and report our findings for a sample of directed dyads during the post-WWII period, along with various robustness tests. Next, we examine whether the post-1950 finding generalizes to the pre-1951 period and explore why extended dependence operates unconditionally in the earlier period but conditionally in the later period. Finally, we discuss the implications of our findings.

Trade with Third Parties and Deterrence

Under what conditions is extended dependence likely to be effective? For extended dependence to deter a potential challenger from initiating military conflict, the target's allies must overcome two challenges. First, the potential challenger needs to *believe* that the third-party allies would credibly follow through with the threat of economic punishment, producing sufficient harm. Because economic punishment would harm the welfare of both the challenger and the third-party allies, the latter may be unwilling to impose harsh economic sanctions out of concern for their own economic prosperity. Past research shows that allies are unreliable, at least sometimes, in keeping their defense commitments (B. A. Leeds, 2003). Therefore, potential challengers may find a third party's (explicit or implicit) threat to impose economic punishment lacks credibility and risk initiating a military conflict with the hope that the third-party ally would renege on its commitment.[3] Furthermore, even if the third-party allies impose economic punishment, the challenger might hope that it would be merely a token gesture, without inflicting serious economic harm. It is important to note that during military conflicts, states often do not entirely stop trading with each other, as shown by the belligerents during WWI (Grinberg, 2021). Even during a full-scale war, hostile third parties would reduce trade with the belligerent state by only 30 percent on average (Feldman & Sadeh, 2018). More recently, various European countries continued to trade with Russia

[3]For this article, we use the term *threat* in a broad sense. We assume that a challenger is aware that the target's allies may come to the latter's aid if the former initiates a military conflict. From the challenger's perspective, the threat from the target's allies need not be explicit; it is often implicit during peacetime. We can conceptualize a target's allies issuing implicit threats to impose economic punishment on the challenger should it initiate a military conflict. This interpretation is consistent with the notion that deterrence could discourage a challenger from initiating military aggression through explicit *or* implicit threats (Snyder, 1960).

to a limited extent out of concern for their welfare.

Second — and more importantly — deterrence by the target's allies can only work if they successfully orchestrate collective action to prevent the potential challenger from accessing substitute markets. Even when extended dependence is high, the challenger might consider the economic punishment tolerable and not sufficiently costly if it can quickly find substitute markets (Kleinberg et al., 2012; Feldman et al., 2021). In a similar vein, Eyler (2007, 54) notes that for sanctions to be effective, a country that initiates economic punishment must use credible threats to prevent other countries from providing substitute markets for the country being punished.

Some may wonder whether this problem of substitute markets and outside options is mitigated if the target has numerous allies, under the logic that multiple allies would share the costs of imposing economic punishment on the challenger and thereby reduce the number of outside options. However, the fact that the target has many allies does not necessitate effective deterrence against the challenger. Those third-party allies who care more about their own economic welfare have less incentive to impose economic punishment on the challenger and prefer that others intervene more. At least some members in the alliance network have an incentive to free-ride on the economic punishment by others; it is in one's own interest to continue trading with the challenger while others bear the burden of deterrence. This possibility is consistent with Early (2009)'s finding that close allies of the sanction sender often continue trading with the target, causing sanctions to fail. Therefore, the more allies the target has, the more serious the free-rider problem (Olson Jr, 1971; Martin, 1993), and the more difficult and costly it is for allies to monitor and coordinate among themselves.

Given the dual challenges noted above, we argue that high extended dependence is more likely to deter the challenger when some of the target's allies are centrally positioned in the alliance network and hold substantial leverage over other allies. Our argument emphasizes the importance of some "significant" ally within the target's alliance network. To deter the challenger, the target's allies need to possess significant economic sway over the challenger (i.e., high extended dependence) and be persuaded or coerced by some "significant" member within the alliance network to join collective action that closes down the challenger's outside options. In this context, we define a country as being "significant" when it is not only centrally positioned in the alliance network but also capable of exerting enormous (economic or military) leverage over other allies. Such a "significant" member acts like an entrepreneur, coordinating collective punishment and closing potential loopholes. Without such an entrepreneur, high extended dependence is unlikely to deter the challenger because it can obviate the punishment by resorting to substitute markets.[4]

For further elaboration, the presence of a powerful state with sufficient leverage and a central position in the target's alliance network helps overcome the challenges noted above for the following reasons. First, such a country has an incentive to punish the challenger to protect its and the alliance's reputation (Mansfield, 1995). A centrally positioned, powerful state would prefer to preserve a reputation for resolve because it is likely to take future conflicts into account and have a long time horizon (Weisiger & Yarhi-Milo, 2015). Consequently, in this context, a potential challenger is more likely to find the threat of economic punishment credible.

Second, a centrally positioned state with enormous leverage can afford to impose a heavy

[4]In Farrell & Newman (2019)'s conception of weaponized interdependence, the "significant" state in global networks of information and finance uses its central position to gather valuable information or deny network access to adversaries. We identify a third function of such a state: to organize collection actions among allies.

punishment on the challenger, given its economic size and capabilities. Closing its market to a single potential challenger is unlikely to significantly harm the centrally positioned state's economic welfare. For example, the United States has maintained economic sanctions on Cuba for several decades, with negligible adverse effects on itself. Thus, the potential challenger is likely to understand that an economic punishment from such a country would be more costly to it than to the other side.

Third, the "significant" member's leverage over other allies often derives from three sources: (1) its central position in the alliance network, as noted above; (2) economic interdependence; and (3) military capabilities. The centrally positioned powerful state, by definition, has more extensive alliance ties beyond the target's alliance network. This "significant" member can reach many allies and use its leverage to persuade or coerce others to participate in collective action. Economically, if allies depend on trading with this "significant" member, the latter gains the ability from such economic dependence to influence others. Militarily, if the "significant" member possesses disproportionate military capabilities over other allies, it has greater capacities to mediate conflicts among others and provide security umbrellas against external threats, thus acquiring the ability to persuade or coerce others. Since the "significant" state's alliance ties and economic or military capabilities are public knowledge, the challenger can anticipate the gravity and credibility of economic punishment emanating from the alliance network.

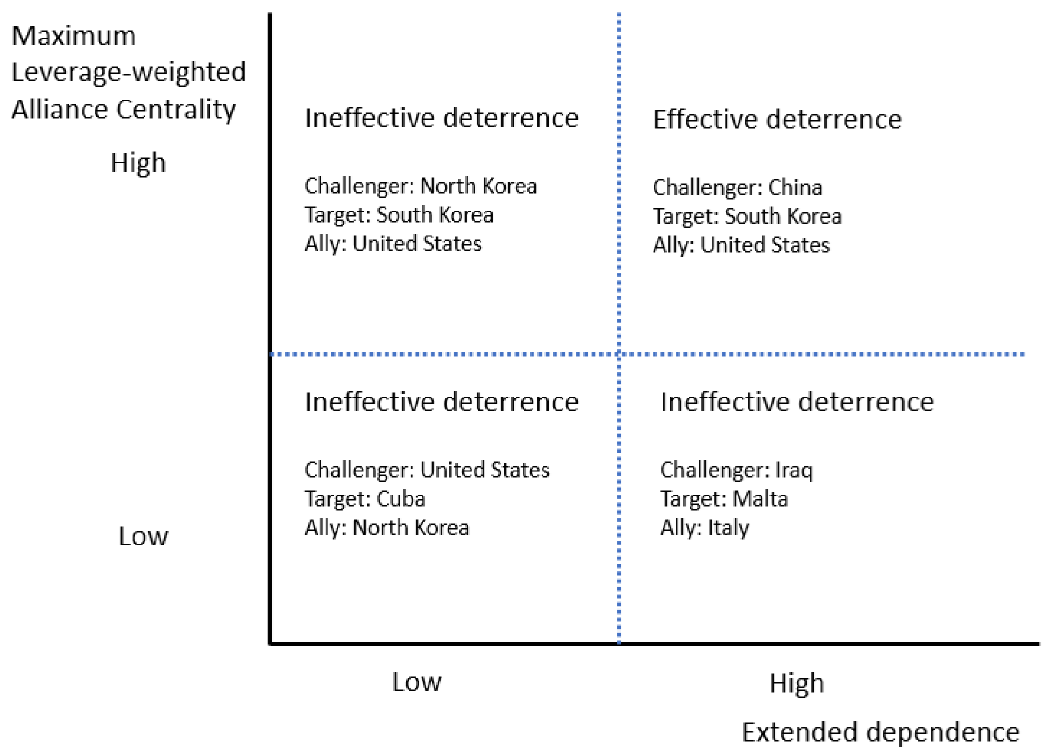
Given its importance to our argument, the "significant" state's ability to mobilize other allies is worth additional clarification. On the one hand, countries in a given alliance community trade disproportionately with and gain large economic benefits from the central member of the same community (e.g., Britain, France, Germany, the Soviet Union, and the United

States) (Haim, 2016; Krasner, 1976; Frieden, 2007), allowing the latter to have significant leverage over others in the alliance network. Furthermore, the “significant” member often provides security benefits to other allies in exchange for the latter’s concessions in other policy areas (Morrow, 1991). For example, the U.S. mediates conflicts of interest among its NATO allies and provides security for many of them. Similarly, France has an extensive alliance network in West Africa - it is more likely that France is the primary provider of security to those alliance members rather than the other way around, as demonstrated by France’s many interventions in the area (Schraeder, 2000; Regan, 2002). Hence, collective action is most likely to be effective within the “significant” member’s alliance network.

On the other hand, the “significant” state has a much weaker capacity to mobilize countries outside its alliance network. For example, in response to the ongoing Russian invasion of Ukraine, India, outside the US alliance network, maintained a lukewarm attitude toward the US-led economic punishment against Russia (Bose, 2023). Notably, the major powers vary significantly in the extensive margins of their alliance networks. For example, during the post-WWII period, China has had only one formal defensive ally, North Korea. In contrast, the other four major powers (the US, France, the UK, and Russia) have had alliance networks with time-varying extensive margins. This pattern has important implications for the dynamics of international conflict. For example, while South Korea may expect support from NATO members because it is allied with the US, North Korea had no one to count on except China, at least before it ratified a defense pact with Russia in 2024. Hence, the effectiveness of extended dependence is affected by the size of the “significant” member’s alliance network and its leverage within it.

In sum, extended dependence is more likely to reduce the likelihood of conflict initiation when both conditions are met: extended dependence is high, and a "significant" state within the target's alliance network is centrally positioned to possess extensive alliance ties and enjoys substantial leverage over those allies. Figure 1 demonstrates our theoretical expectations with illustrative examples, with the horizontal axis denoting the level of extended dependence and the vertical axis denoting the level of leverage-weighted centrality of the most "significant" state (i.e., the maximum leverage-weighted centrality) in the target's alliance network.

Figure 1: Theoretical Expectation



Consider the upper-right quadrant of effective deterrence, where a high degree of extended dependence is coupled with a high level of leverage-weighted centrality of the most "significant" state in the target's alliance network. For example, in the directed dyad of China and South Korea, with the latter being formally allied with the US, the likelihood that China initiates military conflict against South Korea is low because the threat of economic punishment against China originates not only from the U.S. due to China's extended dependence on the U.S. but also from U.S.'s NATO allies because of its central role and enormous leverage in NATO. Therefore, sanction-busting behaviors will be dramatically curtailed, and China's outside options will significantly diminish.

Now consider the upper-left quadrant of ineffective deterrence, where a high level of leverage-weighted centrality of the most "significant" state in the target's alliance network is paired with the challenger's low dependence on trade with the target's allies. Take, for example, North Korea as the challenger and South Korea as the target. North Korea has little extended trade dependence on the US and, thus, Washington has little economic leverage over North Korea to deter its conflict initiation against South Korea, despite the US's extensive network ties and significant influence.

Next, consider the lower-right quadrant of ineffective deterrence, where a high degree of extended dependence is associated with a low level of leverage-weighted centrality of the "significant" state in the target's alliance network, meaning the challenger may have many outside options to circumvent the economic punishment of the target's allies. For example, consider Malta's defense pact with Italy. Substantial trade between Iraq and Italy did not deter Iraq sufficiently from attacking Maltese tankers in the 1980s (Gibler, 2018). In contrast to Washington, Rome could not effectively mobilize its NATO allies as it was not centrally positioned in the alliance network and lacked sufficient economic and military leverage.

Finally, consider the lower-left quadrant of ineffective deterrence, characterized by a low degree of extended dependence and a low level of the "significant" state's leverage-weighted centrality in the target's alliance network. A challenger, whose trade does not depend heavily on the third-party ally that is insignificant in the global alliance network, has little to fear about the consequences of conflict initiation. An example would be the militarized dispute the US initiated against Cuba from December 1986 to November 1987 (Gibler et al., 2016).[5] Although Cuba has been formally allied to North Korea since March 1987 (B. Leeds et al., 2002),[6] it is very unlikely that before using its air power to demonstrate force, Washington would fear North Korea's economic retributions or its ability to organize international efforts to punish the US.

Based on the discussion above, we propose the following hypotheses of conditional extended dependence:

Hypothesis 1: A challenger's trade with the target's allies is more likely to reduce the probability of conflict initiation when the challenger's extended dependence on the target's allies is ***high*** *and a "significant" state within the target's alliance network is* ***centrally positioned*** *to possess a large number of alliance ties and enjoys large* ***economic*** *leverage over those allies.*

Hypothesis 2: A challenger's trade with the target's allies is more likely to reduce the probability of conflict initiation when the challenger's extended dependence on the target's allies is ***high*** *and a "significant" state within the target's alliance network is* ***centrally positioned*** *to possess a large number of alliance ties and enjoys large* ***military*** *leverage over those allies.*

Note that the only difference between the two hypotheses concerns whether, beyond the central position in the alliance network, the other source of leverage of the most "significant" state over other allies is economic or military. Both economic and military leverage will be

[5] MID #2742

[6] ATOP #3975

tested, but their relative importance can not be definitively evaluated empirically, an issue to be addressed later in the section on robustness tests.

Research Design

Measuring maximum leverage-weighted centrality among the target's allies

To test our hypotheses, we need to identify the most significant member of the target's alliance network, one that is most widely connected to other allies and has significant leverage over others in the network. Because leverage can stem from trade dependence or military capabilities, we identify the significant ally by computing two alternative measures. The measure for testing Hypothesis 1 is the maximum trade-dependence-weighted centrality score in the target's alliance network. The trade-dependence-weighted centrality score for each ally is a product of the following two components: a given ally's position in the target's alliance network, measured by its betweenness centrality score; the given ally's economic leverage in the alliance network, measured by the ratio of the sum of its intra-alliance bilateral trade over the sum of the GDPs within the alliance network.

Formally, let A_{it} denote the set of formal defense allies, as defined in ATOP (B. Leeds et al., 2002), in the alliance network of target i at time t. The *raw maximum trade-dependence-weighted centrality* score is defined as follows:

$$\max_j \left(b_{jt} \times \frac{\sum_m j\text{'s bilateral trade}_{mt}}{\sum_m \text{GDP}_{mt}} \right) \quad j \in A_{it}, \;\; m \in A_{jt}$$

The *raw maximum trade-dependence-weighted centrality* score among a given target i's allies $j \in A_{it}$ at time t is calculated by first multiplying each ally j's betweenness centrality score in the alliance network (denoted as b_{jt})[7] with j's intra-alliance economic leverage in j's alliance network and then taking the maximum product value among all the j allies. In the equation above, j's economic leverage is measured by the ratio of the sum of *j's bilateral trade* with all m states in the alliance network over the sum of their GDPs at time t.[8]

The measure for testing Hypothesis 2 is analogously the *maximum military-capability-weighted centrality score* in the target's alliance network. Specifically, the military-capability-weighted centrality score for each ally is a product of the following two components: (1) a given ally's position in the target's alliance network measured by its betweenness centrality score, as before; (2) the given ally's military leverage in the alliance network measured by the ratio of its military capabilities over the sum of military capabilities of all allies in the network. Each ally's military capability, referred to as M-CINC below, is the average of its military personnel share and military expenditure share in the international system from the Correlates of War (COW) National Capabilities database (Singer, 1988).[9] Thus, the military capability weight for the centrality score of each ally in the target's alliance network is the ratio of each ally j's M-CINC score over the sum of all M-CINC scores in the network.

[7]The betweenness centrality score for an ally j at time t is computed as follows (Light & Moody, 2020, 338):

$$b_{jt} = \sum_{l,m} \frac{g^t_{ljm}}{g^t_{lm}} \quad l, m \in A_{jt} \tag{1}$$

where g^t_{lm} denotes all the possible shortest paths from state l to state m, g^t_{ljm} denotes the number of shortest paths that pass through ally j.

[8]We used Barbieri et al. (2009) and Bolt & Van Zanden (2025) to generate our variables.

[9]$\text{M-CINC}_{jt} = \frac{\text{military personnel share}_{jt} + \text{military expenditure share}_{jt}}{2}$, where j represents as a COW state in year t. For more information on the dataset, see https://correlatesofwar.org/data-sets/national-material-capabilities/

The maximum value of the military-capability-weighted centrality scores among all allies in the network is used to test Hypothesis 2. Formally, the *raw maximum military-capability-weighted centrality score* in the target's alliance network is defined as follows:

$$\max_{j}\left(b_{jt} \times \frac{j\text{'s M-CINC}_t}{\sum_m \text{M-CINC}_{mt}}\right) \quad j \in A_{it}, \;\; m \in A_{jt} \tag{2}$$

For clarity, several issues require further elaboration. First, in terms of the network measure, the betweenness centrality score best reflects our concept because it considers both the extent of a given alliance community and a state's centrality as a bridge among alliance members. This approach is also adopted by Haim (2016) in examining the influence of alliance networks on trade.

Second, while a given target i can have multiple allies, we use only the *maximum* leverage-weighted centrality score among all allies, as it best captures the potential influence of the most "significant" state in the alliance network. The higher the maximum trade-dependence-weighted or military-capability-weighted centrality score, the greater its leverage and ability to organize collective action against a potential challenger.

Finally, both raw measures are computed for all directed dyad-year observations from 1870 to 2012 and then normalized to a 0-1 scale to allow comparability across time. Since the variables are continuous, the higher their values, the more significant the identified state is in the target's alliance network, and the more effective extended dependence is likely to be.

Modeling Strategies

Our sample includes all directed dyad-year observations from 1951 to 2012, so our data are comparable to Chen (2021)'s original 1951-2010 sample of all directed dyad years.[10] We use the updated version of the Militarized Interstate Dispute (MID) dataset (version 4.02), which represents a significant improvement based on the critique by Gibler et al. (2016).

Like Chen (2021), we use two dependent variables: all MIDs and fatal MIDs, initiated by challengers against respective targets. According to the MID dataset, an MID occurs when a state threatens, displays, or uses force against another state. The All MIDs variable is coded one if an MID occurs in a directed dyad year and zero otherwise. The Fatal MIDs variable is coded one if an MID with at least one battlefield-related fatality occurs in a directed dyad year and zero otherwise.

Our main independent variables of interest are extended dependence, the respective centrality scores, and the interaction term between extended dependence and the respective centrality scores. Note that extended dependence is "the sum of the challenger's trade volume with the target's allies divided by the challenger's GDP" (Chen, 2021). Based on the two hypotheses, we expect that the coefficients of the interaction terms should be negative and statistically significant.

We include a standard set of control variables in our analysis. We control for the challenger's dyadic dependence on trade with the target, since this variable may correlate with the challenger's propensity to initiate conflict and its extended dependence. Dyadic dependence is the ratio of trade between the challenger and the target to the challenger's GDP.

[10] We stop at the year 2012 since this is the last year for which the data on national military capability are available.

Next, we control for two security-related variables that can confound the relationship between conflict initiation and extended dependence: the dyadic defense pact between the challenger and the target, and their alliance similarity score. When two countries have signed a defense pact and share common allies, they are less likely to experience militarized disputes, and the challenger may also depend more on the target's allies for its economic welfare. We use the weighted s-score for alliance similarity (Signorino & Ritter, 1999; Chiba et al., 2015)

We also control for the challenger's capability share, defined as the ratio of the challenger's national military capability to the sum of the capabilities of the challenger and the target, since challengers with higher military capabilities may be more likely to initiate military conflicts and may be able to sustain economic punishment by the target's allies.

We further control for contiguity, (logged) capital distance, and the major power status of the target. The contiguity variable is from the Correlates of War project, and the capital distance variable from Weidmann et al. (2010). The major power status is based on the Correlates of War coding scheme. We control for the regime type of both the challenger and the target using the democracy score from Pemstein et al. (2010), a continuous measure with higher scores indicating greater democracy.

We account for temporal dependence by including the peace spell time, its squared and cubed terms (Carter & Signorino, 2010) and controlling for the common shocks with two dummy variables for the Cold War (1949-89) and post-911 (2001-2012) periods, respectively.

Since both dependent variables are binary outcomes, we estimate logistic regressions with robust standard errors clustered by directed dyads to account for within-dyad correlation.

Empirical Findings

Before presenting the model results, we first illustrate the descriptive patterns among the variables of interest. Figure 2 highlights MIDs and Fatal MIDS as red dots in four two-dimensional scatter plots of *extended dependence* and *maximum trade-dependence-weighted centrality* or *maximum military-capability-weighted centrality*. If our theoretical expectations in Figure 1 are correct, we should expect very few red dots (MIDs or Fatal MIDs) in the upper right area of the scatter plots and more red dots in other quadrants.[11] The patterns in Figure 2 are consistent with our expectations.

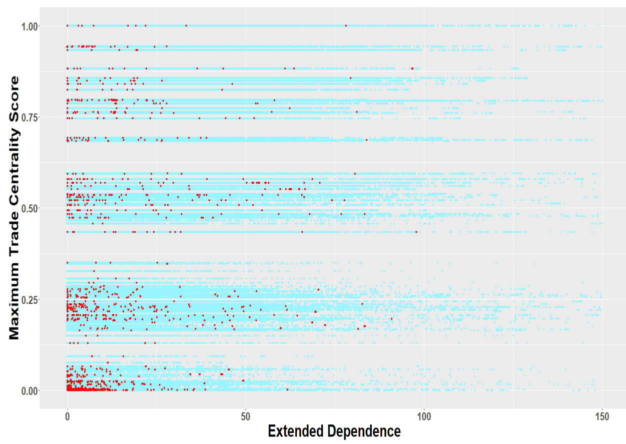
Table 1 presents the main results of our models. Models 1 and 2 use all MIDS as the dependent variable, and Models 3 and 4 use fatal MIDs. The results in Table 1 are consistent with our expectations. Both interaction terms — *extended dependence* × *maximum trade-dependence-weighted centrality* and textitextended dependence × maximum military-capability-weighted centrality — have negative and statistically significant coefficients across the models, as expected in Hypotheses 1 and 2. The higher the target's most significant ally's leverage-weighted centrality score, the more effectively extended dependence can deter the challenger's conflict initiation. The centrally positioned ally can utilize its trade relations and military capabilities to persuade or coerce other allies to join collective efforts against the potential challenger.[12] Note that since these variables are publicly observable, the chal-

[11] For visual clarity, we removed from the plots those observations with values of extended dependence greater than 150%. These outliers account for approximately 0.11% of the estimation sample for the post-1950 period.

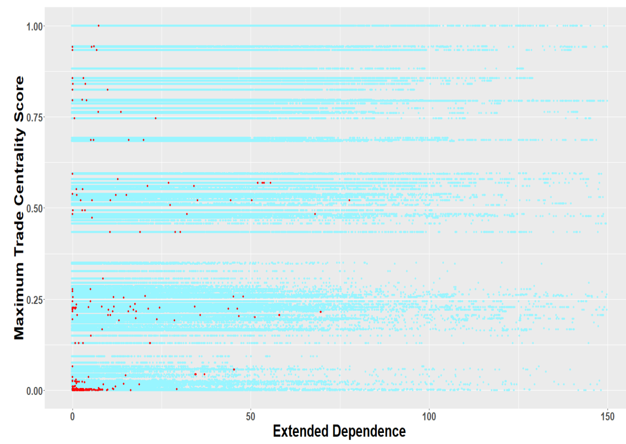
[12] One may wonder if we can identify the relative importance of the two leverage measures by including both in the same model. Unfortunately, we cannot reach a clear and valid conclusion based on the current data and measures. When we include the two leverage measures and their interaction terms in the same model, their Variance Inflation Factor (VIF) statistics are much higher than the standard threshold of 10 for severe multicollinearity, suggesting that hypothesis testing of these highly collinear variables is questionable.(Kennedy, 2008) Specifically, the VIF statistics are 12.90 for maximum trade-dependence-

Figure 2: Distribution of MIDs and Fatal MIDs, 1951-2012

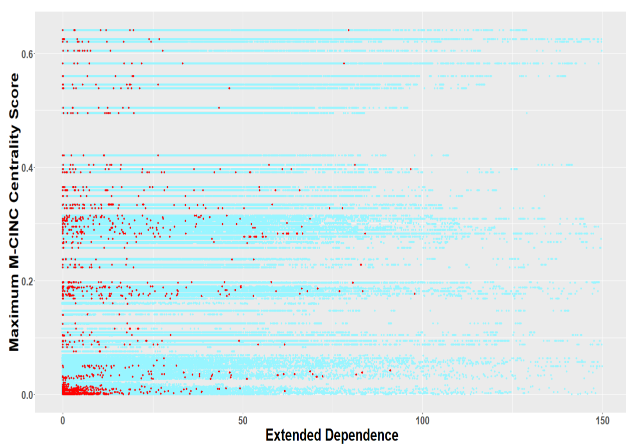
(a) MIDs, 1951-2012 (Trade Centrality)



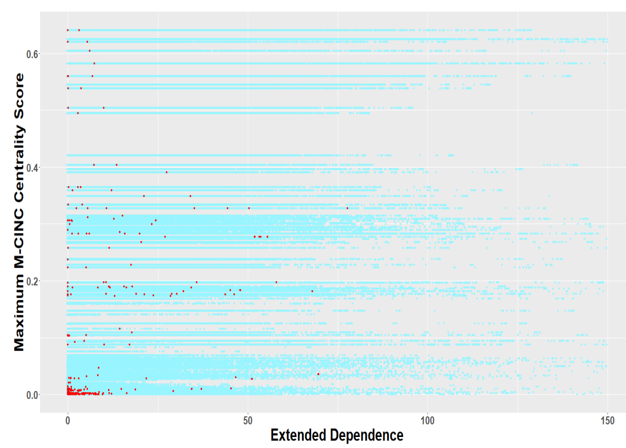
(b) Fatal MIDs, 1951-2012 (Trade Centrality)



(c) MIDs, 1951-2012 (M-CINC Centrality)



(d) Fatal MIDs, 1951-2012 (M-CINC Centrality)



Sources: B. Leeds et al. (2002); Barbieri et al. (2009); Banks & Wilson (2013); Singer (1988)

lenger can infer that in the presence of high extended dependence and a highly significant ally of the target, the cost of conflict initiation will be very high and deterring.

Interestingly, the coefficient of *extended dependence* by itself, which represents its effect when *maximum trade-dependence-weighted centrality* equals zero, is positive in all models

weighted centrality, 22.09 for the trade interaction term, 13.06 for maximum military-capability-weighted centrality, and 15.24 for the military capability interaction term. Hence, the model results can not be used to adjudicate the relative importance of the two leverage measures and their interaction terms. Conceptually, it is not surprising that the two leverage measures are highly related. If an ally's trade with other allies in the alliance network accounts for a very large share of those allies' GDPs, that ally is likely an economic powerhouse that contributes to the country's military capabilities. Empirically, the correlation of maximum trade-dependence-weighted centrality and maximum military-capability-weighted centrality is 0.95 in the estimation sample, showing that the two measures are almost perfectly correlated.

Table 1: Extended Dependence, Leverage-weighted Alliance Centrality, and Conflict Initiation, 1951-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	0.00379	0.00389**	0.00231	0.00357
	(0.00320)	(0.000919)	(0.00606)	(0.00528)
Maximum trade-dependence-weighted centrality	0.737**		0.495	
	(0.248)		(0.528)	
Extended Dependence×Maximum trade-dependence-weighted centrality	-0.0281**		-0.0475**	
	(0.00812)		(0.0159)	
Maximum military-capability-weighted Centrality		1.585**		1.691*
		(0.420)		(0.745)
Extended Dependence×Maximum military-capability-weighted Centrality		-0.0627**		-0.108**
		(0.0152)		(0.0280)
Dyadic Dependence	-0.00358	-0.00314	-0.00874	-0.00841
	(0.00604)	(0.00600)	(0.0133)	(0.0128)
Dyadic Defense Pact	-0.259*	-0.251*	-0.588**	-0.593**
	(0.128)	(0.125)	(0.189)	(0.185)
Challenger Democracy	-0.139*	-0.136*	-0.243**	-0.233**
	(0.0586)	(0.0582)	(0.0797)	(0.0787)
Target Democracy	-0.253**	-0.258**	-0.272*	-0.314**
	(0.0801)	(0.0793)	(0.113)	(0.115)
Target Major Power	2.066**	2.069**	1.476**	1.480**
	(0.180)	(0.179)	(0.266)	(0.262)
Challenger Capability Share	0.823**	0.826**	0.337+	0.357+
	(0.140)	(0.140)	(0.198)	(0.198)
Alliance Similarity	-0.201+	-0.189+	-0.238	-0.213
	(0.115)	(0.115)	(0.175)	(0.176)
Contiguity	2.620**	2.613**	2.638**	2.635**
	(0.163)	(0.163)	(0.225)	(0.227)
Capital Distance	-0.448**	-0.452**	-0.593**	-0.600**
	(0.0674)	(0.0668)	(0.0821)	(0.0820)
Cold War	-0.122	-0.131	0.349*	0.344*
	(0.0954)	(0.0937)	(0.168)	(0.170)
Post-911	0.131	0.114	0.694**	0.667**
	(0.0929)	(0.0939)	(0.169)	(0.169)
Constant	-1.181*	-1.162+	-2.861**	-2.858**
	(0.600)	(0.595)	(0.756)	(0.754)
N	1454403	1454403	1454403	1454403
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses.

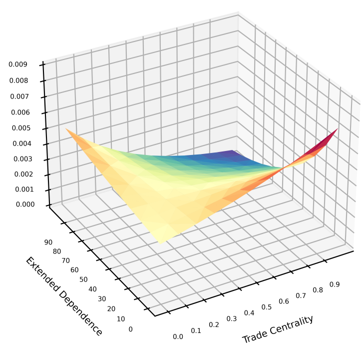
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

but statistically significant in Model 2 (all MIDs) only. The coefficient of *maximum trade-dependence-weighted centrality* by itself, which indicates its effect when *extended dependence* equals zero, is positive but statistically significant only in Model 1 (all MIDs). The coefficient of *maximum military-capability-weighted centrality* by itself, which indicates its effect when *extended dependence* equals zero, is positive and statistically significant for both all MIDs and fatal MIDs.

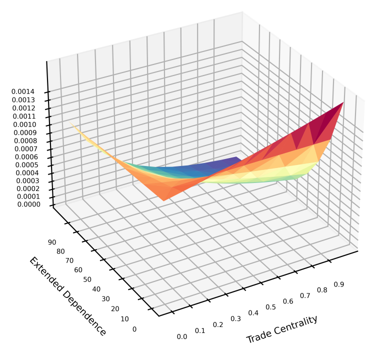
Since the coefficient estimates of nonlinear models lack intuitive interpretations, we illustrate the substantive effects of the key variables by computing and comparing the predicted probabilities of conflict initiation across substantively meaningful scenarios. Specifically, using the estimates in Models 1-4 of Table 1, we compute the predicted probabilities of the initiations of all MIDs and fatal MIDs, based on various combinations of *extended dependence* and the respective maximum leverage-weighted centrality measure while setting dyadic defense pact at 0 (the challenger and the target are not allies), target major power status at 0 (the target is not a major power in the COW dataset), contiguity at 1 (the challenger and the target are geographically contiguous), two period dummies at 0, and other continuous control variables at their estimation sample mean levels.

Figure 3 illustrates the distributions of predicted probabilities of both types of MIDs in three-dimensional plots. The patterns are broadly consistent with our argument. The probability of MID initiation — all MIDs or fatal MIDs — decreases as both extended dependence and maximum leverage-weighted centrality move from low to high values. One unanticipated pattern also emerges in Figure 3. The drop in the predicted probability of MID initiation is much larger and more precipitous from the combination of low extended dependence and high maximum leverage-weighted centrality to the high-high combination, relative to the high-low and low-low combinations. We will assess whether the pattern is driven by a limited set of observations with very high maximum leverage-weighted centrality values (close to 1).

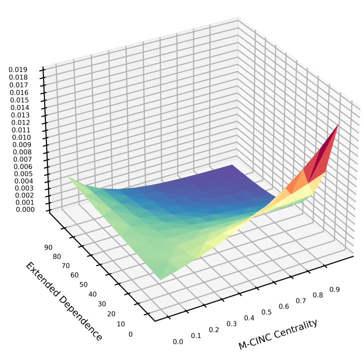
Figure 3: Predicted Probabilities of MID Initiations, 1951-2012



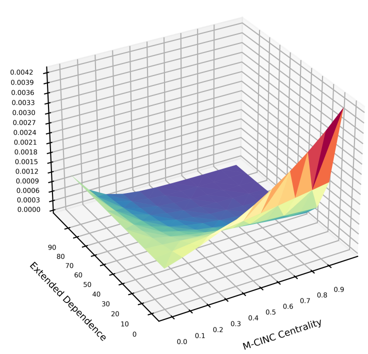
(a) Trade Centrality: All MIDs



(b) Trade Centrality: Fatal MIDs



(c) M-CINC Centrality: All MIDs



(d) M-CINC Centrality: Fatal MIDs

Robustness Tests

We perform many sensitivity tests to examine whether the main results in Table 1 are robust.[13] First, we test the impact of outlier observations. The *extended dependence* variable is right-skewed, so we test if the main results are sensitive to those outliers. We re-estimate the

[13]We show the results for only the variables of interest in the manuscript. The results with the control variables are reported in the online appendix.

models in Table 1 after removing the outlier observations whose *extended dependence* values are greater than 150. Similarly, we test whether the results are robust to removing outlier observations with maximum leverage-weighted centrality scores greater than 0.9. These results, reported in Models 1-A, 1-B, 2-A, and 2-B in Tables 2 and 3, demonstrate that the main findings in Table 1 remain robust.

Second, prior research finds that politically relevant dyads — those involving at least one major power or geographically contiguous — have a much greater likelihood of military conflict than politically non-relevant dyads. Thus, including politically non-relevant dyads may artificially inflate the sample size, making statistical significance easier to attain. We re-estimate the models in Table 1 for politically relevant direct dyads only. The results, reported in Models 3-A and 3-B in Tables 2 (all MIDs) and 3 (fatal MIDs), are consistent with those in Table 1.

Third, one may wonder whether the target's centrality score is an important confounder due to homophily. The centrality scores of the significant allies might be positively correlated with the target's centrality score since rich democratic countries have historically tended to form alliances. At the same time, the target's centrality might be an important predictor of the likelihood of experiencing militarized conflict, because significant allies that are centrally positioned might perceive target countries with higher centrality scores to be more valuable and thereby be more inclined to come to the defense of such allies. We thus control for the target's centrality. As shown in Models 4-A and 4-B in Tables 2 (all MIDs) and 3 (fatal MIDs), our main findings remain robust. The effects of the target's trade dependence-weighted and military-capability-weighted centrality scores are positive and statistically significant, which are reported in the online appendix

Fourth, the post-1951 era witnessed structural changes as many new states emerged in the international system through decolonization in the 1960s. One may wonder whether this could bias our results. We account for this possibility by including the variable *End of Colonial Period*, which is coded 1 for years before 1961 and 0 otherwise. The main results, shown in Models 5-A and 5-B in Tables 4 (all MIDs) and 5 (fatal MIDs), remain robust.

Fifth, as noted in the research design section, the maximum leverage-weighted centrality measure consists of the target's most significant ally's betweenness centrality score and its trade-dependence-weighted or military-capability-weighted leverage measure. One may wonder whether both components affect MID initiations as expected. We re-estimate the four models in Table 1, disaggregating maximum trade-dependence-weighted centrality into two separate measures noted above. Models 6-A and 6-B in Tables 4 (all MIDs) and 5 (fatal MIDs) show that only the interaction term with betweenness centrality is consistently negative and statistically significant. The interaction terms for the leverage measures have the expected negative sign in three of the four models, but none are statistically significant. While both components are conceptually important, the degree of connectedness of the most significant state in the target's alliance network is empirically more important. However, it is worth noting that the VIF for the interaction term between extended dependence and the trade dependence leverage measure is 21.68, casting doubt on any definitive conclusion about this comparison.[14]

Sixth, one may wonder whether the strategic dynamics involving the *challenger*'s incentives could be an important confounder. In particular, one may argue that a challenger with greater leverage over its own allies might have an incentive to initiate more conflicts. We

[14]The VIF for the interaction term between extended dependence and the military leverage measure is 3.71.

control for the challenger's leverage in Models 7-A and 7-B in Tables 4 (all MIDs) and 5 (fatal MIDs). Our main findings remain robust.

Finally, one may ask if our main results in Table 1 are driven by superpower countries or regional differences. For example, the US and the Soviet Union exerted disproportionate influence over their allies. In addition, trade and alliance dynamics often exhibit dramatically different patterns across regions, including Africa, Europe, Asia, and the Americas. Hence, we re-estimate the models in Table 1 by adding two superpower dummy variables for whether a target is a defensive ally of the US or Russia and four regional dummy variables. Models 8-A and 8-B in Tables 4 (all MIDs) and 5 (fatal MIDs) show that our main findings remain robust.

Table 2: All MIDs Models 1-4

Dependent Variable: All MIDs	Model 1-A Extended Dependence Outliers Excluded, 1951–2012	Model 1-B Extended Dependence Outliers Excluded, 1951–2012	Model 2-A Alliance Centrality Outliers Excluded, 1951–2012	Model 2-B Alliance Centrality Outliers Excluded, 1951–2012	Model 3-A Politically Relevant Directed Dyads, 1951–2012	Model 3-B Politically Relevant Directed Dyads, 1951–2012	Model 4-A Target Own Centrality, 1951–2012	Model 4-B Target Own Centrality, 1951–2012
Extended dependence	0.00531	0.00869*	0.00321	0.00389**	-0.000723	0.00188	0.00217	0.00155
	(0.00429)	(0.00406)	(0.00342)	(0.000919)	(0.00415)	(0.00298)	(0.00358)	(0.00269)
Maximum trade-dependence-weighted centrality	0.737**		0.722**		0.713*		0.742**	
	(0.250)		(0.256)		(0.291)		(0.252)	
Extended Dependence×Maximum trade-dependence-weighted centrality	-0.0297**		-0.0250**		-0.0245*		-0.0265**	
	(0.00886)		(0.00891)		(0.0101)		(0.00851)	
Maximum military-capability-weighted Centrality		1.614**		1.585**		1.498**		1.897**
		(0.420)		(0.420)		(0.478)		(0.395)
Extended Dependence×Maximum military-capability-weighted Centrality		-0.0737**		-0.0627**		-0.0614**		-0.0547**
		(0.0170)		(0.0152)		(0.0178)		(0.0149)
N	1452765	1452765	1408751	1454403	149189	149189	1454403	1454403
Temporal Dependence	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓

Clustered standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table 3: Fatal MIDs Models 1-4

Dependent Variable: Fatal MIDs	Model 1-A Extended Dependence Outliers Excluded, 1951–2012	Model 1-B Extended Dependence Outliers Excluded, 1951–2012	Model 2-A Alliance Centrality Outliers Excluded, 1951–2012	Model 2-B Alliance Centrality Outliers Excluded, 1951–2012	Model 3-A Politically Relevant Directed Dyads, 1951–2012	Model 3-B Politically Relevant Directed Dyads, 1951–2012	Model 4-A Target Own Centrality, 1951–2012	Model 4-B Target Own Centrality, 1951–2012
Extended dependence	0.00312	0.00471	0.00162	0.00357	0.00181	0.00252	0.00114	-0.000383
	(0.00698)	(0.00691)	(0.00638)	(0.00528)	(0.00667)	(0.00638)	(0.00629)	(0.00664)
Maximum trade-dependence-weighted centrality	0.497		0.293		0.831		0.450	
	(0.529)		(0.523)		(0.597)		(0.546)	
Extended Dependence×Maximum trade-dependence-weighted centrality	-0.0486**		-0.0373*		-0.0575**		-0.0463**	
	(0.0164)		(0.0163)		(0.0186)		(0.0163)	
Maximum military-capability-weighted Centrality		1.698*		1.691*		2.097*		1.873*
		(0.745)		(0.745)		(0.870)		(0.728)
Extended Dependence×Maximum military-capability-weighted Centrality		-0.110**		-0.108**		-0.118**		-0.0961**
		(0.0294)		(0.0280)		(0.0323)		(0.0281)
N	1452765	1452765	1408751	1454403	149189	149189	1454403	1454403
Temporal Dependence	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓

Clustered standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table 4: All MIDs Models 5-8

Dependent Variable: All MIDs	Model 5-A End of Colonial Period, 1951–2012	Model 5-B End of Colonial Period, 1951–2012	Model 6-A Trade and M-CINC Leverages and Alliance Betweenness Centrality, 1951–2012	Model 6-B Trade and M-CINC Leverages and Alliance Betweenness Centrality, 1951–2012	Model 7-A Challenger Leverage Controlled, 1951–2012	Model 7-B Challenger Leverage Controlled, 1951–2012	Model 8-A Major Power Defense Pacts and Regional Effects, 1951–2012	Model 8-B Major Power Defense Pacts and Regional Effects, 1951–2012
Extended dependence	0.00347	0.00383**	0.00668	0.00603	0.00399	0.00390**	0.000421	0.00298*
	(0.00338)	(0.000893)	(0.00837)	(0.00484)	(0.00319)	(0.000922)	(0.00428)	(0.00129)
Maximum trade-dependence-weighted centrality	0.783**				0.739**		-0.146	
	(0.250)				(0.246)		(0.356)	
Extended Dependence×Maximum trade-dependence-weighted centrality	-0.0266**				-0.0289**		-0.166^{+}	
	(0.00809)				(0.00810)		(0.00908)	
Maximum military-capability-weighted Centrality		1.539**				1.588**		0.413
		(0.425)				(0.420)		(0.568)
Extended Dependence×Maximum military-capability-weighted Centrality		-0.0598**				-0.0629**		-0.0501**
		(0.0151)				(0.0152)		(0.0150)
Trade Leverage			0.600					
			(0.407)					
Extended Dependence×Trade Leverage			-0.0257					
			(0.0324)					
Betweenness Centrality			0.764**	1.021**				
			(0.272)	(0.238)				
Extended Dependence×Betweenness Centrality			-0.0217*	-0.0302**				
			(0.0100)	(0.00804)				
Military Leverage				1.300				
				(2.675)				
Extended Dependence×Military Leverage				-0.317				
				(0.407)				
N	1454403	1454403	1454403	1454403	1454403	1454403	1454403	1454403
Temporal Dependence	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓

Clustered standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table 5: Fatal MIDs Models 5-8

Dependent Variable: Fatal MIDs	Model 5-A End of Colonial Period, 1951–2012	Model 5-B End of Colonial Period, 1951–2012	Model 6-A Trade and M-CINC Leverages and Alliance Betweenness Centrality, 1951–2012	Model 6-B Trade and M-CINC Leverages and Alliance Betweenness Centrality, 1951–2012	Model 7-A Challenger Leverage Controlled, 1951–2012	Model 7-B Challenger Leverage Controlled, 1951–2012	Model 8-A Major Power Defense Pacts and Regional Effects, 1951–2012	Model 8-B Major Power Defense Pacts and Regional Effects, 1951–2012
Extended dependence	0.00111	0.00400	0.00316	0.0128^{+}	0.00232	0.00348	-0.00426	0.00139
	(0.00664)	(0.00483)	(0.0126)	(0.00736)	(0.00608)	(0.00534)	(0.00820)	(0.00656)
Maximum trade-dependence-weighted centrality	0.557				0.497		-1.169^{+}	
	(0.537)				(0.525)		(0.670)	
Extended Dependence×Maximum trade-dependence-weighted centrality	-0.0439**				-0.0477**		-0.0307^{+}	
	(0.0161)				(0.0159)		(0.0183)	
Maximum military-capability-weighted Centrality		1.562*				1.702*		0.205
		(0.773)				(0.750)		(0.964)
Extended Dependence×Maximum military-capability-weighted Centrality		-0.104**				-0.108**		-0.0952**
		(0.0280)				(0.0281)		(0.0300)
Trade Leverage			0.300					
			(0.549)					
Extended Dependence×Trade Leverage			0.0162					
			(0.0366)					
Betweenness Centrality			0.740^{+}	0.825*				
			(0.384)	(0.420)				
Extended Dependence×Betweenness Centrality			-0.0720**	-0.0720**				
			(0.0181)	(0.0173)				
Military Leverage				1.388				
				(5.627)				
Extended Dependence×Military Leverage				-0.419				
				(0.667)				
N	1454403	1454403	1454403	1454403	1454403	1454403	1454403	1454403
Temporal Dependence	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓

Clustered standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Does Conditional Extended Dependence Work in the Pre-1951 Period?

Our argument and empirical analysis above demonstrate that extended dependence operates *conditionally* in the 1951-2012 period, i.e., conditional on the presence of a "significant" state centrally positioned within the target's alliance network and exerting significant leverage over other allies. Following the analysis above, one may ask whether and how extended dependence works in the pre-1951 period.

It is well established that the first wave of economic globalization, characterized by booming trade and investment, occurred in the pre-WWI era, followed by dramatic declines and volatility in global trade and investment during the interwar years and the two world wars (Frieden, 2007). The alliance networks also behaved differently between the pre-1951 and post-1950 periods. Hence, the pre-1951 period provides an excellent opportunity to test whether extended dependence works unconditionally, as Chen (2021) suggests, or conditionally, as we argue. Comparing the findings from the two periods may produce a better understanding of the scope conditions of the two versions of extended dependence.

We re-estimate the four models in Table 1 for the 1870-1950 period, replacing the Cold War and Post-911 common shock dummy variables for the 1951-2012 period with three different common shock dummies for the First World War (1914-18), the Great Depression (1929-39), the Second World War (1939-45), respectively. Table 6 presents the estimation results.

The results in Table 6 are illuminating. The coefficient for extended dependence is

Table 6: Pre-1950 Results, 1870-1950

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	-0.0851*	-0.0812*	-0.470*	-0.442*
	(0.0398)	(0.0361)	(0.187)	(0.181)
Maximum trade-dependence-weighted centrality	-2.613		-89.69	
	(5.757)		(75.59)	
Extended Dependence×Maximum trade-dependence-weighted centrality	0.376		-32.33	
	(0.651)		(119.7)	
Maximum military-capability-weighted Centrality		-1.713		-1.910
		(1.181)		(6.974)
Extended Dependence×Maximum military-capability-weighted Centrality		0.0804		-47.52
		(0.0876)		(73.06)
Dyadic Dependence	-0.0367	-0.0369	-0.0480	-0.0471
	(0.0236)	(0.0237)	(0.0626)	(0.0617)
Dyadic Defense Pact	-0.217	-0.201	-2.357*	-2.415*
	(0.188)	(0.191)	(1.039)	(1.029)
Challenger Democracy	0.0686	0.0686	0.287+	0.288+
	(0.0796)	(0.0797)	(0.162)	(0.161)
Target Democracy	-0.361**	-0.362**	-0.607**	-0.607**
	(0.0726)	(0.0730)	(0.126)	(0.126)
Target Major Power	1.561**	1.555**	1.648**	1.644**
	(0.256)	(0.257)	(0.501)	(0.502)
Challenger Capability Share	1.318**	1.317**	0.842	0.853
	(0.317)	(0.317)	(0.603)	(0.604)
Alliance Similarity	-0.544**	-0.546**	-1.050**	-1.040**
	(0.134)	(0.134)	(0.329)	(0.328)
Contiguity	1.302**	1.303**	1.393**	1.393**
	(0.227)	(0.227)	(0.392)	(0.393)
Capital Distance	-0.250**	-0.249**	-0.442**	-0.444**
	(0.0807)	(0.0806)	(0.145)	(0.145)
WWI	1.509**	1.506**	0.917**	0.935**
	(0.168)	(0.168)	(0.313)	(0.312)
Great Depression	-0.0448	-0.0492	-0.172	-0.155
	(0.149)	(0.149)	(0.277)	(0.277)
WWII	1.881**	1.878**	1.504**	1.522**
	(0.131)	(0.132)	(0.274)	(0.274)
Constant	-2.129*	-2.130*	-4.039*	-4.038*
	(0.909)	(0.908)	(1.843)	(1.849)
N	125865	125865	125865	125865
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

statistically significant and negative in all four models. However, neither interaction term is statistically significant. In sum, a comparison of the results in Table 1 and Table 6 indicates that extended dependence is effective in deterring all MIDs and fatal MIDs *unconditionally* in the pre-1951 period, but *conditionally* in the post-1950 period.[15]

Why does extended dependence operate unconditionally in the pre-1951 period but conditionally in the post-1950 period? We conjecture that the explanation lies in changes to the alliance system over time and the declining reliability of defensive alliances. Recall that for extended dependence to work, the target's defensive allies must orchestrate collective action to deter the challenger. However, most defense pacts formed during peacetime before WWII consisted mainly of alliances between two members. In the absence of many complex interlocking alliance networks, the coordination problem was not very severe.[16] Specifically, using the ATOP data for the pre-1951 era, we identify 12 multilateral defensive alliances (i.e., with three or more members) out of 74 defensive alliances; among those 12 multilateral defensive alliances, only six are arguably designed for deterrence as the remaining six are signed during wartime.[17] In contrast, for the post-1950 period, the new international system includes many more multilateral alliances. Of the 165 defensive alliance pacts, 38 are multilateral. Furthermore, many post-WWII alliances are weak (Lee, 2023), making coordination among allies difficult and necessary.

We further illustrate the changing dynamics of the alliance system over time by computing the proportions of global alliance dyads involving the major powers (as coded in the B. Leeds et al. (2002) dataset) for the 1870-1950 and post-1950 periods. We compute the proportions of alliance dyads for the respective powers by dividing the number of alliance dyads to which

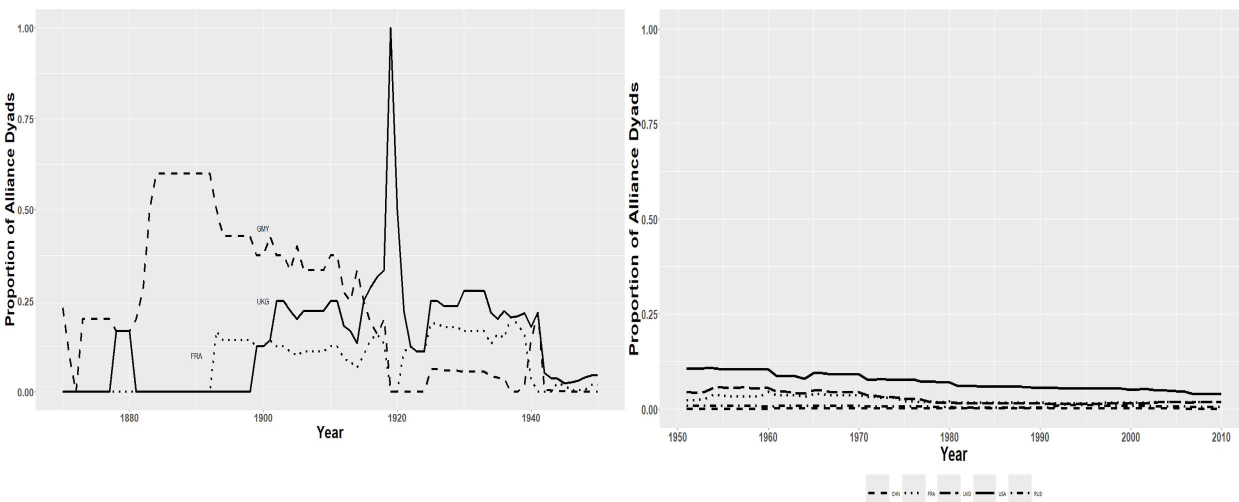
[15] Table 7 shows the results for the whole period from 1870 to 2012. The coefficients for both interaction terms are negative and statistically significant across the entire period.

[16] There were sometimes multilateral defensive alliances formed during wartime, such as the Crimean War (ATOP #1160). However, the primary purpose of such alliances was not deterrence, given that a military conflict had already broken out and coalition partners were coming together to defeat common enemies.

[17] ATOP #2490, ATOP #2515, ATOP #2540, ATOP #2550, ATOP #3010

a major power is a signatory by the total number of existing alliance dyads in a given year. The patterns presented in Figure 4 are illuminating. Notably, in the pre-1951 period, a few major powers dominated the alliance system; however, in the post-1950 period, the five major powers did not hold dominant proportions of global alliance dyads. Figure 4 demonstrates that the alliance networks became more complex in the post-1950 period. Therefore, organizing collective action to deter potential challengers is more necessary but more difficult in the post-1950 period.

Figure 4: Proportion of Alliance Dyads to which Major Powers are Signatories



Source: B. Leeds et al. (2002)

Moreover, relative to the pre-1951 period, alliance commitments were honored less frequently in the post-1950 period (Berkemeier & Fuhrmann, 2018; Lee, 2023). For all types of alliances from 1816 to 2003, the rate at which states honored alliance commitments decreased from 66% before the end of WWII to 22% after WWII (Berkemeier & Fuhrmann, 2018). Regarding defensive alliances, the rate at which states defended their allies dropped from 81% in the 1816-1944 period to 7% in the 1945-2016 period (Lee, 2023). As the alliance system became more complex and less reliable in the post-1950 era, the presence of a "significant" state, centrally positioned within the target's alliance network and exerting leverage over other allies, becomes essential to the credibility of that alliance in the eyes of the challenger. Hence, the more complex the alliance system is and the lower the alliance reliability, the more significant a leader centrally positioned to exercise leverage becomes to the target's alliance network.

Finally, we also test the conditional and unconditional versions of extended dependence for the entire period from 1870 to 2012. Table 7 shows that conditional extended dependence dominates the empirical results. Summary statistics for both periods, reported in Table A1 and Table A2, indicate that trade-dependence-weighted centrality is much more developed and complex in the post-1950 period than in the pre-1951 period. Maximum trade-dependence-weighted centrality ranges between 0 and 1 in the later period but between 0 and 0.15 in the earlier period. The pattern is consistent with that based on raw trade-dependence-weighted centrality scores of major powers in Figure A1. We see a similar pattern for military-capability-weighted centrality. Both the mean and the standard deviation of the military-capability-weighted centrality are higher in the post-1950 period than in the pre-1951 period. Once again, this pattern is consistent with that based on raw military-capability-weighted centrality scores of major powers in Figure A2.[18]

[18] Although we do see in Table A2 that the highest maximum military-capability-weighted centrality score is observed in the pre-1950 period, a more careful examination of the descriptive statistics shows that this is an outlier due to the United States obtaining both extremely high betweenness centrality score and high military leverage score in 1946. Washington's extremely high betweenness centrality score in 1946 is due to the multilateral alliance formed with Latin American countries (ATOP #3010) *and* its alliance with Lisbon (ATOP #2571); the betweenness centrality score of Washington falls to 0 in 1947 as Washington's alliance with Lisbon is terminated in June 1946.

Table 7: Extended Dependence, Leverage-weighted Alliance Centrality, and Conflict Initiation, 1870-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	0.00304	0.00357**	0.000836	0.00237
	(0.00323)	(0.000905)	(0.00661)	(0.00605)
Maximum trade-dependence-weighted centrality	0.806**		0.495	
	(0.237)		(0.531)	
Extended Dependence×Maximum trade-dependence-weighted centrality	-0.0247**		-0.0407*	
	(0.00784)		(0.0164)	
Maximum military-capability-weighted Centrality		1.551**		1.516*
		(0.375)		(0.689)
Extended Dependence×Maximum military-capability-weighted Centrality		-0.0545**		-0.0930**
		(0.0140)		(0.0276)
Dyadic Dependence	-0.00275	-0.00245	-0.0117	-0.0112
	(0.00570)	(0.00565)	(0.0143)	(0.0138)
Dyadic Defense Pact	-0.120	-0.117	-0.592**	-0.606**
	(0.115)	(0.113)	(0.180)	(0.178)
Challenger Democracy	-0.0867+	-0.0849+	-0.174*	-0.169*
	(0.0508)	(0.0506)	(0.0710)	(0.0704)
Target Democracy	-0.311**	-0.307**	-0.358**	-0.384**
	(0.0680)	(0.0667)	(0.0983)	(0.0973)
Target Major Power	1.787**	1.790**	1.337**	1.346**
	(0.148)	(0.147)	(0.212)	(0.210)
Challenger Capability Share	0.930**	0.932**	0.422*	0.437*
	(0.131)	(0.130)	(0.186)	(0.186)
Alliance Similarity	-0.288**	-0.282**	-0.410*	-0.391*
	(0.101)	(0.102)	(0.169)	(0.169)
Contiguity	2.285**	2.280**	2.335**	2.332**
	(0.139)	(0.139)	(0.206)	(0.207)
Capital Distance	-0.407**	-0.410**	-0.587**	-0.595**
	(0.0576)	(0.0571)	(0.0750)	(0.0745)
WWI	1.899**	1.900**	1.477**	1.501**
	(0.188)	(0.188)	(0.285)	(0.285)
Great Depression	-0.0456	-0.0452	-0.131	-0.121
	(0.146)	(0.146)	(0.257)	(0.257)
WWII	2.099**	2.102**	1.830**	1.849**
	(0.134)	(0.134)	(0.202)	(0.202)
Cold War	-0.0945	-0.101	0.425**	0.417**
	(0.0890)	(0.0878)	(0.159)	(0.159)
Post-911	0.156+	0.147	0.696**	0.674**
	(0.0926)	(0.0935)	(0.170)	(0.170)
Constant	-1.414**	-1.399**	-2.879**	-2.858**
	(0.523)	(0.518)	(0.713)	(0.707)
N	1580268	1580268	1580268	1580268
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Conclusion

Under what conditions is extended dependence more likely to deter a potential challenger from initiating a military conflict? In this article, we argue that extended dependence is more likely to be effective when the target is supported by an ally that is centrally positioned in the alliance network and exerts enormous economic or military leverage over other allies. For the challenger to be credibly deterred *ex ante*, the target's most significant ally should have the willingness and capability to impose sufficiently costly punishment on the challenger and coordinate successful collective action among allies against the potential challenger. Our empirical analysis demonstrates that extended dependence deters MID initiations *conditionally* between 1951 and 2012 but *unconditionally* from 1870 to 1950. The alliance system has become more complex over time, and defensive alliances have become less reliable, both of which have made collective action more important and difficult in the post-1950 period.

Our analysis contributes to the growing literature on the effect of third-party trade on interstate military conflict. We specify the conditions under which third-party trade can more effectively deter conflict initiation. We argue that the deterrence effect of third-party trade on conflict initiation holds only under stringent conditions. Our argument differs from past studies on the role of third-party trade in that we emphasize the need for the challenger to have a high level of extended dependence on the target's allies and for an entrepreneurial or leading member among those allies.

Our research challenges conventional wisdom regarding the pacifying impact of trade. To the extent that the effectiveness of extended dependence depends on the degree to which a third-party ally is centrally positioned and has high leverage-weighted centrality among the target's allies, the pacifying impact of trade is limited in the absence of such a leader, even with high extended dependence. During the current power transition period driven by China's rise, if the declining United States no longer has significant advantages in global trade, alliance networks, or economic coercion, it may no longer deter challengers or provide security for its allies.

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AI Declaration

No Artificial Intelligence was used in writing this research article.

Author Contributions

Both authors have contributed equally to the article.

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Table A1: Summary Statistics, 1951-2012

Variables	Obs	Mean	Sd	Min	Max
MID side A	1,495,562	0.00199	0.04458	0	1
MID side A fatal	1,495,562	0.00034	0.01832	0	1
Max. trade-dependence-weighted centrality	1,495,562	0.20279	0.31020	0	1
Max. military-capability-weighted Centrality	1,495,562	0.11678	0.18206	0	0.64084
Extended Dependence	1,4,54,411	6.76394	19.21426	0	3195.397
Dyadic Dependence	1,478,005	0.36859	3.76473	0	1222.419
Dyadic Defense Pact	1,495,562	0.06892	0.25331	0	1
Challenger Capability Share	1,495,562	0.5	0.37263	0.00000	1.00000
Alliance Similarity	1,495,562	0.29577	0.35037	-0.72390	1
Target Major Power	1,495,562	0.03672	0.18806	0	1
Challenger Democracy	1,495,562	0.50682	0.93712	-1.76974	3.09183
Target Democracy	1,495,562	0.50682	0.93712	-1.76974	3.09183
Contiguity	1,495,562	0.03455	0.18265	0	1
Distance	1,495,538	8.72964	0.78341	2.25073	9.90072

Table A2: Summary Statistics, 1870-1950

Variables	Obs	Mean	Sd	Min	Max
MID side A	203,474	0.00719	0.08446	0	1
MID side A fatal	203,474	0.00108	0.03286	0	1
Max. trade-dependence-weighted centrality	203,474	0.00369	0.02159	0	0.14673
Max. military-capability-weighted Centrality	203,474	0.01071	0.08371	0	1
Extended Dependence	126,014	0.78034	3.76038	0	76.88734
Dyadic Dependence	196,598	0.22315	1.62817	0	195.1944
Dyadic Defense Pact	203,474	0.03858	0.19258	0	1
Challenger Capability Share	203,474	0.5	0.35800	0.00004	0.99996
Alliance Similarity	203,474	0.35910	0.43878	-0.89353	1
Target Major Power	203,474	0.12480	0.33049	0	1
Challenger Democracy	203,355	0.17570	0.75829	-1.69933	2.01707
Target Democracy	203,355	0.17570	0.75829	-1.69933	2.01707
Contiguity	203,474	0.08371	0.27695	0	1
Distance	203,000	8.5828	0.94919	4.2816	9.90072

Figure A1: Raw trade-dependence-weighted centrality Scores of Major Powers

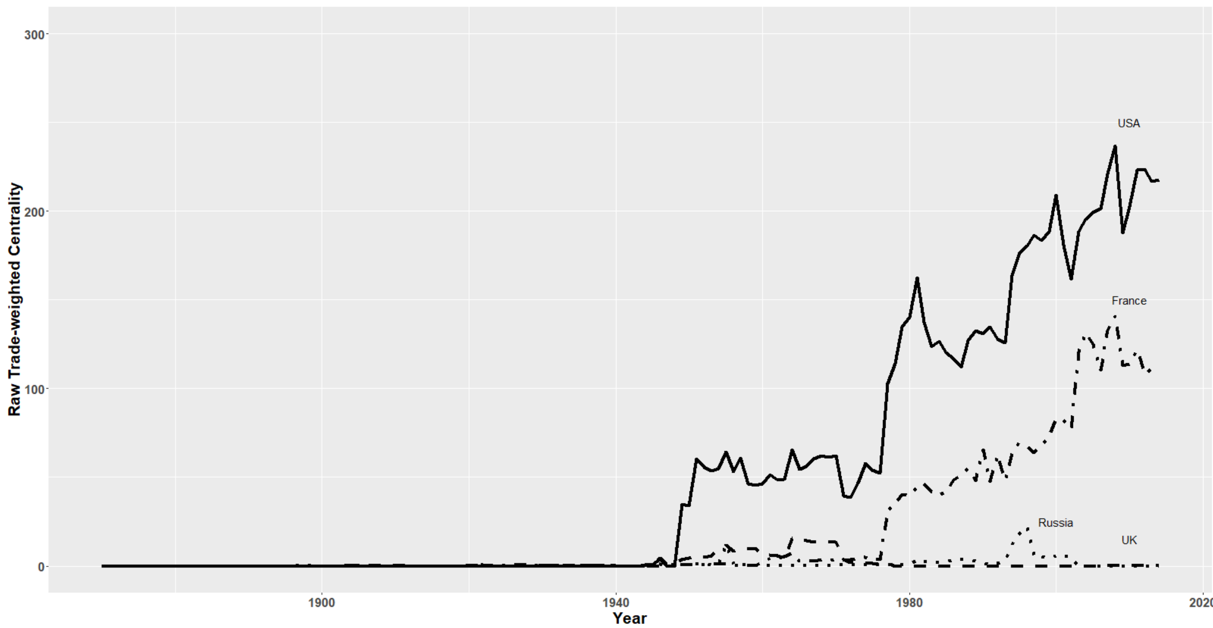

Figure A2: Raw military-capability-weighted Centrality Scores of Major Powers

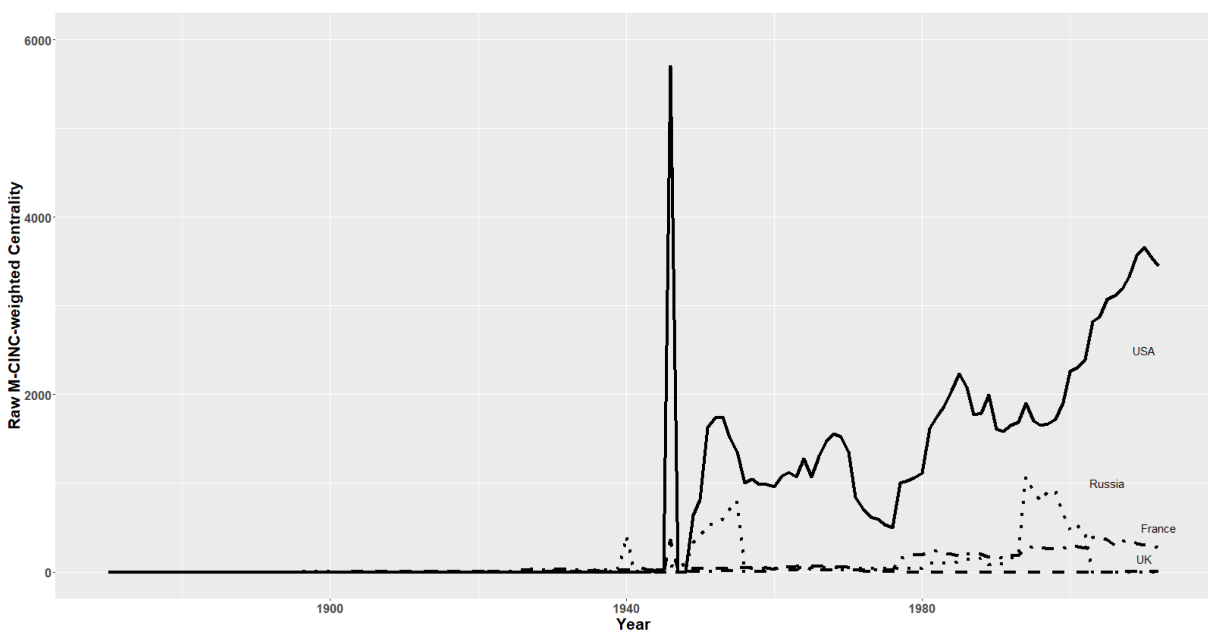

Table A3: Major Power Alliances, 1951-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	0.00115*	-0.00709	0.00228	-0.00655
	(0.000520)	(0.0131)	(0.00467)	(0.0115)
Extended Dependence × Target Defense Pact with U.S.	-0.0169**	-0.0187	-0.0182**	-0.0199
	(0.00481)	(0.0147)	(0.00517)	(0.0154)
Target Defense Pact with U.S.	0.579**	0.633*	0.534**	0.593+
	(0.156)	(0.280)	(0.166)	(0.307)
Dyadic Dependence	-0.00282	-0.00803	-0.00379	-0.0101
	(0.00615)	(0.0137)	(0.00633)	(0.0143)
Dyadic Defense Pact	-0.272*	-0.599**	-0.272*	-0.580**
	(0.127)	(0.192)	(0.125)	(0.190)
Challenger Democracy	-0.138*	-0.243**	-0.135*	-0.237**
	(0.0583)	(0.0785)	(0.0575)	(0.0787)
Target Democracy	-0.283**	-0.358**	-0.316**	-0.380**
	(0.0835)	(0.123)	(0.0822)	(0.121)
Target Major Power	2.091**	1.512**	2.065**	1.551**
	(0.175)	(0.258)	(0.165)	(0.252)
Challenger Capability Share	0.840**	0.372+	0.844**	0.355+
	(0.141)	(0.200)	(0.143)	(0.201)
Alliance Similarity	-0.171	-0.192	-0.165	-0.212
	(0.115)	(0.178)	(0.116)	(0.179)
Contiguity	2.605**	2.626**	2.617**	2.630**
	(0.161)	(0.226)	(0.161)	(0.224)
Distance	-0.455**	-0.605**	-0.450**	-0.602**
	(0.0665)	(0.0828)	(0.0686)	(0.0846)
Cold War	-0.167+	0.301+	-0.194+	0.289
	(0.0980)	(0.179)	(0.0989)	(0.178)
Post-911	0.150	0.700**	0.148	0.689**
	(0.0937)	(0.173)	(0.0957)	(0.175)
Extended Dependence × Target Defense Pact with France			-0.00149	0.000623
			(0.00490)	(0.0155)
Target Defense Pact with France			0.302+	0.0893
			(0.155)	(0.314)
Extended Dependence × Target Defense Pact with Russia			-0.00403	-0.00804
			(0.0147)	(0.0350)
Target Defense Pact with Russia			-0.0773	-0.446+
			(0.184)	(0.257)
Constant	-1.136+	-2.807**	-1.171+	-2.779**
	(0.592)	(0.754)	(0.612)	(0.769)
N	1454403	1454403	1454403	1454403
Temporal Dependence	✓	✓	✓	✓
χ^2 statistic for U.S	10.88	9.18	7.82	6.10
p-value for χ^2 statistic for U.S	0.0010	0.0024	0.0052	0.0135
χ^2 statistic for France			0.95	0.09
p-value for χ^2 statistic for France			0.3298	0.7685
χ^2 statistic for Russia			0.02	0.19
p-value for χ^2 statistic for Russia			0.9022	0.6664

Clustered standard errors in parentheses. Chi-squared tests are based on the null hypothesis that the sum of the coefficients for extended dependence and its interaction term equals zero

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table A4: Extended Dependence Outliers Excluded, 1951-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	0.00531	0.00869*	0.00312	0.00471
	(0.00429)	(0.00406)	(0.00698)	(0.00691)
Maximum Trade Dependence-weighted Centrality	0.737**		0.497	
	(0.250)		(0.529)	
Extended Dependence×Maximum Trade Dependence-weighted Centrality	-0.0297**		-0.0486**	
	(0.00886)		(0.0164)	
Maximum Military Capability-weighted Centrality		1.614**		1.698*
		(0.420)		(0.745)
Extended Dependence×Maximum Military Capability-weighted Centrality		-0.0737**		-0.110**
		(0.0170)		(0.0294)
Dyadic Dependence	-0.00398	-0.00452	-0.00888	-0.00866
	(0.00601)	(0.00588)	(0.0133)	(0.0127)
Dyadic Defense Pact	-0.269*	-0.281*	-0.593**	-0.601**
	(0.129)	(0.128)	(0.191)	(0.189)
Challenger Democracy	-0.138*	-0.134*	-0.243**	-0.233**
	(0.0585)	(0.0580)	(0.0797)	(0.0787)
Target Democracy	-0.255**	-0.263**	-0.272*	-0.315**
	(0.0802)	(0.0794)	(0.113)	(0.115)
Target Major Power	2.066**	2.069**	1.477**	1.481**
	(0.180)	(0.178)	(0.266)	(0.262)
Challenger Capability Share	0.825**	0.836**	0.338+	0.359+
	(0.141)	(0.141)	(0.198)	(0.199)
Alliance Similarity	-0.201+	-0.190+	-0.238	-0.213
	(0.115)	(0.115)	(0.175)	(0.176)
Contiguity	2.622**	2.618**	2.638**	2.636**
	(0.163)	(0.162)	(0.225)	(0.226)
Capital Distance	-0.448**	-0.451**	-0.593**	-0.600**
	(0.0674)	(0.0669)	(0.0821)	(0.0820)
Cold War	-0.125	-0.139	0.347*	0.343*
	(0.0960)	(0.0948)	(0.168)	(0.170)
Post-911	0.132	0.118	0.694**	0.668**
	(0.0929)	(0.0936)	(0.169)	(0.168)
Constant	-1.188*	-1.181*	-2.863**	-2.861**
	(0.600)	(0.596)	(0.756)	(0.754)
N	1452765	1452765	1452765	1452765
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses. Observations with extended dependence values higher than 150 are excluded.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table A5: Alliance Centrality Outliers Excluded, 1951-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	0.00321	0.00389**	0.00162	0.00357
	(0.00342)	(0.000919)	(0.00638)	(0.00528)
Maximum Trade Dependence-weighted Centrality	0.722**		0.293	
	(0.256)		(0.523)	
Extended Dependence×Maximum Trade Dependence-weighted Centrality	-0.0250**		-0.0373*	
	(0.00891)		(0.0163)	
Maximum Military Capability-weighted Centrality		1.585**		1.691*
		(0.420)		(0.745)
Extended Dependence×Maximum Military Capability-weighted Centrality		-0.0627**		-0.108**
		(0.0152)		(0.0280)
Dyadic Dependence	-0.00439	-0.00314	-0.0195	-0.00841
	(0.00616)	(0.00600)	(0.0158)	(0.0128)
Dyadic Defense Pact	-0.276*	-0.251*	-0.604**	-0.593**
	(0.127)	(0.125)	(0.184)	(0.185)
Challenger Democracy	-0.146*	-0.136*	-0.253**	-0.233**
	(0.0587)	(0.0582)	(0.0793)	(0.0787)
Target Democracy	-0.249**	-0.258**	-0.243*	-0.314**
	(0.0800)	(0.0793)	(0.110)	(0.115)
Target Major Power	2.090**	2.069**	1.525**	1.480**
	(0.182)	(0.179)	(0.266)	(0.262)
Challenger Capability Share	0.836**	0.826**	0.345+	0.357+
	(0.141)	(0.140)	(0.199)	(0.198)
Alliance Similarity	-0.205+	-0.189+	-0.261	-0.213
	(0.117)	(0.115)	(0.176)	(0.176)
Contiguity	2.603**	2.613**	2.628**	2.635**
	(0.163)	(0.163)	(0.225)	(0.227)
Capital Distance	-0.455**	-0.452**	-0.593**	-0.600**
	(0.0678)	(0.0668)	(0.0832)	(0.0820)
Cold War	-0.120	-0.131	0.357*	0.344*
	(0.0959)	(0.0937)	(0.168)	(0.170)
Post-911	0.144	0.114	0.674**	0.667**
	(0.0931)	(0.0939)	(0.165)	(0.169)
Constant	-1.141+	-1.162+	-2.903**	-2.858**
	(0.602)	(0.595)	(0.765)	(0.754)
N	1408751	1454403	1408751	1454403
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses. Observations with centrality scores higher than 0.9 are excluded.

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table A6: Politically Relevant Directed Dyads, 1951-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	-0.000723	0.00188	0.00181	0.00252
	(0.00415)	(0.00298)	(0.00667)	(0.00638)
Maximum Trade Dependence-weighted Centrality	0.713*		0.831	
	(0.291)		(0.597)	
Extended Dependence×Maximum Trade Dependence-weighted Centrality	-0.0245*		-0.0575**	
	(0.0101)		(0.0186)	
Maximum Military Capability-weighted Centrality		1.498**		2.097*
		(0.478)		(0.870)
Extended Dependence×Maximum Military Capability-weighted Centrality		-0.0614**		-0.118**
		(0.0178)		(0.0323)
Dyadic Dependence	-0.000244	-0.000765	-0.00625	-0.00663
	(0.00471)	(0.00482)	(0.0130)	(0.0125)
Dyadic Defense Pact	-0.251*	-0.260*	-0.624**	-0.631**
	(0.118)	(0.116)	(0.190)	(0.187)
Challenger Democracy	-0.181**	-0.176**	-0.332**	-0.323**
	(0.0576)	(0.0573)	(0.0941)	(0.0928)
Target Democracy	-0.168*	-0.175*	-0.143	-0.183
	(0.0834)	(0.0825)	(0.130)	(0.130)
Target Major Power	0.735**	0.738**	0.221	0.218
	(0.174)	(0.173)	(0.305)	(0.303)
Challenger Capability Share	0.548**	0.549**	0.140	0.152
	(0.169)	(0.169)	(0.265)	(0.266)
Alliance Similarity	0.0256	0.0335	-0.0412	-0.0262
	(0.119)	(0.119)	(0.193)	(0.194)
Contiguity	1.292**	1.294**	1.167**	1.178**
	(0.165)	(0.164)	(0.248)	(0.248)
Capital Distance	-0.151*	-0.154*	-0.376**	-0.379**
	(0.0614)	(0.0608)	(0.0840)	(0.0833)
Cold War	-0.0187	-0.0395	0.334+	0.323+
	(0.101)	(0.0990)	(0.177)	(0.179)
Post-911	0.218*	0.198*	0.581**	0.538**
	(0.0959)	(0.0968)	(0.199)	(0.200)
Constant	-1.642**	-1.628**	-2.584**	-2.609**
	(0.580)	(0.574)	(0.807)	(0.799)
N	149189	149189	149189	149189
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table A7: Target Own Centrality, 1951-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	0.00217	0.00155	0.00114	-0.000383
	(0.00358)	(0.00269)	(0.00629)	(0.00664)
Maximum Trade Dependence-weighted Centrality	0.742**		0.450	
	(0.252)		(0.546)	
Extended Dependence×Maximum Trade Dependence-weighted Centrality	-0.0265**		-0.0463**	
	(0.00851)		(0.0163)	
Target's Own Trade-weighted Centrality	2.006**		1.978*	
	(0.546)		(0.839)	
Maximum Military Capability-weighted Centrality		1.897**		1.873*
		(0.395)		(0.728)
Extended Dependence×Maximum Military Capability-weighted Centrality		-0.0547**		-0.0961**
		(0.0149)		(0.0281)
Target's Own Military Capability-weighted Centrality		4.394**		4.349**
		(0.952)		(1.128)
Dyadic Dependence	-0.00875	-0.00989	-0.0118	-0.0139
	(0.00844)	(0.00882)	(0.0146)	(0.0150)
Dyadic Defense Pact	-0.269*	-0.289*	-0.582**	-0.588**
	(0.129)	(0.126)	(0.190)	(0.188)
Challenger Democracy	-0.128*	-0.122*	-0.235**	-0.221**
	(0.0570)	(0.0563)	(0.0782)	(0.0767)
Target Democracy	-0.285**	-0.316**	-0.291**	-0.354**
	(0.0786)	(0.0773)	(0.110)	(0.112)
Target Major Power	1.898**	1.879**	1.332**	1.309**
	(0.170)	(0.171)	(0.239)	(0.246)
Challenger Capability Share	0.828**	0.854**	0.338+	0.370+
	(0.141)	(0.141)	(0.198)	(0.199)
Alliance Similarity	-0.189+	-0.162	-0.237	-0.199
	(0.115)	(0.116)	(0.176)	(0.177)
Contiguity	2.634**	2.604**	2.654**	2.650**
	(0.164)	(0.166)	(0.224)	(0.228)
Capital Distance	-0.453**	-0.471**	-0.590**	-0.605**
	(0.0684)	(0.0690)	(0.0826)	(0.0832)
Cold War	-0.115	-0.135	0.357*	0.350*
	(0.0959)	(0.0943)	(0.169)	(0.171)
Post-911	0.113	0.0617	0.687**	0.642**
	(0.0934)	(0.0971)	(0.170)	(0.171)
Constant	-1.151+	-1.046+	-2.885**	-2.846**
	(0.609)	(0.613)	(0.761)	(0.763)
N	1454403	1454403	1454403	1454403
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table A8: End of Colonial Period, 1951-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	0.00347	0.00383**	0.00111	0.00400
	(0.00338)	(0.000893)	(0.00664)	(0.00483)
Maximum Trade Dependence-weighted Centrality	0.783**		0.557	
	(0.250)		(0.537)	
Extended Dependence×Maximum Trade Dependence-weighted Centrality	-0.0266**		-0.0439**	
	(0.00809)		(0.0161)	
Maximum Military Capability-weighted Centrality		1.539**		1.562*
		(0.425)		(0.773)
Extended Dependence×Maximum Military Capability-weighted Centrality		-0.0598**		-0.104**
		(0.0151)		(0.0280)
Dyadic Dependence	-0.00207	-0.00178	-0.00453	-0.00460
	(0.00580)	(0.00578)	(0.0121)	(0.0116)
Dyadic Defense Pact	-0.268*	-0.256*	-0.626**	-0.631**
	(0.129)	(0.126)	(0.192)	(0.186)
Challenger Democracy	-0.152**	-0.149*	-0.276**	-0.267**
	(0.0590)	(0.0588)	(0.0800)	(0.0795)
Target Democracy	-0.269**	-0.265**	-0.302**	-0.328**
	(0.0789)	(0.0783)	(0.111)	(0.112)
Target Major Power	2.045**	2.048**	1.384**	1.382**
	(0.180)	(0.178)	(0.268)	(0.265)
Challenger Capability Share	0.832**	0.831**	0.347+	0.360+
	(0.140)	(0.140)	(0.198)	(0.199)
Alliance Similarity	-0.166	-0.159	-0.171	-0.149
	(0.115)	(0.115)	(0.173)	(0.175)
Contiguity	2.597**	2.593**	2.562**	2.561**
	(0.161)	(0.161)	(0.222)	(0.223)
Capital Distance	-0.452**	-0.455**	-0.611**	-0.616**
	(0.0661)	(0.0657)	(0.0794)	(0.0792)
End of Colonial Period	0.619**	0.588**	1.131**	1.119**
	(0.0934)	(0.0929)	(0.140)	(0.140)
Cold War	-0.251*	-0.255**	0.0883	0.0848
	(0.0980)	(0.0963)	(0.175)	(0.176)
Post-911	0.127	0.114	0.686**	0.668**
	(0.0928)	(0.0936)	(0.169)	(0.168)
Constant	-1.160*	-1.143+	-2.759**	-2.762**
	(0.589)	(0.585)	(0.732)	(0.730)
N	1454403	1454403	1454403	1454403
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table A9: Trade and M-CINC Leverages and Alliance Betweenness Centrality, 1951-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	0.00668	0.00603	0.00316	0.0128^{+}
	(0.00837)	(0.00484)	(0.0126)	(0.00736)
Trade Leverage	0.600		0.300	
	(0.407)		(0.549)	
Extended Dependence×Trade Leverage	-0.0257		0.0162	
	(0.0324)		(0.0366)	
Betweenness Centrality	0.764**	1.021**	0.740^{+}	0.825*
	(0.272)	(0.238)	(0.384)	(0.420)
Extended Dependence×Betweenness Centrality	-0.0217*	-0.0302**	-0.0720**	-0.0720**
	(0.0100)	(0.00804)	(0.0181)	(0.0173)
Military Leverage		1.300		1.388
		(2.675)		(5.627)
Extended Dependence×Military Leverage		-0.317		-0.419
		(0.407)		(0.667)
Dyadic Dependence	-0.00324	-0.00360	-0.00738	-0.00822
	(0.00610)	(0.00613)	(0.0131)	(0.0126)
Dyadic Defense Pact	-0.326*	-0.300*	-0.626**	-0.623**
	(0.128)	(0.125)	(0.194)	(0.189)
Challenger Democracy	-0.138*	-0.138*	-0.247**	-0.244**
	(0.0575)	(0.0580)	(0.0790)	(0.0792)
Target Democracy	-0.260**	-0.253**	-0.283**	-0.273**
	(0.0760)	(0.0756)	(0.104)	(0.103)
Target Major Power	2.066**	2.057**	1.496**	1.479**
	(0.177)	(0.179)	(0.265)	(0.265)
Challenger Capability Share	0.839**	0.829**	0.356^{+}	0.346^{+}
	(0.141)	(0.141)	(0.197)	(0.197)
Alliance Similarity	-0.183	-0.195^{+}	-0.223	-0.232
	(0.115)	(0.115)	(0.176)	(0.176)
Contiguity	2.621**	2.620**	2.647**	2.651**
	(0.163)	(0.164)	(0.226)	(0.226)
Capital Distance	-0.451**	-0.450**	-0.598**	-0.597**
	(0.0667)	(0.0674)	(0.0819)	(0.0820)
Cold War	-0.105	-0.102	0.351*	0.355*
	(0.0948)	(0.0956)	(0.168)	(0.169)
Post-911	0.0882	0.0716	0.686**	0.676**
	(0.101)	(0.0970)	(0.166)	(0.167)
Constant	-1.239*	-1.216*	-2.887**	-2.891**
	(0.600)	(0.606)	(0.750)	(0.757)
N	1454403	1454403	1454403	1454403
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table A10: Challenger Leverage Controlled, 1951-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	0.00399	0.00390**	0.00232	0.00348
	(0.00319)	(0.000922)	(0.00608)	(0.00534)
Maximum Trade Dependence-weighted Centrality	0.739**		0.497	
	(0.246)		(0.525)	
Extended Dependence×Maximum Trade Dependence-weighted Centrality	-0.0289**		-0.0477**	
	(0.00810)		(0.0159)	
Challenger Trade Leverage	0.502+		0.195	
	(0.285)		(0.436)	
Maximum Military Capability-weighted Centrality		1.588**		1.702*
		(0.420)		(0.750)
Extended Dependence×Maximum Military Capability-weighted Centrality		-0.0629**		-0.108**
		(0.0152)		(0.0281)
Challenger Military Capability Leverage		-1.366		-3.463
		(3.009)		(3.796)
Dyadic Dependence	-0.00333	-0.00313	-0.00862	-0.00835
	(0.00605)	(0.00599)	(0.0133)	(0.0127)
Dyadic Defense Pact	-0.312*	-0.243+	-0.606**	-0.573**
	(0.132)	(0.125)	(0.194)	(0.187)
Challenger Democracy	-0.165**	-0.137*	-0.252**	-0.235**
	(0.0587)	(0.0580)	(0.0823)	(0.0789)
Target Democracy	-0.254**	-0.258**	-0.272*	-0.313**
	(0.0797)	(0.0793)	(0.113)	(0.115)
Target Major Power	2.058**	2.070**	1.473**	1.488**
	(0.181)	(0.179)	(0.268)	(0.262)
Challenger Capability Share	0.803**	0.827**	0.330	0.362+
	(0.144)	(0.140)	(0.204)	(0.200)
Alliance Similarity	-0.185	-0.192+	-0.233	-0.218
	(0.116)	(0.116)	(0.174)	(0.175)
Contiguity	2.623**	2.611**	2.638**	2.633**
	(0.164)	(0.163)	(0.225)	(0.227)
Capital Distance	-0.451**	-0.453**	-0.595**	-0.599**
	(0.0672)	(0.0670)	(0.0820)	(0.0825)
Cold War	-0.129	-0.134	0.345*	0.339*
	(0.0957)	(0.0939)	(0.167)	(0.171)
Post-911	0.128	0.112	0.690**	0.666**
	(0.0935)	(0.0939)	(0.169)	(0.168)
Constant	-1.197*	-1.149+	-2.861**	-2.839**
	(0.595)	(0.593)	(0.755)	(0.757)
N	1454403	1454403	1454403	1454403
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses.

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table A11: Major Power Defense Pacts and Regional Effects, 1951-2012

	All MIDs		Fatal MIDs	
	Model 1	Model 2	Model 3	Model 4
Extended Dependence	0.000421	0.00298*	-0.00426	0.00139
	(0.00428)	(0.00129)	(0.00820)	(0.00656)
Maximum Trade Dependence-weighted Centrality	-0.146		-1.169+	
	(0.356)		(0.670)	
Extended Dependence×Maximum Trade Dependence-weighted Centrality	-0.0166+		-0.0307+	
	(0.00908)		(0.0183)	
Maximum Military Capability-weighted Centrality		0.413		0.205
		(0.568)		(0.964)
Extended Dependence×Maximum Military Capability-weighted Centrality		-0.0501**		-0.0952**
		(0.0150)		(0.0300)
Dyadic Dependence	-0.00588	-0.00636	-0.0122	-0.0129
	(0.00672)	(0.00668)	(0.0151)	(0.0147)
Dyadic Defense Pact	-0.187	-0.179	-0.584**	-0.564**
	(0.131)	(0.127)	(0.192)	(0.189)
Challenger Democracy	-0.101+	-0.0963+	-0.203**	-0.189*
	(0.0547)	(0.0546)	(0.0763)	(0.0751)
Target Democracy	-0.112	-0.121	-0.170	-0.204
	(0.0832)	(0.0825)	(0.131)	(0.131)
Target Major Power	2.154**	2.131**	1.730**	1.665**
	(0.202)	(0.199)	(0.308)	(0.297)
Challenger Capability Share	0.970**	0.963**	0.465*	0.445*
	(0.139)	(0.139)	(0.200)	(0.199)
Alliance Similarity	-0.301*	-0.298*	-0.308+	-0.314+
	(0.124)	(0.125)	(0.185)	(0.186)
Contiguity	2.450**	2.452**	2.500**	2.516**
	(0.154)	(0.154)	(0.221)	(0.222)
Capital Distance	-0.477**	-0.478**	-0.638**	-0.635**
	(0.0631)	(0.0629)	(0.0832)	(0.0829)
US Defense Pact	0.333	0.209	0.995**	0.518
	(0.227)	(0.217)	(0.337)	(0.347)
Russian Defense Pact	-0.283	-0.295	-0.439+	-0.454+
	(0.187)	(0.193)	(0.249)	(0.249)
Target in Europe	-0.217	-0.184	-0.368	-0.263
	(0.234)	(0.233)	(0.385)	(0.373)
Target in Africa	-0.232	-0.226	0.122	0.145
	(0.220)	(0.221)	(0.356)	(0.349)
Target in Asia	0.637**	0.644**	0.526	0.568+
	(0.213)	(0.213)	(0.333)	(0.325)
Target in Oceania	-0.786+	-0.746+	-0.524	-0.378
	(0.405)	(0.407)	(0.595)	(0.594)
Cold War	-0.145	-0.114	0.220	0.330+
	(0.0968)	(0.0937)	(0.178)	(0.175)
Post-911	0.101	0.102	0.708**	0.684**
	(0.0966)	(0.0994)	(0.171)	(0.173)
Constant	-1.075+	-1.100+	-2.606**	-2.753**
	(0.641)	(0.642)	(0.868)	(0.863)
N	1454403	1454403	1454403	1454403
Temporal Dependence	✓	✓	✓	✓

Clustered standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$