Online Appendix for "Extended Dependence: Trade, Alliances, and Peace"

Frederick R. Chen*

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Abstract

This online appendix includes five sections. Section A provides the descriptive statistics of the variables in this study as well as a correlation plot. Then, I argue and show in Section B that the potential bias arising from missing bilateral trade data is negative, which means that the effect of *Extended Dependence* would be even larger with fewer missing trade values. Section C discusses the effect of dyadic trade interdependence in a more traditional setting. Section D offers a battery of sensitivity analysis, where I show that my main findings are robust to alternative variable operationalization and different model specifications. Finally, Section E provides additional, specific empirical evidence to support the causal mechanisms.

*Ph.D. student in the Department of Political Science at the University of Wisconsin–Madison. Email: frederick.chen@wisc.edu.

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A Descriptive Statistics

Table A displays the descriptive statistics of the independent and control variables in this study. The calculations include all observations, though a small proportion of the observations are never used due to the lagging of trade or GDP data. Including only effective samples generates almost identical descriptive results. Note that *Extended Dependence* and *Dyadic Dependence* are right-skewed; a few states' *Extended Dependence* or *Dyadic Dependence* (in percentage) is really large. By scrutinizing the original trade data (Barbieri, Keshk, and Pollins, 2009), I observe that the outliers are due to the fact that some bilateral trade values are extraordinarily high. Though investigating the possible errors in the trade dataset is beyond the scope of this study, I check if my results are sensitive to those outliers. Appendix D6 (later in this online appendix) reports the statistical results after removing potential outliers. My main findings still hold.

Table A: Descriptive statistics of the variables

Variables	Observation	Mean	SD	Min	Max
Extended Dependence	1,390,733	6.817	19.362	0	3195.397
Dyadic Dependence	1,390,733	0.380	3.847	0	1222.419
Target Total Capability Share	1,419,932	0.242	0.347	0.000	1.000
Mutual Defensive Allies Count	1,419,932	1.504	5.601	0	36
Dyadic DP	1,419,932	0.068	0.252	0	1
Target Major Power	1,419,932	0.037	0.188	0	1
Challenger Democracy	1,413,189	0.037	0.974	-2.112	2.263
Target Democracy	1,413,189	0.037	0.974	-2.112	2.263
Contiguity	1,419,932	0.042	0.201	0	1
Distance	1,419,932	8.255	0.782	1.609	9.421

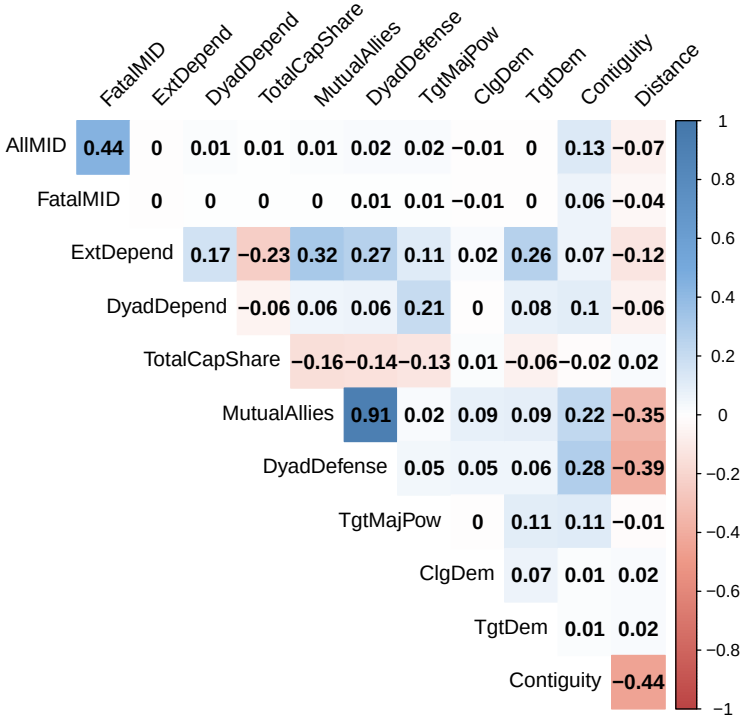

Figure A: Correlation plot

Figure A depicts the correlations among all the variables in the main analysis. Note that there is a really high correlation between *Dyadic Defense Pact* and *Mutual Defensive Allies Count*, which is not surprising. While I argued in the main text that including both variables is theoretically important, I address the concern about possible multicollinearity by dropping one of them from the statistical models. The main findings still hold. In fact, removing one of the two variables does not change the substance of the statistical results regarding the main explanatory variables.

B Potential Bias from Missing Bilateral Trade Data

Despite the scholarly efforts to retrieve accessible data from multiple sources, most trade databases nonetheless suffer from a considerable proportion of missing values, even in the post-WWII era. The COW project trade dataset (Barbieri, Keshk, and Pollins, 2009), for instance, includes more than 20% missing bilateral trade values in the period 1950–2009. The missingness of trade data may arise for several reasons.[1] In some instances, missing trade values indicate no trade at all. In other circumstances, however, this assumption may not hold. For example, a state may fail to report its trade volume when it is occupied by another state, and a state may not report the exchange if the volume is very low. Dealing with missing values is one of the most difficult challenges to trade scholars.

Consistent with most past studies of trade (inter)dependence, I replace missing bilateral trade data with zeros. It is true that absent trade records do not necessarily correspond to absent trade between states. Replacing missing data points with zero values may not be appropriate unless we know with certainty that trade does not exist. Therefore, one may argue that the nonrandomness of the missing trade data may a create a bias to the estimate of how *Extended Dependence* affects the incidence of international conflict.

Indeed, one may wonder if strategies like multiple imputation are suitable in this case. Multiple imputation can arguably reduce bias and increase efficiency for data with missing values if the data are missing at random (MAR). However, the missingness in the trade dataset may not be entirely contingent upon observables when states do not bother to report trivial trade flows. Thus, the key assumption of multiple imputation may not be satisfied (White, Royston, and Wood, 2011). In fact, in cases where data are missing not at random (MNAR), multiple imputation generates results that are frequently more biased, less efficient, and with worse coverage than listwise deletion (Pepinsky, 2018). More-

[1]For a systemically review of the assumptions and coding rules of existing trade data, see, for example, Barbieri, Keshk, and Pollins (2009).

over, multiple imputation is primarily designed to produce multiple imputed datasets for combined regressions based on the final dataset. Conducting multiple imputations for the bilateral trade data and then using them to construct the main independent variable is not what multiple imputation is designed to achieve. Finally, given the large size of the dataset and the computationally extensive nature of multiple imputation, even a powerful server is almost unable to complete the multiple imputation process.

I argue that it is worth detecting the potential direction of the bias that results from the missing trade values. I suggest that the incompleteness of the trade data yields a negative bias against the estimates of *Extended Dependence*, for the following reasons. First, larger states are much less likely to have missing trade data than smaller states within the temporal domain of this study (i.e., 1951–2010). Second, more powerful states are more likely to be involved in militarized disputes compared to smaller powers. Third, dyadic defensive alliances more likely in a dyad with a major power than without a major power.[2]

These arguments suggest that, if I replace missing bilateral trade values with zeros and then construct the main explanatory variable, (1) *Extended Dependence* should be relatively *overestimated* for more conflict-prone states, and that (2) *Extended Dependence* should be relatively *underestimated* for more peace-prone states. Thus, if I can find support for the hypothesis that *Extended Dependence* dampens the likelihood of international conflict initiation using the original trade dataset, the magnitude of the effect will arguably be even larger than if I estimate a dataset with fewer or no missing bilateral trade values.

To provide more concrete evidence that the bias of the estimates of *Extended Dependence* is negative, I reanalyze the trade data as the sum of imports and exports. The COW trade project (Barbieri, Keshk, and Pollins, 2009) treats a bilateral trade flow as missing if either import or export is missing. Put differently, a value is as missing even if the import or export (but not both) is not missing. In fact, approximately 8% of the missing bilateral

[2]The calculations are based on the dataset of this study.

Table B: Effect sizes of *Extended Dependence* using different missing data strategies

	Using original bilateral trade data	Using imports + exports
Model (2)	0.0145 (0.004)***	0.0146 (0.004)***
Model (3)	0.0141 (0.004)***	0.0142 (0.004)***
Model (4)	0.0093 (0.004)**	0.0095 (0.004)**
Model (6)	0.0270 (0.008)***	0.0271 (0.008)***
Model (7)	0.0268 (0.008)***	0.0270 (0.008)***
Model (8)	0.0190 (0.008)*	0.0191 (0.008)*

Note: (1) This table shows the coefficients and robust standard errors (in parentheses) of *Extended Dependence*, using different strategies for replacing missing bilateral trade data. The left column based on the original data (replaced with 0 as long as import/export is missing), while the right column replaces the zeros with import/export values wherever available; (2) * $p<0.05$; ** $p<0.01$; *** $p<0.001$, two-tailed.

trade data points have available, although generally small, import or export flows.[3]

In the main empirical analysis, I constructed my independent variable based on the bilateral trade flows taken directly from the COW trade project (and replace a bilateral trade value with 0 if either import or export is missing). In this online appendix, however, I show the statistical results based on the bilateral trade data when I sum up imports and exports (i.e., setting a missing bilateral trade value as its import/export volume when the import/export value is available). Table B displays the difference between the results. Using the sum of imports and exports leads the coefficient of *Extended Dependence* to be larger, although the relative change is small. This reinforces my argument that the bias that arises from incomplete trade data is negative in this study: the magnitude of *Extended Dependence* would be even larger with less missing trade data.

[3]For those bilateral trade flows that either import or export is missing (but not both are missing), the average import/export is extremely low (only 0.28 million), compared to the average of bilateral trade flows (328.89 million).

C Dyadic Trade Interdependence

In the main analysis, *Dyadic Dependence* does not significantly reduce the likelihood of international conflict initiation. I have argued that using directed dyad-year data is consistent with the purpose of this study, as I need to distinguish between potential challengers and targets. Nonetheless, to investigate whether dyadic trade facilitates peace in a more traditional non-directed dyad-year setting, here I report the statistical results regarding *Dyadic Interdependence* using the dataset of this study.

Since I try to imitate past research on trade interdependence and peace, the operationalization of the variables and specifications of the models are largely in line with those conventional studies. *Dyadic Interdependence* is the lower value of *Dyadic Dependence* of the two states in the dyad. The rationale is that the outbreak of dyadic military conflict is largely contingent upon the weaker link in the dyad. Moreover, $Polity_L$ and $Polity_H$ are the lower and higher value of the Polity 2 scores in the dyad, respectively (Marshall, Jaggers, and Gurr, 2002). *Dyadic Alliance* captures whether the states in the dyad share any type of alliance agreements in a given year (Leeds et al., 2002). To measure the power (dis)parity between the states in the dyad, *Capability Share* is the lower CINC score divided by the sum of total CINC scores in the dyad (Singer, Bremer, and Stuckey, 1972). *Major Power* is a binary variable indicating whether either state in the dyad is a major power in the international system (Correlates of War Project, 2017b). *Contiguity* denotes whether the two states in the dyad are physically contiguous or are separated by small open water no less than 150 miles (Stinnett et al., 2002). *Distance* is the natural log of the distance between the capital cities of the two states, calculated by EUGene (Bennett and Stam, 2000).

Also same as before, I make a distinction between *All MIDs* and *Fatal MIDs*, the results of which are displayed separately. Since bilateral trade data contain some missing values, I report the statistical results when I use listwise deletion and when I replace missing trade flows with zeros, respectively. I use rare events logistic regressions to analyze the

statistical results.

Table C shows the results. As we can find, *Dyadic Interdependence* yields a significant effect on reducing the likelihood of *Fatal MIDs*, though I do not find evidence to support that dyadic trade dampens *All MIDs* more generally. While this analysis is based on all dyads, using politically relevant dyads generates similar results. Thus, the findings indicate that whether dyadic trade can generate a pacifying impact depends on the measure of conflict and that the explanatory power of dyadic trade on the likelihood of conflict initiation is limited.

Table C: Dyadic trade interdependence and interstate conflict

	DV: All MIDs		DV: Fatal MIDs	
	LD	MZ	LD	MZ
	(C1)	(C2)	(C3)	(C4)
Dyadic Interdependence	-0.020	-0.024	-0.260*	-0.276*
	(0.021)	(0.024)	(0.154)	(0.152)
Polity_L	-0.075***	-0.076***	-0.086***	-0.082***
	(0.011)	(0.011)	(0.017)	(0.016)
Polity_H	0.048***	0.055***	0.057***	0.061***
	(0.009)	(0.009)	(0.015)	(0.014)
Dyadic Alliance	0.255*	0.185	0.115	-0.016
	(0.124)	(0.120)	(0.225)	(0.212)
Capability Share	1.422***	1.423***	1.055	1.175*
	(0.420)	(0.395)	(0.651)	(0.601)
Major Power	1.712***	1.806***	1.279***	1.389***
	(0.202)	(0.203)	(0.338)	(0.313)
Contiguity	3.319***	3.446***	4.148***	4.283***
	(0.199)	(0.201)	(0.380)	(0.357)
Distance	-0.213***	-0.276***	-0.356***	-0.398***
	(0.060)	(0.060)	(0.128)	(0.107)
Temporal Dependence	✓	✓	✓	✓
Observations	424,282	524,935	424,282	524,935

Note: (1) LD = listwise deletion; MZ = missingness as zeros; (2) Robust standard errors clustered by dyads in parentheses; (3) * $p<0.10$; ** $p<0.05$; *** $p<0.01$, two-tailed.

D Robustness Checks

This section reports the statistical results of a battery of sensitivity analysis to check if the main findings of this study are robust to alternative sample selections, variable operationalization, and model specifications. As I will show, my main findings that *Extended Dependence* is a strong predictor of military conflict initiation hold in all of these robustness checks.

D.1 Using politically relevant dyads only

I used all directed dyads in the main analysis. One may argue that politically relevant dyads are at a much higher risk of military conflict than other dyads. Thus, I focus on politically relevant dyads exclusively and report the empirical results in Table D1. Politically relevant dyads are defined as either (1) pairs of states, including their colonies, that are physically contiguous or are separated by a small distance of open water up to 400 miles (Correlates of War Project, 2017a; Stinnett et al., 2002) or (2) pairs of states including at least one major power in the international system (Correlates of War Project, 2017b). Analyzing only politically relevant dyads does not change the substance of the statistical results. In fact, the coefficients of *Extended Dependence* are very close to those in the main analysis using all dyads. Therefore, trade with adversaries' friends promotes peace even for those dyads that have a higher conflict propensity.

One may argue that, though having a much smaller size, politically relevant dyads still include a considerable proportion of dyads that have no reason to fight. In one of the robustness checks later in this online appendix, I incorporate directed-dyad fixed effects into the models. My results still hold, meaning that *Extended Dependence* does have a significant impact on the incidence of interstate conflict initiation even for those directed dyads that have experienced military conflict (i.e., excluding all directed dyads without conflict history).

D.2 Treating revisionist states as initiators

In the main analysis, I identified the initiator of a MID as the state in the dyad that takes the first militarized action. One may argue that, in addition to analyzing who fires the first shot, it is also important to investigate which states seek to revise the status quo. I therefore evaluate the results when I treat revisionist states as "initiators." The data also come from the Dyadic MID project dataset (Maoz et al., 2019). The statistical results regarding the main explanatory variable do not change substantially. Table D2 shows the results. In fact, the absolute values of the coefficients of *Extended Dependence* in Models (5) to (8) increase when treating revisionist states as "initiators." The only major difference between Table D2 and Table 1 in the main analysis is that *Dyadic Dependence* is statistically significant in Model (D2.1), though the p-value is 0.047, which is only slightly smaller than the 0.05 significance level. Thus, my main findings largely hold, regardless of how I conceptualize the "initiators" of military conflict.

D.3 Taking the sum of *Extended Dependence* and *Dyadic Dependence*

In the main analysis, I treated *Extended Dependence* and *Dyadic Dependence* as two separate variables. The main purpose was to make comparisons between the two predictors. This did not mean, however, that the two variables competed with each other. Here in the online appendix, I take the sum of *Extended Dependence* and *Dyadic Dependence*, and use it as a combined predictor of interstate conflict initiation. The results are available in Table D3. As we can find, the combined predictor has a significant effect on reducing the likelihood of both *All MIDs* and *Fatal MIDs*.

D.4 Controlling for specific alliances

I conditioned on third-party alliance relationships (i.e., *Challenger Total Capability Share* and *Mutual Defensive Allies Count*) in the main analysis. Here in the online appendix, I ad-

dress the concern that the main findings may be driven by some specific sets of alliances. More specifically, the U.S.'s alliances and the North Atlantic Treaty Organization (NATO) may be two sets of alliances that come to readers' mind. Thus, I control for whether the potential target is a defensive ally of the U.S. or is a member-state of the NATO. Note that U.S.'s alliances have already captured the NATO memberships, except for the cases where the U.S. itself is the potential target. The information on these two variables is based on the ATOP dataset (Leeds et al., 2002). Table D4 shows the statistical results. My findings hold even after considering specific alliances in the models.

D.5 Including additional control variables

Other possible control variables regarding third-party alliance relationships include (1) the total number of the target's defensive allies, (2) alliance portfolio similarity between the challenger and target, and (3) the number of co-IGO memberships. However, to mitigate the problem with multicollinearity and to make the models relatively concise, I did not include these variables in the main analysis. Here, I report the statistical results with these additional control variables (see Table D5). The data on the first variable is based on the ATOP dataset (Leeds et al., 2002). The second variable is the unweighted *S* score computed with ATOP alliance data (Chiba, Johnson, and Leeds, 2015; Signorino and Ritter, 1999). I do not use the weighted *S* score because *Challenger Total Capability Share* has already captured the relative capability of the allies. The data on intergovernmental organizations are retrieved from the newly updated version of the COW IGO dataset (Pevehouse, Nordstrom, and Warnke, 2004). Including these variables does not change the substance of the statistical results.

D.6 Removing potential outliers

Extended Dependence is right-skewed; for some states, the value of *Extended Dependence* is very large. To mitigate the possible concern that the main results are driven by those outliers, I re-analyze the data by removing those observations where *Extended Dependence* is greater than 200%. Table D6 displays the results, which are almost identical to the statistical results reported in the main analysis.

D.7 Using listwise deletion for *Dyadic Dependence*

In the main analysis, I replaced missing dyadic trade values with zeros when constructing *Dyadic Dependence*. Since the proportion of missing trade data is relatively large, the purpose of replacing missing values in the main analysis was to keep as many observations as possible. Also, as I explained in section B of the online appendix, using multiple imputation may not be appropriate given that trade data are not missing at random. In Table D7, I report the results when using listwise deletion for *Dyadic Dependence*. This alternative strategy does not change the results substantially.

D.8 Using *Democratic Dyad* as a control variable

In the main analysis, I used the Unified Democracy Scores (UDS) to measure the challenger's and target's democratic levels, respectively (Pemstein, Meserve, and Melton, 2010). As a robustness check, I replace these two continuous variables with a binary dummy variable, *Democratic Dyad*. This variable is coded 1 if both sides' UDS scores are at least 0.25, and 0 otherwise. I use 0.25 as the cutoff because the proportion of democratic states by this criterion is close to the fraction of democracies by using the Polity IV project dataset (i.e., Polity 2 scores greater than 6). In fact, the results are not sensitive to different thresholds of the criterion. Table D8 reports the empirical results when including *Democratic Dyad* as a control variable. The main findings remain.

D.9 Including directed-dyad fixed effects

I included year-specific fixed effects in every model in the main analysis to capture the possibility of aggregate temporal trends. I did not incorporate directed-dyad fixed effects in the main text because unit fixed effects would remove a large proportion of the observations due to invariance. Nonetheless, to assess whether the results hold with unit-specific fixed effects, I incorporate directed-dyad fixed effects and report the results in Table D9. The incorporation of directed-dyad fixed effects controls for all time-invariant confounders. In Table D9, the sizes of the coefficients of *Extended Dependence* are similar to those in the main text, and the explanatory variable remains statistically significant in every model. This means that the findings hold, even using the most conservative model specification (i.e., unit fixed effects, year fixed effects, and corrections for temporal dependence together). Substantively, the results indicate that, for those directed dyads that do experience interstate conflict, the change in *Extended Dependence* can well explain the likelihood of conflict initiation.

Table D1: Using politically relevant dyads only

	DV: All MIDs				DV: Fatal MIDs			
	(D1.1)	(D1.2)	(D1.3)	(D1.4)	(D1.5)	(D1.6)	(D1.7)	(D1.8)
Extended Dependence		-0.013***	-0.013***	-0.011**		-0.027***	-0.027***	-0.021**
		(0.004)	(0.004)	(0.004)		(0.008)	(0.008)	(0.008)
Dyadic Dependence	-0.008		-0.003	-0.002	-0.006		0.004	0.005
	(0.007)		(0.007)	(0.006)	(0.016)		(0.013)	(0.013)
Challenger Total Capability Share				0.472**				0.312
				(0.152)				(0.303)
Mutual Defensive Allies Count				0.009				-0.027
				(0.010)				(0.022)
Dyadic Defense Pact	-0.234*	-0.106	-0.105	-0.158	-0.733***	-0.459*	-0.460*	-0.076
	(0.118)	(0.118)	(0.119)	(0.192)	(0.196)	(0.198)	(0.199)	(0.329)
Target Major Power	0.264	0.305*	0.317*	0.516**	0.034	0.140	0.132	0.206
	(0.160)	(0.150)	(0.155)	(0.174)	(0.296)	(0.268)	(0.280)	(0.312)
Challenger Democracy	-0.288***	-0.274***	-0.274***	-0.297***	-0.421***	-0.393***	-0.393***	-0.394***
	(0.062)	(0.061)	(0.060)	(0.061)	(0.109)	(0.106)	(0.106)	(0.104)
Target Democracy	-0.097	-0.043	-0.041	-0.054	-0.140	-0.051	-0.052	-0.057
	(0.069)	(0.071)	(0.071)	(0.071)	(0.129)	(0.129)	(0.129)	(0.132)
Contiguity	1.803***	1.805***	1.809***	1.849***	2.001***	2.034***	2.030***	2.064***
	(0.185)	(0.180)	(0.182)	(0.176)	(0.320)	(0.312)	(0.315)	(0.308)
Distance	-0.123*	-0.128*	-0.129*	-0.154**	-0.370***	-0.367***	-0.366***	-0.381***
	(0.052)	(0.051)	(0.050)	(0.050)	(0.082)	(0.079)	(0.079)	(0.077)
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Temporal Dependence	✓	✓	✓	✓	✓	✓	✓	✓
Observations	143,939	143,939	143,939	143,939	142,049	142,049	142,049	142,049

Note: (1) Robust standard errors clustered by directed dyads in parentheses; (2) * $p<0.05$; ** $p<0.01$; *** $p<0.001$, two-tailed.

Table D2: Treating revisionist states as conflict initiators

	DV: All MIDs				DV: Fatal MIDs			
	(D2.1)	(D2.2)	(D2.3)	(D2.4)	(D2.5)	(D2.6)	(D2.7)	(D2.8)
Extended Dependence		-0.013***	-0.012**	-0.010*		-0.034***	-0.033***	-0.025**
		(0.004)	(0.004)	(0.004)		(0.010)	(0.010)	(0.009)
Dyadic Dependence	-0.015*		-0.011	-0.010	-0.025		-0.013	-0.013
	(0.008)		(0.007)	(0.007)	(0.019)		(0.016)	(0.016)
Challenger Total Capability Share				0.507**				0.390
				(0.164)				(0.357)
Mutual Defensive Allies Count				0.011				-0.030
				(0.013)				(0.026)
Dyadic Defense Pact	-0.149	-0.038	-0.029	-0.112	-0.509*	-0.245	-0.232	0.167
	(0.153)	(0.155)	(0.155)	(0.255)	(0.234)	(0.227)	(0.230)	(0.383)
Target Major Power	1.253***	1.223***	1.275***	1.423***	1.126***	1.114***	1.169***	1.217***
	(0.180)	(0.177)	(0.178)	(0.187)	(0.314)	(0.288)	(0.298)	(0.323)
Challenger Democracy	-0.302***	-0.286***	-0.286***	-0.305***	-0.459***	-0.421***	-0.420***	-0.418***
	(0.060)	(0.060)	(0.060)	(0.061)	(0.104)	(0.101)	(0.100)	(0.101)
Target Democracy	-0.064	-0.020	-0.014	-0.036	-0.165	-0.074	-0.067	-0.075
	(0.072)	(0.074)	(0.073)	(0.076)	(0.141)	(0.143)	(0.142)	(0.146)
Contiguity	3.747***	3.752***	3.757***	3.707***	4.673***	4.698***	4.705***	4.657***
	(0.181)	(0.181)	(0.181)	(0.182)	(0.336)	(0.335)	(0.335)	(0.347)
Distance	-0.336***	-0.333***	-0.337***	-0.352***	-0.438***	-0.423***	-0.425***	-0.443***
	(0.061)	(0.060)	(0.060)	(0.060)	(0.098)	(0.096)	(0.095)	(0.092)
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Temporal Dependence	✓	✓	✓	✓	✓	✓	✓	✓
Observations	1,378,861	1,378,861	1,378,861	1,378,861	1,336,657	1,336,657	1,336,657	1,336,657

Note: (1) Robust standard errors clustered by directed dyads in parentheses; (2) * $p<0.05$; ** $p<0.01$; *** $p<0.001$, two-tailed.

Table D3: Taking the sum of extended and dyadic dependence

	DV: All MIDs		DV: Fatal MIDs	
	(D3.1)	(D3.2)	(D3.3)	(D3.4)
Extended + Dyadic Dependence	-0.013***	-0.009**	-0.023**	-0.016*
	(0.003)	(0.003)	(0.007)	(0.007)
Challenger Total Capability Share		0.725***		0.521
		(0.138)		(0.299)
Mutual Defensive Allies Count		0.005		-0.026
		(0.011)		(0.021)
Dyadic Defense Pact	-0.163	-0.126	-0.485*	-0.079
	(0.123)	(0.193)	(0.200)	(0.320)
Target Major Power	1.158***	1.344***	0.787**	0.865**
	(0.152)	(0.164)	(0.250)	(0.275)
Challenger Democracy	-0.225***	-0.246***	-0.372***	-0.376***
	(0.058)	(0.059)	(0.107)	(0.106)
Target Democracy	-0.056	-0.085	-0.073	-0.087
	(0.067)	(0.069)	(0.128)	(0.133)
Contiguity	3.787***	3.712***	4.661***	4.595***
	(0.164)	(0.166)	(0.285)	(0.297)
Distance	-0.323***	-0.345***	-0.425***	-0.443***
	(0.052)	(0.054)	(0.079)	(0.079)
Year Fixed Effects	✓	✓	✓	✓
Temporal Dependence	✓	✓	✓	✓
Observations	1,378,861	1,378,861	1,362,097	1,362,097

Note: (1) Robust standard errors clustered by directed dyads in parentheses; (2) * $p<0.05$; ** $p<0.01$; *** $p<0.001$, two-tailed.

Table D4: Controlling for specific alliances

	DV: All MIDs		DV: Fatal MIDs	
	(D4.1)	(D4.2)	(D4.3)	(D4.4)
Extended Dependence	-0.015***	-0.012**	-0.027**	-0.017*
	(0.004)	(0.004)	(0.009)	(0.008)
Dyadic Dependence	-0.004	-0.007	0.001	0.000
	(0.007)	(0.007)	(0.014)	(0.014)
Challenger Total Capability Share	0.946***	0.769***	0.725*	0.494
	(0.148)	(0.144)	(0.338)	(0.310)
Mutual Defensive Allies Count	-0.004	0.009	-0.031	-0.025
	(0.011)	(0.011)	(0.021)	(0.021)
Target U.S. Defense Pact	0.621**		0.677	
	(0.197)		(0.439)	
Target NATO member		0.359		-0.211
		(0.242)		(0.406)
Dyadic Defense Pact	-0.008	-0.170	0.036	-0.092
	(0.199)	(0.193)	(0.329)	(0.321)
Target Major Power	1.363***	1.244***	0.844**	0.867**
	(0.166)	(0.176)	(0.285)	(0.288)
Challenger Democracy	-0.247***	-0.247***	-0.366***	-0.375***
	(0.057)	(0.059)	(0.100)	(0.106)
Target Democracy	-0.194*	-0.138	-0.196	-0.062
	(0.080)	(0.085)	(0.176)	(0.156)
Contiguity	3.658***	3.698***	4.555***	4.595***
	(0.164)	(0.169)	(0.302)	(0.299)
Distance	-0.370***	-0.347***	-0.465***	-0.437***
	(0.054)	(0.055)	(0.081)	(0.078)
Year Fixed Effects	✓	✓	✓	✓
Temporal Dependence	✓	✓	✓	✓
Observations	1,378,784	1,378,784	1,362,097	1,362,097

Note: (1) Robust standard errors clustered by directed dyads in parentheses; (2) * $p<0.05$; ** $p<0.01$; *** $p<0.001$, two-tailed.

Table D5: Including additional control variables

	DV: All MIDs	DV: Fatal MIDs
	(D5.1)	(D5.2)
Extended Dependence	-0.010 (0.004)**	-0.020 (0.008)**
Dyadic Dependence	-0.006 (0.008)	0.000 (0.014)
Challenger Total Capability Share	0.952 (0.180)***	0.561 (0.355)
Mutual Defensive Allies Count	0.007 (0.013)	-0.009 (0.026)
Target Total Defensive Allies Count	0.005 (0.008)	-0.012 (0.017)
Alliance Portfolio Similarity	-1.418 (0.414)***	-1.650 (0.634)**
Co-IGO Memberships	0.031 (0.004)***	0.026 (0.012)*
Dyadic Defense Pact	-0.235 (0.216)	-0.103 (0.361)
Target Major Power	1.132 (0.162)***	0.776 (0.271)**
Challenger Democracy	-0.364 (0.052)***	-0.480 (0.098)***
Target Democracy	-0.209 (0.070)**	-0.183 (0.124)
Contiguity	3.477 (0.172)***	4.480 (0.273)***
Distance	-0.373 (0.068)***	-0.461 (0.092)***
Year Fixed Effects	✓	✓
Temporal Dependence	✓	✓
Observations	1,378,070	1,361,306

Note: (1) Robust standard errors clustered by directed dyads in parentheses; (2) * $p<0.05$; ** $p<0.01$; *** $p<0.001$, two-tailed.

Table D6: Removing potential outliers

	DV: All MIDs			DV: Fatal MIDs		
	(D6.1)	(D6.2)	(D6.3)	(D6.4)	(D6.5)	(D6.6)
Extended Dependence	-0.014***	-0.014***	-0.009**	-0.027***	-0.027***	-0.019*
	(0.004)	(0.004)	(0.004)	(0.008)	(0.008)	(0.008)
Dyadic Dependence		-0.008	-0.007		-0.001	0.000
		(0.007)	(0.007)		(0.014)	(0.014)
Challenger Total Cap. Share			0.724***			0.514
			(0.139)			(0.300)
Mutual Def. Allies Count			0.005			-0.023
			(0.011)			(0.022)
Dyadic Defense Pact	-0.167	-0.161	-0.130	-0.469*	-0.467*	-0.101
	(0.123)	(0.123)	(0.195)	(0.197)	(0.198)	(0.325)
Target Major Power	1.104***	1.141***	1.335***	0.713**	0.725**	0.818**
	(0.151)	(0.155)	(0.168)	(0.247)	(0.259)	(0.286)
Challenger Democracy	-0.225***	-0.225***	-0.246***	-0.369***	-0.369***	-0.375***
	(0.058)	(0.058)	(0.059)	(0.107)	(0.107)	(0.106)
Target Democracy	-0.060	-0.056	-0.085	-0.075	-0.073	-0.087
	(0.068)	(0.067)	(0.070)	(0.128)	(0.128)	(0.133)
Contiguity	3.782***	3.785***	3.712***	4.649***	4.651***	4.589***
	(0.164)	(0.164)	(0.166)	(0.285)	(0.285)	(0.296)
Distance	-0.319***	-0.321***	-0.344***	-0.421***	-0.421***	-0.440***
	(0.052)	(0.052)	(0.054)	(0.079)	(0.079)	(0.079)
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Temporal Dependence	✓	✓	✓	✓	✓	✓
Observations	1,377,987	1,377,987	1,377,987	1,361,223	1,361,223	1,361,223

Note: (1) Robust standard errors clustered by directed dyads in parentheses; (2) * $p<0.05$; ** $p<0.01$; *** $p<0.001$, two-tailed.

Table D7: Using listwise deletion for dyadic dependence

	DV: All MIDs			DV: Fatal MIDs		
	(D7.1)	(D7.2)	(D7.3)	(D7.4)	(D7.5)	(D7.6)
Extended Dependence		-0.014***	-0.009*		-0.025**	-0.017*
		(0.004)	(0.004)		(0.008)	(0.008)
Dyadic Dependence	-0.012	-0.008	-0.005	-0.005	-0.000	0.002
	(0.008)	(0.007)	(0.007)	(0.015)	(0.014)	(0.014)
Challenger Total Cap. Share			0.870***			0.586
			(0.162)			(0.362)
Mutual Def. Allies Count			0.009			-0.022
			(0.011)			(0.022)
Dyadic Defense Pact	-0.206	-0.067	-0.051	-0.650**	-0.396	-0.025
	(0.123)	(0.125)	(0.203)	(0.216)	(0.215)	(0.353)
Target Major Power	0.979***	1.016***	1.237***	0.573	0.645*	0.731*
	(0.163)	(0.159)	(0.177)	(0.296)	(0.281)	(0.313)
Challenger Democracy	-0.237***	-0.216***	-0.255***	-0.335**	-0.298*	-0.313**
	(0.062)	(0.060)	(0.061)	(0.123)	(0.119)	(0.116)
Target Democracy	-0.147*	-0.080	-0.106	-0.253	-0.150	-0.163
	(0.071)	(0.073)	(0.074)	(0.141)	(0.146)	(0.151)
Contiguity	3.749***	3.750***	3.653***	4.466***	4.481***	4.412***
	(0.168)	(0.168)	(0.171)	(0.297)	(0.298)	(0.312)
Distance	-0.202***	-0.209***	-0.229***	-0.347***	-0.347***	-0.362***
	(0.053)	(0.051)	(0.052)	(0.085)	(0.083)	(0.080)
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Temporal Dependence	✓	✓	✓	✓	✓	✓
Observations	1,026,694	1,026,694	1,026,694	1,013,749	1,013,749	1,013,749

Note: (1) Robust standard errors clustered by directed dyads in parentheses; (2) * $p<0.05$; ** $p<0.01$; *** $p<0.001$, two-tailed.

Table D8: Using democratic dyad as a control variable

	DV: All MIDs				DV: Fatal MIDs			
	(D8.1)	(D8.2)	(D8.3)	(D8.4)	(D8.5)	(D8.6)	(D8.7)	(D8.8)
Extended Dependence		-0.012***	-0.011***	-0.007*		-0.023**	-0.022**	-0.016*
		(0.003)	(0.003)	(0.003)		(0.008)	(0.007)	(0.007)
Dyadic Dependence	-0.011		-0.007	-0.006	-0.009		-0.002	-0.001
	(0.008)		(0.007)	(0.007)	(0.016)		(0.014)	(0.014)
Challenger Total Capability Share				0.772***				0.589*
				(0.141)				(0.299)
Mutual Defensive Allies Count				0.012				-0.011
				(0.011)				(0.022)
Dyadic Defense Pact	-0.181	-0.085	-0.080	-0.125	-0.529**	-0.343	-0.330	-0.115
	(0.118)	(0.119)	(0.119)	(0.191)	(0.195)	(0.195)	(0.196)	(0.333)
Target Major Power	1.130***	1.123***	1.155***	1.376***	0.728**	0.751**	0.767**	0.908**
	(0.152)	(0.149)	(0.151)	(0.164)	(0.268)	(0.248)	(0.260)	(0.287)
Democratic Dyad	-1.084***	-0.993***	-0.988***	-1.092***	-1.970***	-1.782***	-1.782***	-1.829***
	(0.121)	(0.124)	(0.124)	(0.130)	(0.354)	(0.360)	(0.361)	(0.362)
Contiguity	3.805***	3.804***	3.807***	3.723***	4.697***	4.700***	4.702***	4.624***
	(0.163)	(0.164)	(0.164)	(0.165)	(0.286)	(0.286)	(0.287)	(0.298)
Distance	-0.331***	-0.328***	-0.331***	-0.361***	-0.440***	-0.433***	-0.433***	-0.459***
	(0.052)	(0.052)	(0.052)	(0.054)	(0.082)	(0.082)	(0.081)	(0.081)
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Temporal Dependence	✓	✓	✓	✓	✓	✓	✓	✓
Observations	1,378,861	1,378,861	1,378,861	1,378,861	1,362,097	1,362,097	1,362,097	1,362,097

Note: (1) Robust standard errors clustered by directed dyads in parentheses; (2) * $p<0.05$; ** $p<0.01$; *** $p<0.001$, two-tailed.

Table D9: Including directed-dyad fixed effects

	DV: All MIDs			DV: Fatal MIDs		
	(D9.1)	(D9.2)	(D9.3)	(D9.4)	(D9.5)	(D9.6)
Extended Dependence	-0.012**	-0.013**	-0.012**	-0.030**	-0.027*	-0.025*
	(0.004)	(0.004)	(0.004)	(0.011)	(0.011)	(0.011)
Dyadic Dependence		0.001	-0.001		0.001	-0.001
		(0.010)	(0.010)		(0.022)	(0.022)
Challenger Total Cap. Share			0.509*			0.696
			(0.217)			(0.472)
Mutual Def. Allies Count			0.009			-0.008
			(0.012)			(0.033)
Dyadic Defense Pact		0.052	0.094		-0.201	0.055
		(0.147)	(0.190)		(0.347)	(0.453)
Target Major Power		0.486	0.492		(omitted)	(omitted)
		(0.319)	(0.320)			
Challenger Democracy		-0.075	-0.062		-0.105	-0.094
		(0.071)	(0.071)		(0.165)	(0.166)
Target Democracy		-0.026	-0.050		-0.004	-0.041
		(0.072)	(0.072)		(0.164)	(0.167)
Contiguity		1.529***	1.491***		1.144	1.086
		(0.239)	(0.239)		(0.597)	(0.598)
Distance		(omitted)	(omitted)		(omitted)	(omitted)
Directed-Dyad Fixed Effects	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Temporal Dependence	✓	✓	✓	✓	✓	✓
Observations	29,808	29,609	29,609	8,237	8,234	8,234

Note: (1) Standard errors in parentheses; (2) * $p<0.05$; ** $p<0.01$; *** $p<0.001$, two-tailed.

E Additional Evidence of the Causal Mechanisms

I use this section to provide additional statistical evidence of the causal mechanisms. In the main text, I argued that *Extended Dependence* facilitates peace through three mechanisms. In the event of military conflict, the allies of the target state may (1) reduce trade following direct military intervention, (2) punish the challenger by imposing economic sanctions, or (3) undermine the challenger's ability to access alternative markets to its lost trade. In the online appendix, I provide some preliminary evidence of Mechanisms 1 and 3. I primarily focus on these two mechanisms because they are directly related to trade volumes so that I can test them with the dataset of this study. While I do not provide statistical evidence for Mechanism 2, I offered some qualitative evidence in the main text. I suggest that systematically exploring the circumstances under which third-party allies impose economic sanctions is a very interesting and important topic that deserves a separate, full article. I therefore leave it for future investigation.

The statistical analysis relies on the COW bilateral trade dataset (Barbieri, Keshk, and Pollins, 2009). Since I lagged the independent variables by one year to account for potential endogeneity, I focus on the period 1952–2011, which is consistent with the temporal domain of the main analysis. I employ two regression models: (1) the two-way fixed effects (i.e., dyad-specific fixed effects and year-specific fixed effects) model with lagged dependent variable, and (2) the dyad fixed effects model with AR(1) disturbances. Because these two models have already accounted for time-invariant confounders and autocorrelation within each dyad, I do not include other control variables. The dependent variable in these tests is the natural log of bilateral trade (in U.S. millions of current dollars). Since the log of 0 is undefined, I manually add one thousand to all trade values.

To support Mechanism 1, I examine whether trade between the challenger and the joiner on the target's side decreases. The independent variable here is whether the two states in the dyad engaged in a (*Fatal*) *MID* where one state was the challenger and the other state was a joiner on the target's side in the preceding year. Also consistent with

Table E1: Trade between the challenger and joiner on the target side

	DV: Trade, logged			
	(E1.1)	(E1.2)	(E1.3)	(E1.4)
MID Initiation	-1.124*** (0.138)	-0.405*** (0.114)		
Fatal MID Initiation			-1.690*** (0.255)	-0.706*** (0.217)
Dyad Fixed Effects	✓	✓	✓	✓
Year Fixed Effects	✓		✓	
Lagged Dependent Variable	✓		✓	
AR(1)		✓		✓
Observations	527,539	519,324	527,539	519,324

Note: (1) Standard errors in parentheses; (2) *** $p<0.001$.

the main analysis, I only consider the primary challengers. Table E1 reports the empirical results. *MIDs* initiation between the challenger and joiner on the target's side does decline significantly in all of these models ($p\leq 0.001$). This finding indicates that, if the allies of the target state intervene in the military conflict, the challenger is likely to suffer from additional lost trade. Relatively, *Fatal MIDs* yields a more detrimental effect on reducing the bilateral trade between the challenger and joiner on the target side.

For Mechanism 3, I test the effect of military conflict on trade between the challenger and the target's allies. The independent variable in this analysis is whether one state initiated a (*Fatal*) *MID* against an ally of the other state in the previous year. I display the results in Table E2. While different model specifications generate different statistical results, at a minimum, the results indicate that trade between the challenger and allies of the target generally does not increase. If this is the case, then the potential challenger will tend to have a harder time replacing its lost trade when it is more economically dependent on the target's allies.

I should note that these results are preliminary, but they are supportive of the causal mechanisms. As I discussed in the conclusion section in the article, I see this study as a

Table E2: Trade between the challenger and target's allies

	DV: Trade, logged			
	(E2.1)	(E2.2)	(E2.3)	(E2.4)
MID Initiation	-0.076***	0.001		
	(0.016)	(0.014)		
Fatal MID Initiation			-0.133***	-0.018
			(0.037)	(0.030)
Dyad Fixed Effects	✓	✓	✓	✓
Year Fixed Effects	✓		✓	
Lagged Dependent Variable	✓		✓	
AR(1)		✓		✓
Observations	527,539	519,324	527,539	519,324

Note: (1) Standard errors in parentheses; (2) *** $p<0.001$.

valuable step to advancing our understanding of the relationship among trade, alliances, and peace as well as how economic linkages and international security institutions can work together in ways that lead to peace. Future research can benefit from conducting more comprehensive analysis of each of the causal mechanisms.

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