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Trade and War, Revisited

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Abstract

This study revisits the question of the nexus between economic interdependence and militarized interstate disputes. Despite deepening ties between countries through trade and investment after the Second World War, the number of militarized interstate disputes has not decreased. Incorporating the political regimes of trade partners into analyses and addressing a potential methodological issue in the literature, this study finds that the stronger the trade ties between a pair of countries, the less likely they are to enter militarized interstate disputes. A trade-peace nexus exists for pairs of democracies. The nexus is weakened or almost nonexistent when one of the pairs is an authoritarian regime.

Keywords: international trade, interstate militarized disputes, war
JEL classification: F14, F51

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1. INTRODUCTION

In 1748, Montesquieu argued in De L'esprit Des Lois that international economic dependence among countries reduces the probability of interstate disputes. Endless wars in Europe, especially from the Medieval ages, culminated in the First and Second World Wars. Europe was ruined in 1945. The European people hoped for a peaceful and affluent society. To deepen the economic ties between France and Germany, long-time foes, the then French Foreign Minister, Robert Schuman, proposed that France and Germany should place their coal and steel sectors under the control of a supranational authority. This initiative gave birth to the European Coal and Steel Community and eventually to the European Union. Since then, war between France and Germany has been unimaginable. After the Second World War, and especially after the collapse of the Soviet Union, nations became increasingly interconnected through international trade, foreign direct investment, and global finance.

Despite deepening economic ties between nations, the number of military conflicts is not decreasing, as shown in the subsequent sections. Even Europe, which seemed to have been in the course of perpetual peace, saw a full-scale invasion of Ukraine by Russian forces on its eastern flank and is now facing the potential risk of military conflicts with Russia.

Triggered by Russian President Vladimir Putin's irrational decision to wage war against its neighboring country, Ukraine, this study revisits the question of nations' mutual economic dependency and war using the most recent data with some improvements in methodologies, incorporating the concept of political regimes (authoritarian, democratic, and hybrid).

Literature

The relationship between trade ties and interstate conflicts has mainly been studied in political science literature. In one of their early survey studies, Barbieri and Schneider (1999) argued that theories suggest economic ties may either work for or against peace. A review paper by Schultz (2015) discussed an emerging view of borders as institutions that not only distribute territory but also allow cooperation and the production of joint gains. On the empirical front, Kinne (2012) incorporated network analysis into the issue and found that network centrality constrained aggression. However, these studies do not properly address endogeneity issues or omit variable biases, as pointed out by Martin et al. (2008). Drawing on the idea from political science literature that the trade-peace nexus depends on whether a pair of states have a symmetric or asymmetric trade relationship, Martin et al. (2008) constructed bilateral openness and multilateral openness indices from trade data spanning 1950 to 2000 and analyzed the trade-peace nexus. Their estimation results showed that bilateral trade reduces the probability of conflict, whereas multilateral trade increases it. In other words, the more dependent a country is on its partner country in its trade, the less likely it is to enter an interstate conflict. The less dependent on a partner country (high multilateral openness), the smaller the cost of waging war and the more likely a country is to go to war. Alesina and Spolaore (1997, 2003) argued that globalization reduces local economic dependence, decreases the opportunity cost of conflict, and increases the equilibrium number of local wars. Regarding the effect of Foreign Direct Investment

(FDI) on conflicts, Bussmann's (2010) empirical study showed that economic integration through FDI reduces the risk of a fatal dispute outbreak. However, the FDI data they used was not dyadic (country pairs).

Novelty of this study

Below, I describe the novelty of this paper vis-à-vis the existing literature. This study argues that political regimes and values are important factors affecting the probability of war. As has become clear from the Russian invasion of Ukraine, Vladimir Putin disdains Western democracy and its value. In democratic countries, governments need to heed public opinion. If governments ignore public appeals, either from citizens, consumers, or firms, to not wage war with an important partner country, they can be voted out. However, authoritarian regimes offer little incentive to care about voting. A one-party regime such as China has no elections; thus, the Chinese Communist Party does not need to win ballots. This study incorporates the political regimes of pairs of countries into its analyses. It also highlights a potential problem with the specifications of previous literature and attempts to improve on it.

2. DATA

The data on interstate disputes are taken from the Militarized Interstate Disputes (MID) (v5.0) of the Correlates of War (COW) project. Furthermore, international trade data are taken from UN Comtrade at SITC rev.2. Political regime data are obtained from the Global State of Democracy Indices.

MID (v5.0) categorized interstate disputes for the period from 1816 to 2014, covering 166 countries, into five levels: Level 1, no militarized action; Level 2, threat to use force; Level 3, display of force; Level 4, use of force; and Level 5, war.[1]

UN Comtrade, compiled by the United Nations Statistics Division, covers approximately 200 countries and represents more than 99% of the world's merchandise trade. The data are provided by several product codes, such as the Harmonized System (HS) code or Standard International Trade Classification (SITC). HS 6-digit has the most disaggregated code at the internationally harmonized level with approximately 5200 product codes, whereas the most disaggregated SITC at 5-digit has approximately 1200 product codes. This study uses trade data from the SITC codes because SITC code data are available from the 1960s, whereas HS code data are available only from approximately 1990.

The Global State of Democracy Indices categorizes countries into the following five democratic categories based on five attributes: 1. Representative Government (free and equal access to political power), 2. Fundamental Rights (individual liberties and resources), 3. Checks on Government (effective control of executive power), 4. Impartial Administration (fair and predictable public administration), 5. Participatory Engagement (instruments for and realization of political involvement). Each attribute is composed of several subattributes. The five democratic performances were

[1] Level 1: No militarized action includes, for example, South Korea and Japan, who went on alert in response to a North Korean missile test. Level 5: War is defined as a conflict resulting in at least 1000 deaths of military personnel.

aggregated into three groups: Authoritarian, Hybrid, and Democratic. There are other datasets similar to the Global State of Democracy Indices used in this study, as shown in Table A2 in the Appendix. This study uses the Global State of Democracy Indices because of its focus on democratic performance, sufficiently long data period, sufficient number of countries, and number of indicators covered. The closest dataset to the Global State of Democracy Indices is the Varieties of Democracy (V-dem). However, this study uses the Global State of Democracy Indices because, as gleaned from the explanations on their respective websites, the Global State of Democracy Indices are an improved version of the Democracy Index based on the Varieties of Democracy datasets.

3. DESCRIPTIVE ANALYSES

Figure 1 shows the number of disputes compiled from the MID (v5.0), including all hostility levels. Unsurprisingly, there were spikes around 1915 and 1940, during the First and Second World Wars, respectively. Notably, the number of disputes did not show a downward trend after the Second World War or even increased in the 1990s, despite the deepening globalization at that time.

========== Figure 1 ==========

Figure 2 shows the ratios of political regimes between 1975-2020. The proportion of democracies increased substantially during the 1990s. From 2010 to the present, the ratio has been stable, with approximately 25% being Authoritarian, 65% Democratic, and 10% being Hybrid. Figure 3 illustrates the democratic performance of China and Russia, two large authoritarian countries. When the Soviet Union was dismantled into many sovereign countries, and the Russian Federation emerged, its democratic performance level increased to Levels 2 and 3 mainly due to its adoption of general elections and has stayed at Level 2: hybrid regime, since around 2012. On the other hand, China has remained at Level 1: authoritarian regime.[2]

========== Figure 2 ==========

========== Figure 3 ==========

Figure 4 depicts the number of disputes by pair of political regimes, such as democracy versus democracy and democracy versus authoritarianism, since 1975. Until 1990, most disputes were between authoritarian regimes or between authoritarian and democratic regimes. From around 1990, the number of disputes between democratic regimes increased, which was not surprising given the increasing number of democratic regimes at that time.

Figure 5 converts the numbers in Figure 4 into shares using pairs of political regimes. In the long run, the share of authoritarian-authoritarian pairs decreases, whereas that of other pairs generally increases.

========== Figure 4 ==========

========== Figure 5 ==========

The world trade values by pair of political regimes for 1970-2020 are shown in Figure 6. Trade

[2] Given the oppression of political opponents by Vladimir Putin, Russia's president, Russia's Level 2 status may be debatable.

value steadily increased in the long run, especially in the 2000s and the late 2010s, except for the collapse of trade due to the global financial crisis of 2007-2008. Most of the increase occurred between democratic pairs. However, the shares of trade values by the pairs of political regimes depicted in Figure 7 indicate that the shares have changed little.

========== Figure 6 ==========

========== Figure 7 ==========

From these descriptive analyses, no association between interstate disputes and international trade is observed. The next section focuses on the econometric analyses.

4. ESTIMATION ANALYSES

To identify the nexus between economic interdependence through trade and disputes, the following benchmark model is estimated:

$$Dispute_{ijt} = \beta_0 + \beta_1 \ln BilateralTradeValue_{ij} + \sum_{k=1}^{6} \tilde{\beta}_k \ln BilateralTradeValue_{ij} * DemocracyStatusCombinationDummy_k + \alpha_{it} + \alpha_{jt} + \alpha_{ij} + \varepsilon_{ijt} \quad (1)$$

where i represents the country of origin, and j represents the destination country. y is the year. $\ln BilateralTradeValue_{ij}$ is the sum of trade values between countries i and j. α_{it}, α_{jt}, α_{ij} are country i – year fixed effects, country j – year fixed effects, and country i – country j pair fixed effects. ε_{ijt} is the error term. There are six DemocracyStatusCombination dummies as combinations of regime categories, namely Democracy-Democracy, Democracy-Hybrid, Democracy-Authoritarian, Hybrid-Authoritarian, Hybrid-Hybrid, and Authoritarian-Authoritarian.

This estimation equation is different from the previous study by Martin et al. (2008), whose estimation model is presented below.

$$Dispute_{ijt} = \beta_0 + \beta_1 \ln BilateralTradeValue_{ij} + \beta_2 MultilateralOpenness_{ij} + \beta_3 Distance_{ij} + \beta_4 Contiguous_{ij} + Year + \varepsilon_{ijt} \quad (2)$$

where, $\ln BilateralOpenness_{ij} = \ln\left(m_{ijt}/E_{it} + m_{jit}/E_{jt}\right)$,
$\ln MultirateralOpenness_{ij} = \ln\left(\sum_{h\neq j,i}^{R} m_{iht}/E_{it} + m_{jht}/E_{jt}\right)$
m: imports, E: GDP

Bilateral openness captures economic interdependence through trade between countries i and j, whereas multilateral openness captures how countries i and j diversify their trading partners. When country i's trade with countries other than country j is high, multilateral trade openness is higher; thus, country i is less dependent on country j in its trade. Martin et al. (2008) employed a logit model. Although Martin et al.'s (2008) estimation equation is estimated below, the abovementioned Equation (1) was used as the benchmark estimation model. The data used for the estimations are for 1976-2014, as all three datasets are available only for this period.

Table 1 shows the distribution of hostility levels in MID from 1976 to 2014. Information regarding disputes has direction. Namely, it is an action from the state i to the state j. From the side of the state i ("Country i" in the table), out of the total observations of 267344, 266166 are non-dispute dyads and 1178 are dispute dyads. Out of these 1178 disputes, 90 are categorized into "war," 518 into "use of force," and 297 into "display of force."

========== Table 1 ==========

Table 2 presents the estimation results of Martin et al. (2008). In this estimation, I follow Martin et al.'s (2008) definition of MID as 1 when the dispute level is higher than or equal to Level 4. Column (2), which has the four-year lagged trade value as an explanatory variable, corresponds to the results of Martin et al. (2008), who argue that the influence of trade relationships on MID should have time lags. Although Martin et al. (2008) showed a statistically significant coefficient estimate with a negative sign for the covariate, Log of bilateral openness t-4, and a statistically significant coefficient estimate with a positive sign for the covariate, Log of multilateral openness, the replication of this study shows statistically insignificant coefficient estimates for both covariates. However, as Column (1) shows, replication with both covariates in the contemporaneous period (i.e., no time lags) yields coefficient estimates with the expected signs of Martin et al. (2008). A 1% increase in the bilateral openness index was associated with a 61.5% decrease in the probability of a pair of countries entering a MID. A 1% increase in the multilateral openness index was associated with a 67% increase in the probability of a pair of countries entering a MID. As the data source used in this study is the same as that of Martin et al. (2008), except for the time period, a potential reason for this difference lies in the longer study period. Whereas the dependent variable, the MID of Martin et al. (2008), does not distinguish between the initiator of the MID and the country that was threatened or attacked, this study argues that it is better to have a unidirectional MID as the dependent variable, because asymmetry such as GDP matters. Russia is a much larger country than Ukraine and thus is more likely to take military action against Ukraine. This study employed Equation (1). As it involves full fixed effects, I estimated a linear model instead of a logit model.

========== Table 2 ==========

Benchmark estimation results

The benchmark estimation results are shown in Column (1) of Table 3. The dependent variable of disputes takes the value of 1 if the hostility level ranges from 1 to 5. As expected, the variable of our interest, the Log of bilateral trade value, shows a statistically significant coefficient estimate with a negative sign. Note that the importer/exporter fixed effects absorb the effects of regime pairs on disputes. The results indicate that, in general, the more trade two countries engage in, the less likely they are to have MID. However, the magnitude of the estimated coefficient was not large. Doubling the trade value–that is, a 100% increase in trade value–is associated with a 0.05% decrease in interstate military disputes. The cross-term variable of the log of bilateral trade value and democracy status combination has Democracy-Democracy as the reference category. Compared with Democracy-Democracy, all other combinations show statistically significant positive coefficients, indicating that

the trade-peace nexus weakens in pairs other than Democracy-Democracy. Column (2) shows the estimation results when the definition of disputes is changed to the case of the state i, which has a hostility level of more than 4. The estimation results are qualitatively the same as those in Column (1). Because the coefficient estimate of the cross-term with Authoritarian-Authoritarian (0.000615) more than offsets the coefficient estimate of the Log of bilateral trade value (-0.000493), which may indicate that more trade is associated with a higher chance of MID in the case of the Authoritarian-Authoritarian pair, I estimated the same model with the Authoritarian-Authoritarian pair as the reference category in Column (3) for all hostility levels and Column (4) for a hostility level of 4 or higher. The coefficient estimates are statistically insignificant, indicating that a trade-peace nexus does not exist in the case of an Authoritarian-Authoritarian pair. However, the cross-term with the democracy status combination dummy involving democracy is mostly statistically significant with negative signs.

========== Table 3 ==========

As argued in political science literature, power asymmetry may trigger disputes. To address this possibility, the GDP gap, defined as $\ln(GDP_i/GDP_j)$, is included as another control variable. The estimation results are presented in Table 4. As expected, the Log of GDP gap ratio shows a statistically significant coefficient estimate with a positive sign for a hostility level of 4 or higher. The other covariates showed qualitatively similar results to those presented in Table 3.

========== Table 4 ==========

Dependency on the trade of essential necessities such as oil and natural gas may contaminate the nexus between peace and international trade. The trade of essential natural resources may trigger military action, as shown by Russia's invasion of Ukraine. Thus, as a robustness check, estimations excluding oil and natural gas are conducted with the results in Table 5, which are qualitatively the same as those in Table 3.

========== Table 5 ==========

Addressing endogeneity

One concern about the nexus between peace and international trade is endogeneity, particularly reverse causation. To address this concern, Martin et al. (2008) employed estimations with lagged independent variables and instrumental variable estimation using a generalized system of preference (GSP) and a remoteness index. The rationale for using these two variables as instrumental variables is as follows: The GSP, which consists of tariff preferences granted by developed countries to developing countries, is positively correlated with international trade between pairs of countries (correlation condition), whereas the LDC (Least Developed Countries)'s eligibility for GSP programs is primarily based on their level of poverty; thus, GSP status has little to do with the beneficiary country's propensity to enter into military conflicts (exclusion restriction). The remoteness index is an inverse measure of each importer's set of alternative sourcing countries for their imports. Due to decreased competition from the rest of the world, a pair of countries with few nearby and large alternative sources of goods (remote pairs) will alter the geographical structure of their trade through a relative increase in their bilateral imports with respect to their multilateral imports. I followed the instrumental variable

estimations proposed by Martin et al. (2008) using the programming codes they made available but found that GSP variables have strange numbers, such as 5 or 8, even though they should be either 0, 1, or 2. Having corrected the computation, I estimated the first stage but found insignificant or even incorrect signs for the coefficient estimates. The second-stage estimation also shows statistically insignificant coefficients, sometimes with opposite signs. The same was true for the remoteness index. Thus, I abandoned the instrumental variable estimations. Instead, to address the endogeneity issue, the equation is estimated with lagged explanatory variables. Table 6 shows the estimation results. The one-time lagged trade value shows a statistically significant negative coefficient estimate. These results align with our intuition that there may be a time lag between the trade nexus and peaceful relationships. When there are conflicts over multiple years, such as in the case of Russia-Ukraine, using lagged explanatory variables may not help address the endogeneity issue. In light of this consideration, estimation analyses excluding observations of three or more consecutive interstate military disputes were conducted. As shown in Table 7, the estimation results are qualitatively the same as those shown in Table 6.

========== Table 6 ==========

========== Table 7 ==========

Supply chains

The deterrent effect of trade relationships on MID may be stronger when the trade of a pair of countries is intertwined through international supply chains. To investigate this possibility, I estimated Equation (1) by replacing the bilateral trade value with forward/backward linkage, which is used as a measure of international supply chains. Forward linkage represents how much Country A's output is used in Country B's production of exports. Backward linkage represents how much Country A uses imports of intermediate goods from Country B to produce its own exports. Forward and backward linkage data were drawn from the UNCTAD Eora Global Value Chain Database. Table 8 presents the estimation results. In columns (1) and (2), where the reference category is Democracy-Democracy, the variable of interest, Log of Forward linkage/GDP, shows statistically significant coefficient estimates with negative signs, indicating that a deeper supply chain is associated with a lower probability of MID. The coefficient estimate of -0.00167 in Column (1) indicates that a 1% increase in the Forward linkage/GDP ratio is associated with a 0.167% decrease in its likelihood of entering a MID. The cross-term with Authoritarian-Authoritarian shows statistically significant coefficient estimates with positive signs, mostly canceling trade-peace effects. Columns (3) and (4) show the estimation results with Authoritarian-Authoritarian as the reference category. The coefficient estimates for Log of Forward linkage/GDP are statistically insignificant or significant only at the 10% significance level, while the coefficient estimate for the cross term with Democracy-Democracy shows statistically significant coefficient estimates with negative signs, indicating that trade-peace nexus works for pairs of democratic countries.

========== Table 8 ==========

Trade concentration index

Another study on this topic was conducted by Yakovlev and Spleen (2022). They proposed an alternative model to that of Martin et al. (2008). Below are their arguments:

> "previous studies model trade interdependence and diversification simply as a linear combination of bilateral and multilateral trade flows. This is problematic for two reasons. First, multilateral trade flows tend to reflect the overall degree of trade dependence or openness rather than diversification per se, as we demonstrate in more detail later in this paper. Second, modeling bilateral trade dependence as a product of bilateral trade and its concentration produces a more accurate measure of true bilateral dependence by 'weighing' it with trade concentration. We convey this point simply and concisely by inserting this 'weighted' bilateral trade variable into the rationalist theoretical approach used extensively in conflict analysis (Gartzke & Hewitt, 2010). According to the rationalist approach, if the present discounted value of the total benefits (TB) of war exceeds its present discounted total costs (TC), then the net benefit (NB = TB-TC) of conflict is positive and the rational decision is then to go to war (yi = 1 if war occurs, yi = 0 otherwise). The equation below enumerates this cost-benefit analysis from the monadic perspective of some country i versus some other country j.
>
> $NB_{ij}=TB_{ij}-TC_{ij}=p_iV_{ij}-\tau_ib_{ij}-O_{ij}=(F_i/F_i+F_j)V_{ij}-\tau_ib_{ij}-O_{ij}$
>
> where V_{ij} is the total value of some asset or objective to be captured with probability p_i by country i using its military force F_i against military force F_j of country j, b_{ij} is the bilateral trade flow between country i and j weighted by the trade concentration index (TCI) τ_i of country i, and O_{ij} is all other implicit and explicit costs of going to war. Variable τ_i is the TCI inspired by Hirschman (1945) and is the key focus of this paper. Monadic or single-country TCI is calculated as the sum of the squared trade shares that a given nation has with all of its trading partners. Similar to HHI, TCI's theoretical range is from 0 to 1, where a value closer to 1 implies highly concentrated trade flows (i.e., very few but large trade shares) and a value closer to zero represents highly diversified trade flows (i.e., large numbers of small trade shares). The product of bilateral trade and TCI (τ_ib_{ij}) captures the degree of effective bilateral dependence much better than a linear combination of bilateral and multilateral flows used in previous studies. For example, if country i trades only with country j and $\tau_i = 1$, then all of its bilateral trade b_{ij} could be lost if the two countries go to war with each other. However, as TCI approaches zero, country i can better redirect its bilateral trade away from country j and toward its numerous other trading partners, thereby dramatically reducing the risk of bilateral trade losses in the event of war. Now, suppose that country i has zero trade with country j; then the product of bilateral trade and TCI becomes zero, correctly showing that the degree of trade diversification for country i would have no effect on the opportunity cost of war for

this country pair (dyad).[3]"

From the above cost-benefit equation, Yakovlev and Spleen (2022) estimated the following reduced-form equation:

$$\Pr(MID_{ijt}) = \beta_0 + \beta_1 \ln\left(\frac{b_{ij,t-4}+b_{ji,t-4}}{2}\right) + \beta_2 \ln\left(\frac{\tau_{i,t-4}+\tau_{j,t-4}}{2}\right) + \beta_3 Controls_{ijt} \quad (3)$$

where b_{ij}, b_{ji} are bilateral import flows as a share of GDP, and τ_i is country i's trade concentration index. TCI is calculated as the sum of the squared trade shares that a given nation has with all its trading partners, i.e., if country i trades only with country j and τ_i=1. However, I argue that taking an average of bilateral trade flow and TCI of countries i and j is inappropriate because their rationalist theoretical approach to the cost and benefit of waging a war is essentially how country i depends on country j. Thus, when analyzing the MID actions initiated by country i in country j, we should have only the TCI of country i. To incorporate the military power balance between countries i and j, as suggested by the above rationalist cost-benefit analysis of F_i/F_i+F_j, I have included the military alliance variable as an additional covariate.[4] The estimation equation is as follows:

$$MID_{ijt} = \beta_0 + \beta_1 lnBilateralTradeValue_{ij} * \tau_i + \sum_{k=1}^{3} lnBilateralValue_{ij} * \tau_i * RegimeDummy_k + \alpha_{it} + \alpha_{jt} + \alpha_{ij} + \varepsilon_{ijt} \quad (4)$$

Table 9 presents the estimation results. The cross-term of bilateral trade value and TCI (τ_i) shows statistically significant coefficients with negative signs, as expected. The cross-term with the authoritarian regime shows statistically significant coefficients with positive signs, indicating that the deterrent effect of trade dependence on conflict is attenuated in the case of an authoritarian regime.

========== Table 9 ==========

5. CONCLUDING REMARKS AND DISCUSSION

This study revisits the question of the nexus between economic interdependence and MID. Despite the deepening of ties between countries through trade and investment after World War II, the number of interstate disputes has not decreased. Incorporating the political regimes of trade partners into the analyses and addressing a potential methodological issue in previous literature, this study finds that the stronger the trade ties of a pair of countries, the less likely they are to enter MID. A trade-peace nexus exists for pairs of democracies. The nexus is weakened or almost nonexistent when one

[3] Table A2 in the appendix presents the numerical illustration of this argument.
[4] As I was not able to obtain the military expenditure data of countries in the Militarized Interstate Disputes (v5.0) of the Correlates of War (COW) project, I used the information on military alliance instead. Military alliance data are drawn from The Alliance Treaty Obligations and Provisions Project by RICE University.

of the pairs is an authoritarian regime.

As FDI can have stronger deterrent effects on militarized actions, I tried to incorporate FDI into the analyses. However, the lack of bilateral FDI data for authoritarian regimes such as China and Russia hindered the analyses. Future data will enable us to incorporate FDI into analyses.

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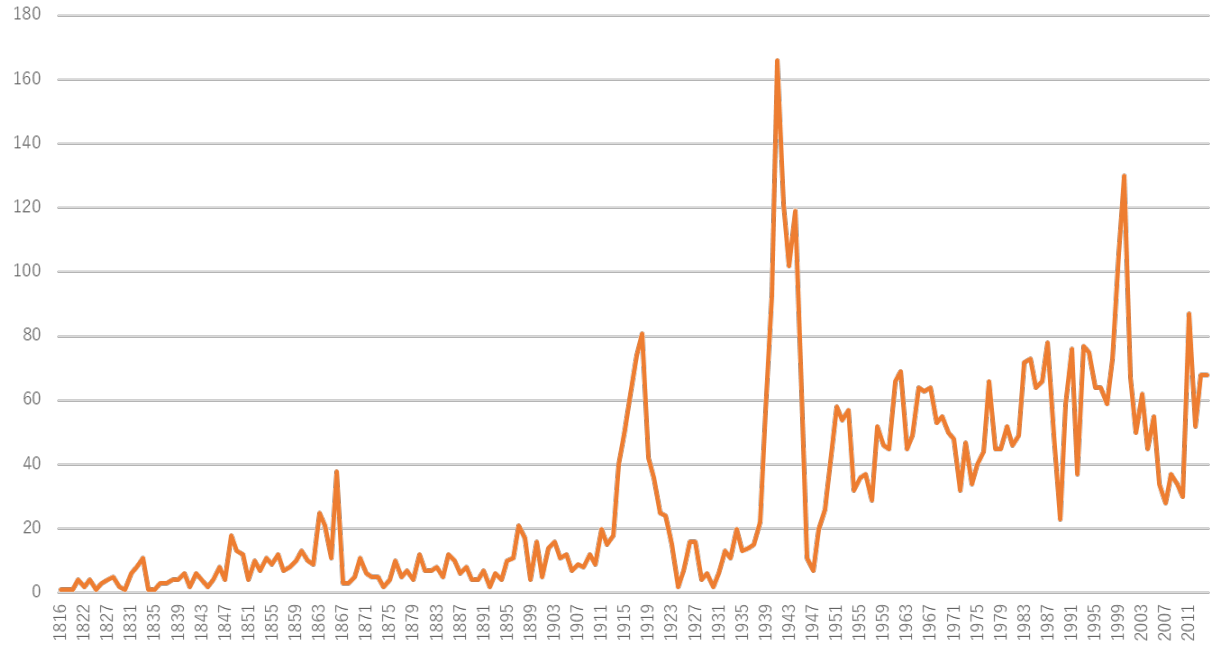
Yakovlev P. and Spleen B. (2021). "Make concentrated trade not war?" *Review of Development Economics*, 26, 661-686

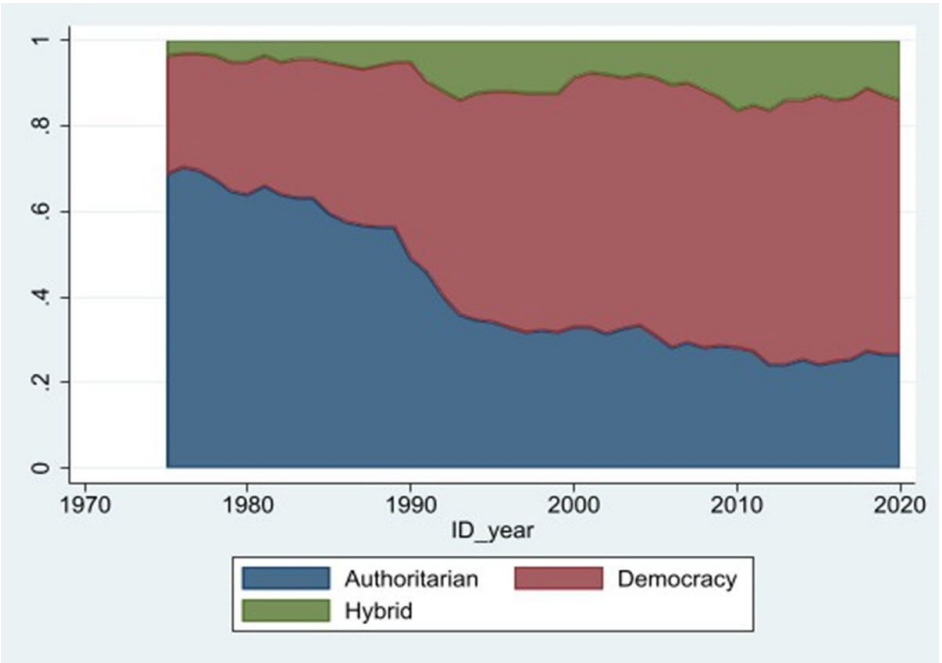
Figures and Tables

Figure 1: Number of interstate disputes 1816-2011



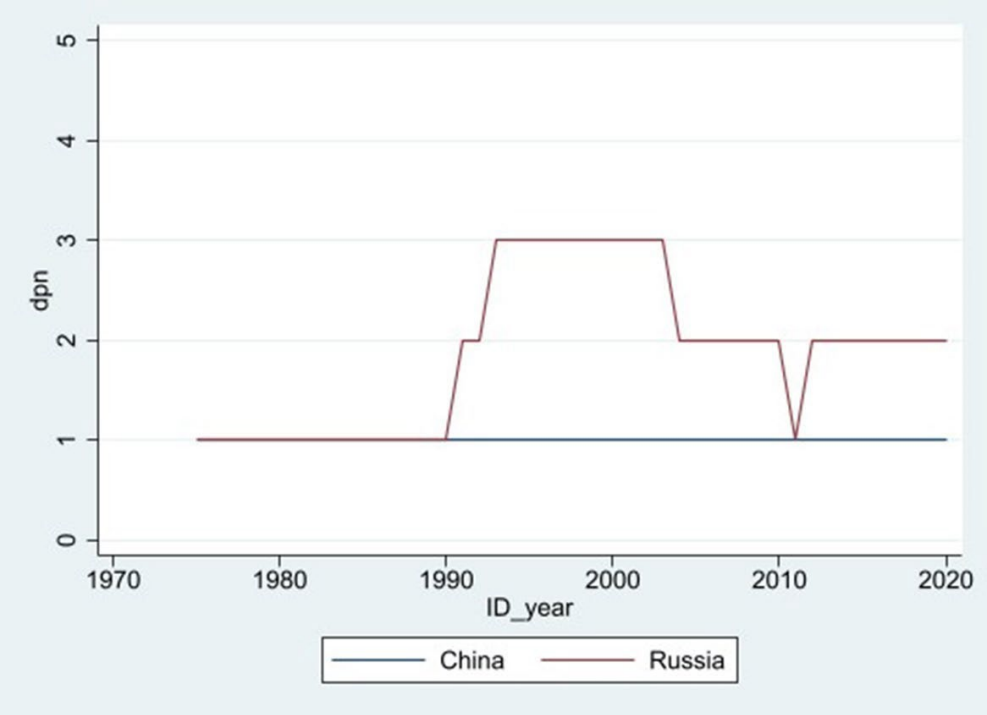
Source: Authors' computation from Militarized Interstate Disputes (v5.0)

Figure 2: Ratios of political regimes



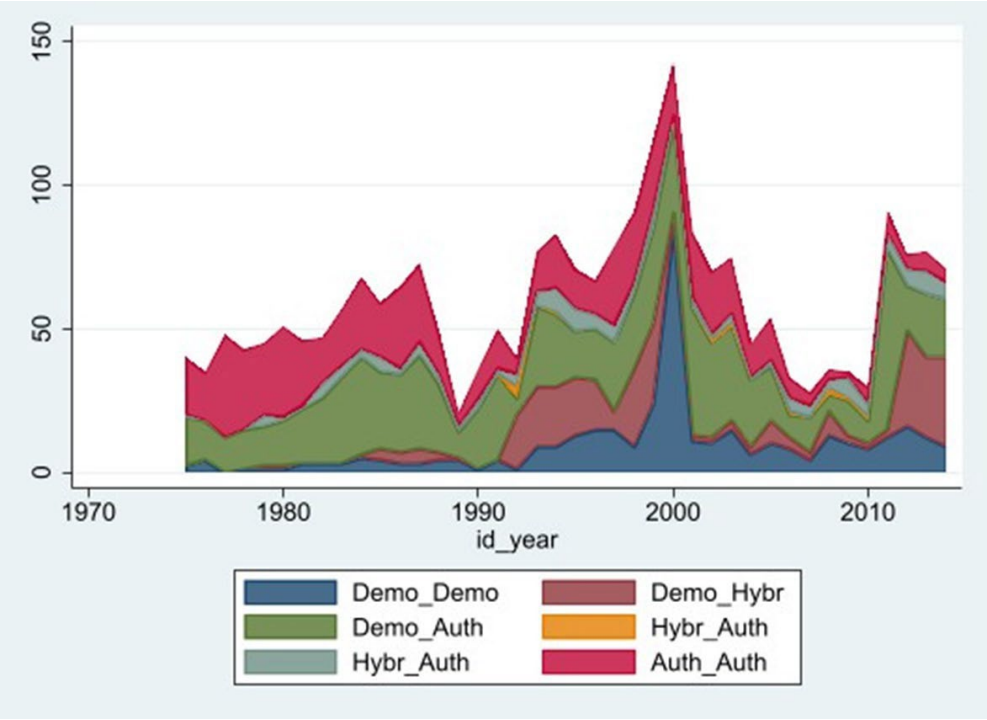
Source: Authors' computation from the Global State of Democracy Indices

Figure 3: Democratic performance of China and Russia



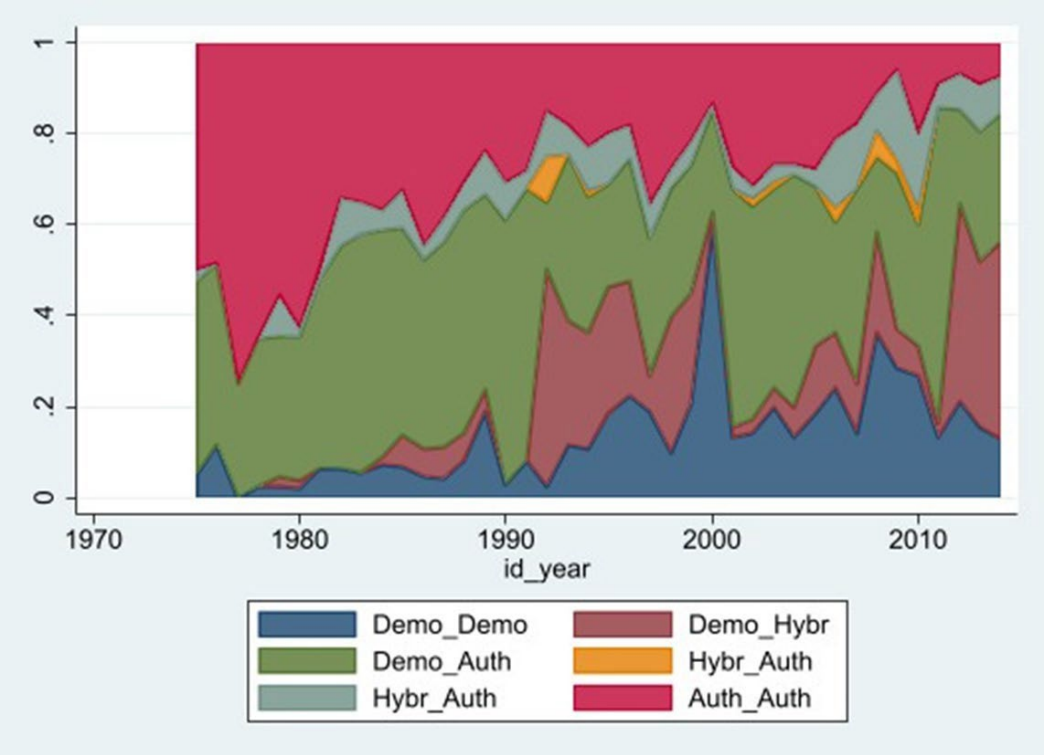
Source: Authors' computation from the Global State of Democracy Indices

Figure 4: Number of disputes by pairs of political regimes



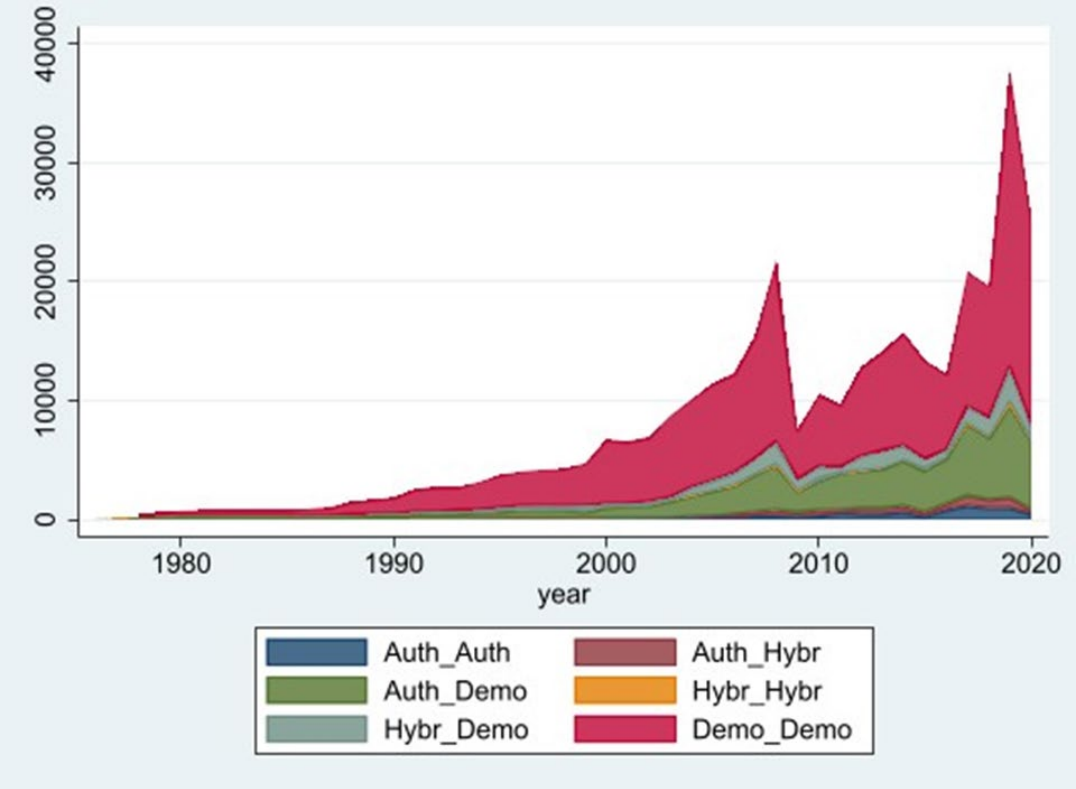
Source: Authors' computation from Militarized Interstate Disputes (v5.0) and the Global State of Democracy Indices

Figure 5: Shares of disputes by pairs of political regimes



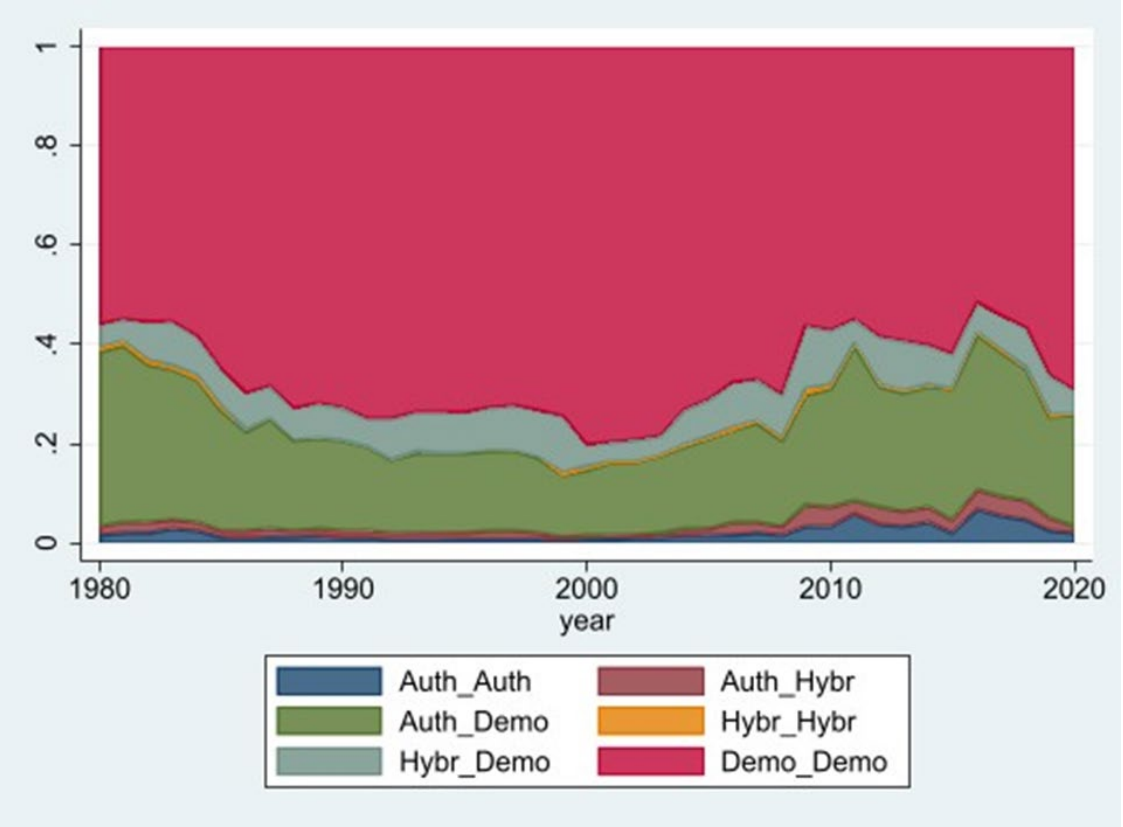
Source: Authors' computation from Militarized Interstate Disputes (v5.0) and the Global State of Democracy Indices

Figure 6: World trade values by pairs of political regimes



Source: Authors' computation from the Global State of Democracy Indice and UN Comtrade

Figure 7: World trade shares by pairs of political regimes



Source: Authors' computation from the Global State of Democracy Indice and UN Comtrade

Table 1: Distribution of conflicts' intensity over 1976-2014

	Distribution of conflicts' intensity over 1976-2014			
	Full sample 266,166			
Non-dispute dyads	1,178			
Dispute dyads	Country i		Country j	
Hostility level of militarized interstate dispute	Frequency	%	Frequency	%
1 No militarized action	247	20.97	207	17.57
2 Threat to use force	26	2.21	17	1.44
3 Display of force	297	25.21	327	27.76
4 Use of force	518	43.97	551	46.77
5 War	90	7.64	76	6.45
Total	1,178	100	1,178	100

Table 2: Estimation results à la Martin et al. (2008)

Logit:	(1)	(2)
Dependent variable: Dispute(=1, 0)	Reference:Democracy-Democracy	Reference:Democracy-Democracy
Log of bilateral openness	-0.615***	
	(0.0997)	
Log of Multirateral openness	0.670**	
	(0.279)	
Log of bilateral openness t-4		0.0391
		(0.0367)
Log of Multirateral openness t-4		0.115
		(0.106)
Number of peaceful years	-0.0291***	-0.0297***
	(0.00160)	(0.00181)
Log of distance	0.0905	-0.408***
	(0.105)	(0.0832)
Contiguous	1.035***	0.848***
	(0.213)	(0.244)
ln. bi. openness * distance	0.0800***	-0.00247
	(0.0132)	(0.00349)
ln. mul. openness * distance	-0.131***	-0.0559***
	(0.0352)	(0.0113)
Observations	433,172	328,486

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Benchmark estimation results

	(1)	(2)	(3)	(4)
	Reference:Democracy-Democracy	Reference:Democracy-Democracy	Reference:Authoritarian-Authoritarian	Reference:Authoritarian-Authoritarian
Dependent variable: Dispute(=1, 0)	All hostility level	Hostility level 4 or higher	All hostility level	Hostility level 4 or higher
Log of bilateral trade value	-0.000493***	-0.000432***	0.000123	6.18e-05
	(6.30e-05)	(5.51e-05)	(9.44e-05)	(8.50e-05)
Log of bilateral trade value * Democracy Status Combination				
Authoritarian - Authoritarian	0.000615***	0.000494***		
	(0.000126)	(0.000112)		
Authoritarian - Hybrid	0.000622***	0.000558***	7.06e-06	6.45e-05
	(0.000115)	(0.000100)	(9.06e-05)	(8.30e-05)
Authoritarian - Democracy	0.000376***	0.000297***	-0.000239**	-0.000196**
	(5.85e-05)	(5.09e-05)	(7.56e-05)	(6.74e-05)
Hybrid - Hybrid	0.000538***	0.000611***	-7.77e-05	0.000117
	(0.000148)	(0.000131)	(0.000158)	(0.000143)
Hybrid - Democracy	0.000389***	0.000401***	-0.000226	-9.32e-05
	(7.43e-05)	(6.28e-05)	(0.000121)	(0.000108)
Democracy - Democracy			-0.000615***	-0.000494***
			(0.000126)	(0.000112)
Year * Importer fixed effect	✓	✓	✓	✓
Year * Exporter fixed effect	✓	✓	✓	✓
Importer * Exporter fixed effect	✓	✓	✓	✓
Observations	534,459	534,459	534,459	534,459
R-squared	0.271	0.252	0.271	0.252

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Estimation results with GDP

	(1)	(2)	(3)	(4)
	Reference:Democracy-Democracy	Reference:Democracy-Democracy	Reference:Democracy-Democracy	Reference:Democracy-Democracy
Dependent variable: Dispute(=1, 0)	All hostility level	Hostility level 4 or higher	All hostility level	Hostility level 4 or higher
Log of bilateral trade value	-0.000227***	-0.000196***	-0.000227***	-0.000196***
	(4.24e-05)	(3.88e-05)	(4.24e-05)	(3.88e-05)
Log of GDP gap ratio	0.000340	0.000639**	0.000285	0.000632**
	(0.000335)	(0.000284)	(0.000336)	(0.000283)
Log of bilateral trade value * Democracy Status Combination				
Authoritarian - Authoritarian	0.000184***	0.000121***	0.000184***	0.000121***
	(5.09e-05)	(4.49e-05)	(5.09e-05)	(4.49e-05)
Authoritarian - Hybrid	0.000170***	0.000124***	0.000170***	0.000124***
	(4.52e-05)	(3.96e-05)	(4.52e-05)	(3.96e-05)
Authoritarian - Democracy	0.000169***	0.000106***	0.000169***	0.000106***
	(2.36e-05)	(1.97e-05)	(2.36e-05)	(1.97e-05)
Hybrid - Hybrid	0.000133**	0.000114**	0.000133**	0.000114**
	(5.54e-05)	(5.06e-05)	(5.54e-05)	(5.06e-05)
Hybrid - Democracy	6.88e-05***	3.99e-05**	6.88e-05***	3.99e-05**
	(2.66e-05)	(1.94e-05)	(2.66e-05)	(1.94e-05)
Log of GDP gap ratio * Democracy Status Combination				
Authoritarian - Authoritarian			-0.000121	-0.000152
			(0.000151)	(0.000139)
Authoritarian - Hybrid			-0.000310**	-0.000330**
			(0.000150)	(0.000139)
Authoritarian - Democracy			0.000110	6.00e-05
			(7.71e-05)	(6.46e-05)
Hybrid - Hybrid			2.52e-05	-0.000308
			(0.000222)	(0.000235)
Hybrid - Democracy			0.000158*	0.000106
			(9.23e-05)	(7.83e-05)
Year fixed effect	✓	✓	✓	✓
Importer * Exporter fixed effect	✓	✓	✓	✓
Observations	472,335	472,335	472,335	472,335
R-squared	0.226	0.211	0.226	0.211

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Estimation results excluding oil and natural gas

	(1)	(2)
	Reference:Democracy-Democracy	Reference:Democracy-Democracy
Dependent variable: Dispute(=1, 0)	All hostility level	Hostility level 4 or higher
Log of bilateral trade value	-0.000461***	-0.000399***
	(6.25e-05)	(5.45e-05)
Log of bilateral trade value * Democracy Status Combination		
Authoritarian - Authoritarian	0.000573***	0.000462***
	(0.000128)	(0.000113)
Authoritarian - Hybrid	0.000600***	0.000542***
	(0.000116)	(0.000101)
Authoritarian - Democracy	0.000356***	0.000283***
	(5.92e-05)	(5.16e-05)
Hybrid - Hybrid	0.000528***	0.000603***
	(0.000150)	(0.000132)
Hybrid - Democracy	0.000387***	0.000399***
	(7.56e-05)	(6.37e-05)
Year * Importer fixed effect	✓	✓
Year * Exporter fixed effect	✓	✓
Importer * Exporter fixed effect	✓	✓
Observations	533,160	533,160
R-squared	0.271	0.251

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Estimation results with lagged explanatory variables

	(1)	(2)	(3)	(4)
	Reference:Democracy-Democracy	Reference:Democracy-Democracy	Reference:Authoritarian-Authoritarian	Reference:Authoritarian-Authoritarian
Dependent variable: Dispute(=1, 0)	All hostility levels	Hostility level 4 or higher	All hostility levels	Hostility level 4 or higher
Log of bilateral trade value	-2.95e-05	-0.000241***	7.77e-06	-2.18e-05
	(8.68e-05)	(7.15e-05)	(0.000142)	(0.000128)
Log of bilateral trade value * Democracy Status Combination				
Authoritarian - Authoritarian	3.73e-05	0.000219		
	(0.000183)	(0.000161)		
Authoritarian - Hybrid	-0.000201	0.000193	-0.000238*	-2.57e-05
	(0.000174)	(0.000145)	(0.000135)	(0.000120)
Authoritarian - Democracy	-2.45e-05	0.000152**	-6.17e-05	-6.72e-05
	(9.00e-05)	(7.48e-05)	(0.000113)	(0.000100)
Hybrid - Hybrid	-0.000487**	0.000229	-0.000525**	1.01e-05
	(0.000236)	(0.000199)	(0.000240)	(0.000212)
Hybrid - Democracy	-0.000357***	0.000147*	-0.000394**	-7.17e-05
	(0.000118)	(8.57e-05)	(0.000179)	(0.000155)
Democracy - Democracy			-3.73e-05	-0.000219
			(0.000183)	(0.000161)
Log of bilateral trade value * Democracy Status Combination (t-1)	-0.000553***	-0.000228***	0.000137	0.000110
	(8.52e-05)	(7.11e-05)	(0.000143)	(0.000127)
Authoritarian - Authoritarian	0.000690***	0.000338**		
	(0.000185)	(0.000163)		
Authoritarian - Hybrid	0.000920***	0.000329**	0.000230	-9.08e-06
	(0.000174)	(0.000144)	(0.000153)	(0.000133)
Authoritarian - Democracy	0.000510***	0.000204**	-0.000180	-0.000135
	(9.52e-05)	(8.06e-05)	(0.000121)	(0.000104)
Hybrid - Hybrid	0.000988***	0.000240	0.000298	-9.82e-05
	(0.000235)	(0.000189)	(0.000254)	(0.000218)
Hybrid - Democracy	0.000766***	0.000165*	7.59e-05	-0.000174
	(0.000124)	(8.70e-05)	(0.000191)	(0.000162)
Democracy - Democracy			-0.000690***	-0.000338**
			(0.000185)	(0.000163)
Log of bilateral trade value * Democracy Status Combination (t-2)	-0.000121*	-4.80e-05	0.000274**	0.000150
	(7.10e-05)	(6.12e-05)	(0.000131)	(0.000116)
Authoritarian - Authoritarian	0.000395**	0.000198		
	(0.000166)	(0.000146)		
Authoritarian - Hybrid	0.000608***	0.000340***	0.000213	0.000141
	(0.000151)	(0.000130)	(0.000138)	(0.000121)
Authoritarian - Democracy	0.000191**	9.36e-05	-0.000205*	-0.000105
	(7.98e-05)	(6.98e-05)	(0.000106)	(9.05e-05)
Hybrid - Hybrid	0.000792***	0.000359**	0.000396*	0.000161
	(0.000201)	(0.000168)	(0.000229)	(0.000199)
Hybrid - Democracy	0.000433***	0.000200**	3.72e-05	1.71e-06
	(0.000101)	(7.79e-05)	(0.000175)	(0.000151)
Democracy - Democracy			-0.000395**	-0.000198
			(0.000166)	(0.000146)
Year * Importer fixed effect	✓	✓	✓	✓
Year * Exporter fixed effect	✓	✓	✓	✓
Importer * Exporter fixed effect	✓	✓	✓	✓
Observations	434,264	434,264	434,264	434,264
R-squared	0.288	0.261	0.288	0.261

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Estimation results with lagged explanatory variables, excluding observations with more than or equal to three consecutive interstate military disputes

	(1)	(2)	(3)	(4)
	Reference:Democracy-Democracy	Reference:Democracy-Democracy	Reference:Authoritarian-Authoritarian	Reference:Authoritarian-Authoritarian
	All hostility levels	Hostility level 4 or higher	All hostility levels	Hostility level 4 or higher
Dependent variable: Dispute(=1, 0)	Dropped sequence dispute Obs.	Dropped sequence dispute Obs.	Dropped sequence dispute Obs.	Dropped sequence dispute Obs.
Log of bilateral trade value	-1.81e-05	-0.000142**	4.31e-05	-3.36e-06
	(7.90e-05)	(6.12e-05)	(0.000133)	(0.000117)
Log of bilateral trade value * Democracy Status Combination				
Authoritarian - Authoritarian	6.12e-05	0.000139		
	(0.000168)	(0.000143)		
Authoritarian - Hybrid	-0.000143	0.000113	-0.000204	-2.61e-05
	(0.000159)	(0.000126)	(0.000125)	(0.000108)
Authoritarian - Democracy	-1.72e-06	9.00e-05	-6.29e-05	-4.87e-05
	(8.25e-05)	(6.51e-05)	(0.000104)	(8.93e-05)
Hybrid - Hybrid	-0.000468**	6.53e-05	-0.000529**	-7.34e-05
	(0.000206)	(0.000157)	(0.000214)	(0.000177)
Hybrid - Democracy	-0.000317***	6.55e-05	-0.000378**	-7.33e-05
	(0.000110)	(7.58e-05)	(0.000166)	(0.000139)
Democracy - Democracy			-6.12e-05	-0.000139
			(0.000168)	(0.000143)
Log of bilateral trade value * Democracy Status Combination (t-1)	-0.000338***	-8.87e-05	5.62e-05	1.87e-05
	(7.31e-05)	(5.52e-05)	(0.000133)	(0.000115)
Authoritarian - Authoritarian	0.000394**	0.000107		
	(0.000168)	(0.000140)		
Authoritarian - Hybrid	0.000671***	0.000213*	0.000276*	0.000105
	(0.000159)	(0.000123)	(0.000144)	(0.000121)
Authoritarian - Democracy	0.000376***	0.000131*	-1.81e-05	2.31e-05
	(8.59e-05)	(6.82e-05)	(0.000112)	(9.15e-05)
Hybrid - Hybrid	0.000823***	0.000222	0.000429*	0.000114
	(0.000214)	(0.000161)	(0.000234)	(0.000192)
Hybrid - Democracy	0.000619***	0.000162**	0.000224	5.47e-05
	(0.000116)	(7.56e-05)	(0.000176)	(0.000143)
Democracy - Democracy			-0.000394**	-0.000107
			(0.000168)	(0.000140)
Log of bilateral trade value * Democracy Status Combination (t-2)	-9.17e-05	-7.13e-05	0.000256**	0.000155
	(5.94e-05)	(4.81e-05)	(0.000120)	(0.000103)
Authoritarian - Authoritarian	0.000348**	0.000227*		
	(0.000149)	(0.000127)		
Authoritarian - Hybrid	0.000509***	0.000348***	0.000161	0.000122
	(0.000138)	(0.000113)	(0.000129)	(0.000110)
Authoritarian - Democracy	0.000148**	9.59e-05	-0.000200**	-0.000131
	(7.05e-05)	(5.92e-05)	(9.81e-05)	(8.01e-05)
Hybrid - Hybrid	0.000645***	0.000365***	0.000298	0.000138
	(0.000182)	(0.000141)	(0.000208)	(0.000171)
Hybrid - Democracy	0.000346***	0.000181***	-1.63e-06	-4.53e-05
	(9.33e-05)	(6.86e-05)	(0.000160)	(0.000133)
Democracy - Democracy			-0.000348**	-0.000227*
			(0.000149)	(0.000127)
Year * Importer fixed effect	✓	✓	✓	✓
Year * Exporter fixed effect	✓	✓	✓	✓
Importer * Exporter fixed effect	✓	✓	✓	✓
Observations	433,899	433,899	433,899	433,899
R-squared	0.220	0.199	0.220	0.199

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Estimation results with forward linkage

	(1)	(2)	(3)	(4)
	Reference:Democracy-Democracy	Reference:Democracy-Democracy	Reference:Authoritarian-Authoritarian	Reference:Authoritarian-Authoritarian
Dependent variable: Dispute(=1, 0)	All hostility levels	Hostility level 4 or higher	All hostility levels	Hostility level 4 or higher
Log of (Forward + Backward linkage)/GDP	-0.00167***	-0.00198***	-0.000233	-0.00115*
	(0.000604)	(0.000530)	(0.000689)	(0.000610)
Log of linkage per GDP* Democracy Status Combineation				
Authoritarian - Authoritarian	0.00143***	0.000833*		
	(0.000507)	(0.000429)		
Authoritarian - Hybrid	0.00134***	0.000746**	-8.87e-05	-8.70e-05
	(0.000464)	(0.000378)	(0.000266)	(0.000220)
Authoritarian - Democracy	0.000691***	0.000404*	-0.000742***	-0.000429**
	(0.000259)	(0.000219)	(0.000249)	(0.000211)
Hybrid - Hybrid	0.00128**	0.000666	-0.000153	-0.000167
	(0.000566)	(0.000451)	(0.000542)	(0.000450)
Hybrid - Democracy	0.000650**	0.000348	-0.000783*	-0.000485
	(0.000286)	(0.000229)	(0.000442)	(0.000379)
Democracy - Democracy			-0.00143***	-0.000833*
			(0.000507)	(0.000429)
Year * Importer fixed effect	✓	✓	✓	✓
Year * Exporter fixed effect	✓	✓	✓	✓
Importer * Exporter fixed effect	✓	✓	✓	✓
Observations	458,394	458,394	458,394	458,394
R-squared	0.283	0.271	0.283	0.271

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Estimation results with Trade Concentration Index

Dependent variable: Dispute(=1, 0)	(1) Log of bilateral trade value	(2) Bilateral Trade Value / GDP	(3) Log of (Bilateral Trade Value / GDP)
Bilateral trade value*τi	-0.000322***	-0.0418**	-0.0119***
	(6.49e-05)	(0.0170)	(0.00156)
Bilateral trade value*τi* Democracy Status Country i			
Hybrid	7.49e-05	-0.143	0.00538
	(0.000157)	(0.123)	(0.0134)
Authoritarian	0.00137***	0.0671***	0.0955***
	(0.000201)	(0.0243)	(0.0131)
Military Alliance by Country j	-9.28e-05	-0.000233**	-0.000244**
	(0.000115)	(0.000117)	(0.000117)
Year * Importer fixed effect	✓	✓	✓
Year * Exporter fixed effect	✓	✓	✓
Importer * Exporter fixed effect	✓	✓	✓
Observations	1,027,359	953,497	953,497
R-squared	0.225	0.229	0.229

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix:
Table A1: List of the other democracy index datasets

Web URL	Index/Indicator	Published by	Focus	Scale / Classification	Number of Indicators	Period Covered	Number of Countries Covered
Global State of Democracy Indices	Global State of Democracy Indices	International IDEA	Democratic performance (e.g. representative government, fundamental rights)	0–1 scale (higher is better)	165	1975-2023	174
Democracy Index 2024	Democracy Index	Economist Intelligence Unit (EIU)	Electoral process, government functioning, political participation, civil liberties	0–10 scale; classified as Full Democracy, Flawed Democracy, Hybrid Regime, Authoritarian Regime	60	2006-2024	167
Freedom in the World 2024	Freedom in the World	Freedom House	Political rights and civil liberties	0–100 scale; classified as Free, Partly Free, Not Free	25	1973-2024	210
Polity IV / Polity5 Project	Polity IV / Polity5 Project	Center for Systemic Peace	Institutional democracy and autocracy	–10 (hereditary monarchy) to +10 (consolidated democracy)	3	1800-2018	160
Varieties of Democracy (V-Dem)	Varieties of Democracy (V-Dem)	V-Dem Institute (University of Gothenburg)	Multiple democracy dimensions (electoral, liberal, participatory, deliberative, egalitarian)	0–1 scale across various indices	Over 600	1789-2023	202
Bertelsmann Transformation Index (BTI) 2024	Bertelsmann Transformation Index (BTI)	Bertelsmann Stiftung	Democracy and market economy transformation	1–10 scale; classified as Democracy, Hybrid, Autocracy	17	2006-2024	137
Worldwide Governance Indicators (WGI) – "Voice and Accountability"	Worldwide Governance Indicators (WGI) – "Voice and Accountability" dimension	World Bank	Democratic governance and citizen participation	–2.5 to +2.5 scale	1	1996-2023	Over 200
Human Freedom Index 2024	Human Freedom Index	Cato Institute / Fraser Institute	Civil and personal freedoms including political rights	0–10 scale	86	2008-2022	165
Rule of Law Index 2024	Rule of Law Index (specific to governance aspects)	World Justice Project	Rule of law, government accountability	0–1 scale; higher scores indicate stronger adherence to the rule of law	8	2015-2024	142
CIRI Human Rights Data Project	CIRI Human Rights Data Project	University of Connecticut	Political rights, civil liberties	0–2 scale per indicator	15	1981-2011	195

Table A2: Numerical illustration of the argument of Yakovlev and Spleen (2021)

Country 1	j	Squared	Country 2	j	Squared	Country 3	j	Squared	Country 4	j	Squared
	0.1	0.01		0.2	0.04		0.9	0.81		1	1
	0.1	0.01		0.2	0.04		0.1	0.01			
	0.1	0.01		0.2	0.04						
	0.1	0.01		0.2	0.04						
	0.1	0.01		0.2	0.04						
	0.1	0.01									
	0.1	0.01									
	0.1	0.01									
	0.1	0.01									
	0.1	0.01									
tau_i		0.1			0.2			0.82			1

Even if tau_i is 1 as in the case of Country 4, Country 4 does not lose anything by waging a war against non-trading partner.

Namely, if Country 4 has no trade with a particular country j, its dependence on country j should be zero.

Thus, the authors proposed $b_{ij*}t_i$