Decomposing the Relationship between PTAs and Militarized Conflict

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This article attempts to answer the question of why preferential trade agreements (PTAs) that are signed but not in force provide strong institutional incentives to prevent international conflict among member states. It does so by first distinguishing signed but not in force PTAs and those in force PTAs and directly examining their influence on conflict; and second decomposing the effects of PTAs into ex ante "observable" and "behavioral" effects, comparing two explanations for the crucial conflict propensity with a specific of trade barriers and adjudication mechanisms of PTA members.

Introduction

With the rapid development of the economy and remarkable advancements in the fields of science and technology, economic globalization has become inevitable as human society develops. Economic globalization also promotes trade and economic cooperation. Analyzing the effects of trade on political relations has become a focal point among international relations scholars. A considerable volume of recent scholarship has focused on the relationship between trade and interstate relations following the Second World War. As scholars applying different theories and different empirics launch the discussion of economic interdependence's impact on interstate conflict in the past 20 years, the number of preferential trade agreements (PTAs) has been growing dramatically. For example, in Asia, 238 PTAs involving Asian countries have been concluded and/or are under negotiation (Hamanaka, 2012). Under comprehensive political calculations and empirical commercial intercourse, PTAs are rationally determined in a competitive economic environment to "reduce policy-controlled barriers to the flow of goods, services, capital, labor, etc.," (Baier, Egger, and McLaughlin, 2008: 461) and to promote the welfare of national enterprises and consumers. Under this inspiring economic phenomenon, there is

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growing evidence showing that PTAs have a pacifying effect on militarized conflicts by building trust.

Trade institutions build mutual trust through increasing expected gains, and enlarge negotiation range as firms invest in a preferential grouping (Fernandez and Portes, 1998; Schiff and Winters, 1998; Mansfield et al., 1999; Mansfield and Pevehouse, 2000). Therefore, PTA member states are less likely to be involved in hostilities as trade flows rise between them (Mansfield and Pevehouse, 2000). However, Baier and Bergstrand (2007) demonstrate through careful theoretical and empirical analysis that PTAs dramatically increase members' international trade using the gravity equation approach. They argue that "a free trade agreement approximately doubles two members' bilateral trade after ten years on average" (74). In this sense, scholars fail to identify the separate effect of FTAs on conflict. Solving the challenge of PTAs being correlated with trade levels that favor peace, Peterson and Rudloff (2015) tried to directly examine PTAs' effect by distinguishing PTAs between signed but not in force and those in force. However, their work does not distinguish dyads which have PTAs in force from those that do not have PTAs signed as isolating dyads with signed PTAs but not in force. In other words, we can more accurately assess the effect of PTAs if we can distinguish the in-force PTAs situation and the non-PTA situations. More in specific, prior work does not look at whether these two groups (no PTA vs. signed but not in force PTA) of states differ in ex ante observables or they behave differently due to potential trade expectations.

This article offers a new way to study the relationship between international institutions and conflict, conceptualizing the difference in the conflict probability between PTA-signed but not in force members and no PTA states by decomposing the difference into two distinct quantities: differences in observables and differences in behavior. First, PTA-signed but not in force member states may differ from no PTA members on observable characteristics associated with a lower conflict probability. First, those member states with PTAs signed but not in force may have a lower conflict probability because they differ from those no PTA member states on observable characteristics, i.e., economic interdependence, alliance membership, joint democracy, contiguity, being a major power, and the balance of military capabilities. Second, states with FTA signed but not in force may respond differently than those no PTA member states to the same observable variables. States with PTA signed but not in force may behave gently to dynamics in strategic variables and be less likely to respond to changes than those in force member states due to trade expectations. From the perspective of PTA members, the negotiations of PTAs are time-consuming. The formation of PTAs is built on mutual agreements. They have bright trade expectations on coming in force PTAs. Therefore, they may behave bounteously towards any changes in these variables in order to safeguard the fruits of efforts

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in negotiations and the trust that has been built mutually.

Theories and Facts

Scholars began to expect that such de jure economic interdependence (i.e. PTAs) tends to decrease international conflicts and enhance world peace after the formation of European Economic Community (EEC) since it significantly contributes to the peace between France and Germany after the Second World War.

Anderson and Wincoop (2003) found that multilateral PTAs and bilateral PTAs act differently in terms of war. They argued that economic globalization which is due to easier access to foreign market (which is the direct result of multilateral PTAs) tends to increase multilateral trade at the expense of bilateral trade. In this sense, bilateral PTAs raise the relative cost of a bilateral conflict and therefore reduce its probability. However, at the same time, it lowers the relative costs of a bilateral conflict with third countries as well. As a result, bilateral PTAs may increase the likelihood of military conflicts with third countries. Moreover, multilateral PTAs increase the likelihood of conflicts among member states. That is, it is very easy for states to divert their trade to other multilateral FTAs members. More straightforwardly, Martin, Mayer and Thoenig (2008) contended that bilateral PTAs deter bilateral war, while multilateral PTAs increase the probability of war between any given pair of countries of membership. Bilateral trade increases the opportunity cost of bilateral conflict. In multilateral PTAs, since all members comply with the same principles of trading and face the same level of policy-controlled barriers, they might have very few incentives to make concessions to avert escalation of any conflicts between another country of membership.

There is a growing evidence showing that members of PTAs are less likely to be involved in militarized conflict. Reviewing the previous literation on PTAs and militarized conflict, I conclude three reasons to explain the pacifying impact of PTAs. First, given the condition that war is the result of of actions that eliminate the bargaining range (Fearon 1995, Slantchev 2010), PTAs significantly "facilitate the resolution of interstate tensions prior to the outbreak of open hostilities by establishing a forum for bargaining and negotiation among members" (Nye and Keohane 1971, 109). In this sense, once PTAs are signed, they enforce leaders to negotiate on the essential issue of trade that either have been started or been expected. Thereby, PTAs avoid any empty bargaining range and thus mitigate militarized conflict. Second, PTAs contribute to certainty of liberalization. With a signed PTA, a state commits to certainty and continuation of reduced trade barriers and open market. Thus, PTAs have a pacifying impact on militarized conflict once the leaders perceive that increasing trade will continue in the foreseeable future

(Copeland 1996). The last explanation is trade expectations theory. Signed PTAs directly increase promising trade expectations for PTA members. They create opportunity costs to conflict (Polachek 1980). One side's initiation of the termination of a signed PTA could serve to facilitate costly signaling of resolve (Gartzke 2003). Additionally, PTAs can help to "address concerns about the distribution of gains stemming from economic exchange" (Gieco 1998, Mastanduno 1991, Mearsheimer 1994). Therefore, signed PTAs signals positive trade expectations through increasing opportunity costs to conflict and regulating trade distributions and further reduce the possibility of militarized conflict.

There are also a few studies that discussed the variation in institutional design. Hafner-Burton and Montgomery (2012) argue that asymmetries in member dependence can encourage conflict due to distrust as PTAs create hierarchical relations among PTA members.

However, there is little empirical studies directly testing the pacifying effect of PTAs, largely due to the correlation between economic interdependence and institutional design. Surprisingly, the formation of PTAs is not solely due to a tight commercial intercourse. PTAs are determined in a competitive economic environment, resulting from both political calculations and economic interdependence:

> The vast majority of FTAs (PTAs) are among countries: (1) that are close in distance and consequently share low bilateral transaction costs, but are also remote from the rest of the world; (2) that are large and similar in economic size and consequently benefit from greater specialization in production and greater variety in terms of consumption; and (3) that differ in relative factor endowments, benefitting from the exchange of traditional comparative advantages (Baier, Bergstrand, Egger, and McLaughlin, 2008: 492).

Briefly, bilateral FTAs (and/or PTAs) are established after careful consideration of geographic advantages which could lower bilateral transaction costs between two economic entities with similar economic sizes that occupy different essential productive factors. The formation of foreign PTAs tends to lower tariffs in order to reduce the welfare loss from trade diversion (Egger, Peter and Larch, 2008).

More thoroughly, Hamanaka (2012) has demonstrated the theoretical relationship between PTAs and economic interdependence. She argued that high levels of trade interdependence lead to the formation of PTAs (Hamanaka 2012), because policymakers are more willing to have problems, occurring in increasingly complex and dense economic interdependencies, formalized and solved through institutionalized and formal agreement rather than solving issues through ad hoc political bargaining (Keohane, 1993; Petri, 1993). Additionally, she contended that low levels of trade interdependence also lead to

the formation of PTAs as a tool to "exploit the trade potential between the members that has yet to be realized" (15). In this sense, PTAs and economic interdependence are highly relevant. More recently, Leung (2016) empirically tested the impact of FTAs on economic interdependence in North American countries, showing that "the average treatment effect of a free trade agreement is 0.94, which shows that bilateral trade increases, on average, by 155% from a free trade agreement" (177). Straightforwardly, on average, an PTA approximately doubles two members' bilateral trade after 10 years (Baier and Bergstrand 2007). Therefore, it becomes crucial to isolate the effect of PTAs from existing trade flow first in order to directly test their infulence on conlifct.

Research Design

The unit of analysis is the dyad-year, where values for both dependent variable and explanatory variables are recorded in a given year from 1957 to 2000. The relatively short time period is constrained by limited data availability.

The first dependent variable identifies whether dyads engage in militarized dispute by threatening, displaying, or using force against its dyadic partner (Dyadic MID, 3.10). This dependent variable is commonly used in literature on PTAs and conflict (Mansfield and Pevehouse 2000). A country pairing is coded as one when either (or both) took direct actions toward the other state or from it, and zero otherwise. However, it is important to notice that many of these disputes are minor. It means that many of the MID onset data only involve actions of threats and military display. In order to make my assumption of pacifying impact of institutional design more convincing, I specify models with a second dependent variable, *fatal MID*. It equals one when a MID observation involves a minimum of one fatality in dyad-years, and zero otherwise.

I rely on logistic regression for all empirical tests, given that both of these two dependent variables are dichotomous. Additionally, I exclude observations in which a MID is ongoing from previous years. The newly revised Militarized Interstate Dispute data set is used to measure intense interstate conflict. In the dataset, each dyadic MID involves exactly two states in which one of them was directly involved in militarized incidents against the other (Dyadic MID codebook). A country pairing is coded as one when either (or both) took direct actions toward the other state or from it, and zero otherwise.

The key decomposition factor is PTA signed but not in force. I examined PTA resources including the World Trade Organization Regional Trade Agreements Information System (World Trade Organization n.d.), the World Bank Global Preferential Trade agreement Database (World Bank n.d.a.), and the McGill Faculty of Law Preferential Trade Agreements Database (McGill Faculty of Law 2011). In this paper, I used the

PTA data constructed by Peterson (2015). From the trade agreement data, I code three primary independent variables. The first variable is *pta_signed*. It takes the value of "1" in all years following the signing of a dyadic PTA (including the signing year itself) until the PTA has entered into force. It takes the value of "0" in years before it is signed. It takes "NA" value after the PTA has entered into force. By doing so, I can isolate the effect of PTAs due to expected trade from current trade. For the reason of making comparison, I also code two alternative variables, i.e., *pta_signed_or_force* and *pta_force*. The first alternative variable *pta_signed_or_force* is coded as "1" in all years once the PTA is signed, and "0" otherwise. The second alternative variable *pta_force* is coded as "1" in all years once the PTA has entered into force, and "0" otherwise. The two alternative variables could correlate with current trade flows.

Table 1 illustrates the distribution of militarized conflict conditioned by the formation of PTAs between dyads from 1957 to 2000. Table 1 shows that there are 2566 occurences of militarized conflict in total during this time period. Only 73 (2.8%) of the total disputes involve dyads with PTAs signed but not in force. 97.2% militarized conflict involves dyads that do not have PTAs signed. Similarlly, the bottom table illustrates the distribution of fatal militarized conflict conditioned by the formation of PTAs. There are 856 fatal militarized conflict recorded between 1957 and 2000. 31 (3.6%) of the total 856 fatal conflict involves dyads that have formed signed PTAs while 96.4% involves dyads without signed PTAs. The MID conditioned by PTAs distribution provides some apparent fact that militarized conflicts are more likely to happen between dyads without signed PTAs.

Table 1: Distributions of PTAs and MID

	No Interstate Conflict	Interstate Conflict	Total
Without PTAs signed but not in force	328,860	2,493	331,353
With PTAs signed but not in force	19,139	73	19,212
Total	347,999	2,566	350,565

	No Fatal MID	Fatal MID	Total
Without PTAs signed but not in force	333,222	825	334,047
With PTAs signed but not in force	19,456	31	19,487
Total	352,678	856	353,534

Other important variables on observables include economic interdependence (Oneal and Russett 1997), contiguity and geographic proximity (COW), joint democracy (Polity IV), military alliance (COW), power ratio (CINC), and Cold War.

States that have been involved in large trade flows prone to forming trade agreements while are less likely to get involved in conflict. Therefore, I have to control for trade

interaction in order to isolate the effect of economic interdependence. I rely on the so-called "lower dependence" first introduced by Oneal and Russett (1997) since it is commonly used in many PTA studies. The "lower dependence" is calculated by taking the value of dyadic trade flows (A's imports from B plus A's exports to B) divided by the higher of the dyad members' GDP. This variable captures the least dependence of the state on dyadic trade for its income. It helps us distinguish between the effect of existing trade relations and the effect of PTAs on conflict.

It is necessary to control for both direct and indirect contiguity. On one hand, contiguous countries undertake relatively lower trade cost than noncontiguous countries at least due to the shorter distance of shipping. Therefore, contiguous countries have higher levels of trade than noncontiguous countries. On the other hand, contiguous countries are more likely to get involved in conflicts due to inevitable sovereignty and territorial disputes. Scholars have empirically tested the claim that contiguous dyads are more likely to trade with each other (Arad and Hirsch, 1981) and have higher levels of conflict (Goertz and Diehl, 1992; Gochman, 1991) than noncontiguous countries.

The COW contiguity set (dyad-year-level in specific), as revised in 2007 by Paul Hensel, was used here. I will hold the argument that there are no significant differences between different categories of contiguity (Barbieri, 1994a); therefore, I chose to employ a dummy variable of contiguity, where direct contiguity (by land and by sea less than 150 miles) is coded as one, and zero otherwise.

Democratic peace theory emphasizes that economic interdependence makes positive influence on interstate relationships of democratic regimes while decreasing conflict. A number of scholars have empirically tested that democracies rarely go to war with each other (Dixon, 1994; Bremer, 1992; Maoz and Russett, 1993). Additionally, I assume that relatively harmonious and benign relationship between similar regimes could contribute to the formation of bilateral PTAs. Therefore, it is extremely important to control the influence of joint democracy.

I rely on the Polity IV data (Marshall, Jaggers and Gurr 2016) to represent dyadic democracy here, in order to fit my unit of analysis. In the Polity IV dataset, a score of -10 is given if the regime is highly authoritarian, while the score of 10 represents a highly democratic regime. I will use Erik's (2007) calculation method to prepare monadic values by "combining Polity democracy (DEMOC) and autocracy (AUTOC) scales as follows: [(DEMOCi - AUTOCi) + 10]/2" (174). BOTH DEMOC. ($\geq$ 7) equals one ("1"), and zero ("0") if one of dyad is less than seven.

Additionally, alliances are intended to deter and reduce interstate conflicts. Additionally, the high correlation between military alliance and trade partners has been revealed by Gowa (1994). Therefore, I have to control for the presence of military alliances. The

COW alliances data (4.1 dyad_yearly in specific), as released in 2013, was used here. Alliance is a dichotomous variable coded "1" for dyad exist an alliance in a given year, and "0" otherwise.
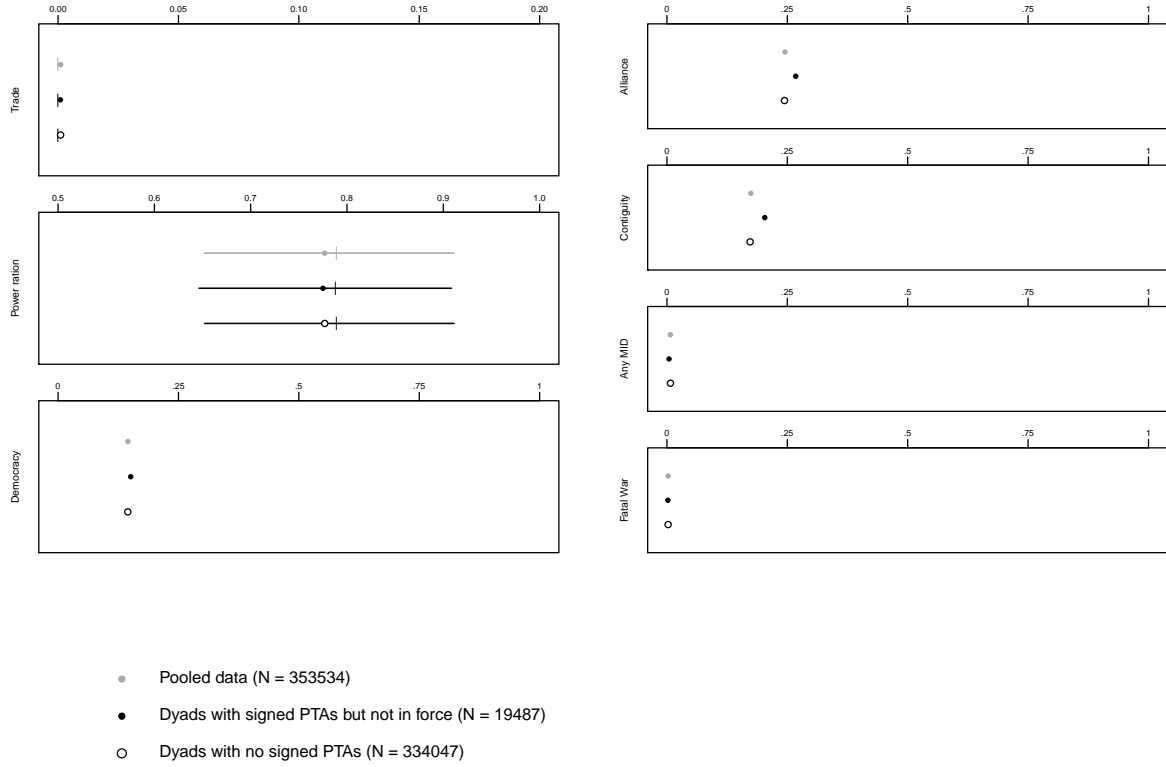
Moreover, studies have revealed the significant impact of relative power on interstate relations. Organski and Kugler (1980) argued that asymmetrical power promotes peace while Morgenthau (1964) contended that power parity is more conducive to promoting peace. And thus, I must control for the relative power of dyad countries.

Relative power is operationalized as state's COW relative capabilities index (CINC). CINC weighted state's average share of urban population, energy consumption, military expenditures, and industrial resources (Bremer, 1980). A ratio of larger to smaller state's capabilities is used to measure relative power. The log of the relative capabilities is used to control for the large variations in CINC scores among states within the system (Barbieri, 1996). Finally, I include a dichotomous indicator of the Cold War period. The variable is coded as one if the conflict occured between 1957 (the first observation of my data) and 1991, and zero otherwise. I control for this period because it could correlate both with trade contacts and conflicts.

Empirical Strategy

To illustrate the different probability of getting involved in militarized conflict between PTA members (right after signing the agreement) and non-PTA member states, some discriptive statistics are provided on pairs of states in Figure one. Figure one graphically displays sample statistics for each variable to highlight the distributions of observable characteristics between the samples. Of the 353534 observations, 19487 are PTA (signed but not in force) members and 334047 are states without signed PTAs. In each panel, mean values are shown for three samples: the sample of all observations (top row: gray circles), the sample of dyadic countries with PTAs signed but not in force (middle row: black circles), and the sample of dyads without signed PTAs (bottom row: white circles). For nonbinary variables, horizontal lines associated with circles show upper and lower quartile values (25% and 75% quartile values), and vertical ticks on the horizontal lines show the median values. From these graphs, note that dyads with PTAs (signed but not in force) and dyads without signed PTAs does not behave so much differently on these observable characters except for alliance and contiguity. The panel for alliance indicates that dyads with signed but not in force PTAs are more likely to be alliance. The panel for contiguity shows that most of dyads with signed but not in force PTAs are neighbors. These descriptive statistics are consistent with the reality. Millitary alliance and neighbors must have many opportunities to communicate with each other. These com-

Figure 1: Differences in Distributions of the Observable Variables

- (gray dot) Pooled data (N = 353534)
- (black dot) Dyads with signed PTAs but not in force (N = 19487)
- (open circle) Dyads with no signed PTAs (N = 334047)

munications create prerequisites and opportunities to reach trade agreement. However, these descriptive statistics do not reveal any differences in conflict behavior between PTA members and non-PTA members. In order to further illustrate the behavioral differences, conditional on the ex ante observable factors, the outcome variable (both MID and fatal MID) on the explanatory variables are regressed.

In the first step, two hypotheses addressing the relationship between PTAs and militarized conflict are presented. The first hypothesis expects a pacifying trade expectation effect of signed but not in force PTAs on militarized conflict. The second hypothesis is presented for the purpose of comparison. I expect that the infuence of PTAs that either have been signed or in force might not be significant due to correlation with current economic flows.

H1: Signed but not in force PTAs is associated with a lower likelihood of militarized conflict.

H2: Existing economic flows between dyads blunt the pacifying effect of PTAs that either have been signed or in force on militarized conflict.

The basic logit model is specified as following:

$$Log(MID/fatalMID) = \beta_0 + \beta_1 PTAs(with\_conditions) + \beta_2 economic\_dependence + \beta_3 alliance$$
$$+\beta_4 joint\_democracy + \beta_5 contiguity + \beta_6 relative\_power\_ratio + \beta_7 cold\_war + u$$

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The results of my first-step analysis are summarized in Table 2. I estimate six separate models in an effort to distinguish between the potentially pacifying impact of signed and in force PTAs. Models 1 through 3 examine MID as the dependent variable, while Models 4 through 6 examine fatal MID data as the dependent variable. Models 1 and 4 contains the key decomposition variable of signed but not in force PTAs. Models 2 and 5 contains both signed but not in force PTAs and in force PTAs. Models 3 and 6 contains in force PTAs. I can distinguish the effect of PTAs between signed only and those in force PTAs by doing the model comparison.

In model 1, preferential trade agreements significantly decrease the likelihood of militarized conflict between dyads during the PTAs signed period. In other words, once PTAs are signed, the pacifying effect of institutional design becomes apparent immediately. In model 4, such a pacifying effect of signed PTAs still holds for fatal militarized conflict. The results provide convincing evidence that signed PTAs have substantively pacifying effect on militarized conflict due to states' strong expectation of foreseeable trade flows through preferential trade agreement.

In models 2, 3, 5, and 6, the results reveal some conflicting conclusions against the pacifying effect of PTAs. The results indicate that signed PTAs (including in force PTAs) and in force PTAs could increase the likelihood of militarized conflict, though the influence is minor. However, examing the influence of lower economic dependence, I found that more current trade dependence could significantly and largely decrease the likelihood of militarized conflict. It provides some possible explanations for the conflicting conclusions made from models 2, 4, 5, and 5. One possible explanation is that the pacifying effect of PTAs could be significantly obscured by the pacifying impact of current trade dependence. Additionally, in models 2 and 5, the pacifying effect of signed PTAs could be obscured by both in force PTAs and current trade dependence.

The graphs of predictions in Figure 2 are used to identify the relationship between whether dyads have signed but not in force PTAs and the probability of getting involved in militarized conflict. I controlled for economic dependence at the mean level. The left graph indicates that those nonallied, non-joint democratic, noncontiguous countries will less likely to fight with each other once PTAs are signed. The pacifying effects of signed PTAs are also felt among allied, jointly democratic, contiguous dyads, shown in the right graph.

The second step of my analysis of the pacifying effect of signed but not in force PTAs involves the technique of decomposition. Figure 3 displays the estimated coefficients along with standard errors from logit regressions for three samples (pooled data, dyads with signed but not in force PTAs, and dyads without signed PTAs). Circles show the point estimates of the coefficients for each explanatory variable, and horizontal line segments

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Table 2: Coefficients and Robust Standard Errors for Membership in PTAs and Militarized Conflict from the Pooled Data

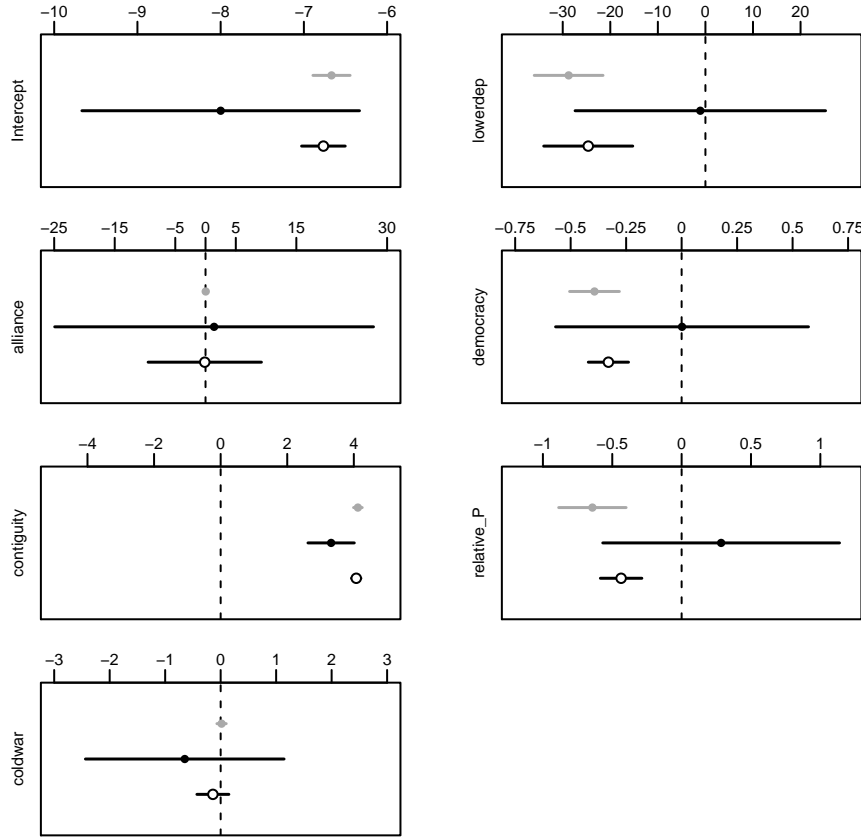|	*Dependent variable:*					
	MID				fatal_mid	
	(1)	(2)	(3)	(4)	(5)	(6)
pta_signed	−0.619***			−0.464*		
	(0.128)			(0.197)		
pta_signedorforce		0.160***			0.107	
		(0.044)			(0.075)	
pta_force			0.515***			0.484***
			(0.046)			(0.078)
lowerdep	−22.958***	−30.440***	−34.818***	−65.717***	−82.946***	−90.321***
	(4.541)	(3.759)	(3.882)	(13.628)	(12.330)	(12.587)
alliance	−0.082	0.00005	−0.109**	−0.100	−0.041	−0.148*
	(0.045)	(0.039)	(0.040)	(0.076)	(0.064)	(0.066)
democracy	−0.325***	−0.397***	−0.433***	−0.545***	−0.879***	−0.904***
	(0.070)	(0.057)	(0.057)	(0.137)	(0.121)	(0.121)
contiguity	4.050***	4.116***	4.129***	4.866***	4.914***	4.927***
	(0.075)	(0.066)	(0.066)	(0.179)	(0.153)	(0.153)
relative_P	−0.422**	−0.664***	−0.693***	−0.931***	−0.842***	−0.869***
	(0.145)	(0.124)	(0.125)	(0.244)	(0.208)	(0.209)
coldwar	−0.181*	−0.079	−0.286***	−0.033	0.110	−0.125
	(0.078)	(0.050)	(0.050)	(0.125)	(0.084)	(0.085)
Constant	−6.775***	−6.684***	−6.696***	−8.174***	−8.255***	−8.273***
	(0.132)	(0.114)	(0.114)	(0.254)	(0.219)	(0.219)
Observations	325,406	427,389	427,389	325,406	427,389	427,389
Log Likelihood	−10,571.320	−14,600.310	−14,545.230	−4,276.295	−5,947.457	−5,929.986
Akaike Inf. Crit.	21,158.650	29,216.620	29,106.450	8,568.589	11,910.910	11,875.970

Note: *p<0.05; **p<0.01; ***p<0.001

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Figure 2: Probability Predictions for MID
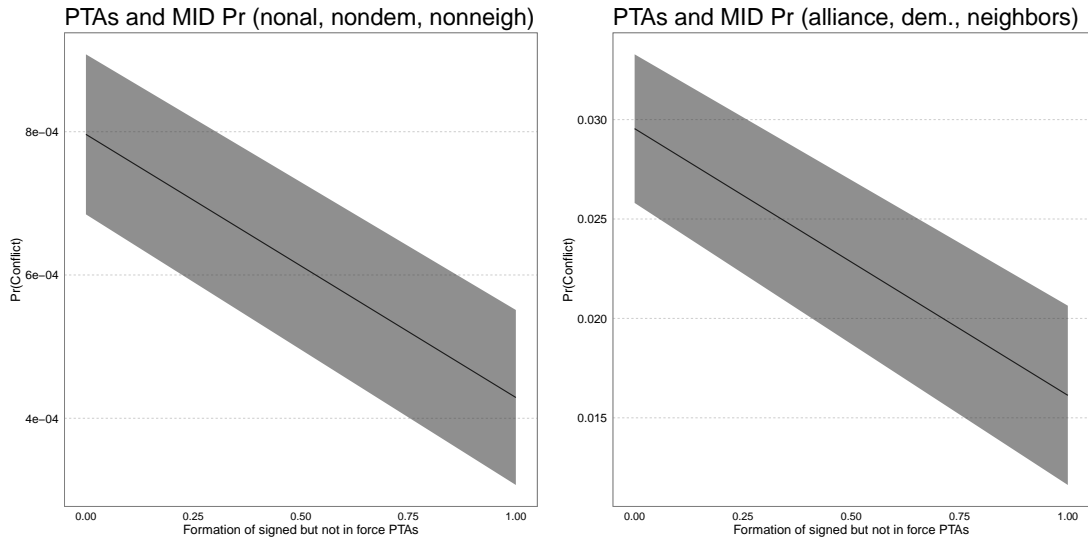
represent 95% confidence intervals. In each panel, estimates from the pooled data are displayed in the top row in gray, dyads with signed but not in force PTAs in the middle in black, and dyads without signed PTAs in the bottom in white. Different from observable factors, there are significant differences in the regression coefficients, depending on the sample. Note that alliance and relative power ratio have strikingly different effects on the conflict probability, depending on whether they have PTAs signed. Among PTA member states, these two variables increase the likelihood of militarized conflict. On the other hand, among non-PTA members, allied dyads are less likely to experience militarized conflict, and dyads that have a relatively greater power ratio are less likely to be involved in militarized dispute. The pacifying effects of alliance commitment and relative power ratio are more likely to be felt among non-PTA members. All the other coefficients have the same signs in three samples, but there are substantial differences in their substantive effect on the conflict probability. To decompose the effect of PTAs on militarized conflict, I measure the level of how much of the difference in conflict probability between PTA members and non-PTA members is due to differences in the models' coefficients of separately estimated models of MID occurence for the PTA members group and non-PTA members group. Then I also calculate the difference in the conflict probability that is due to differences in observable characteristics between these two groups. In order to answer the question of how much of the difference in conflict probability is due to PTA and non-PTA groups' observable difference and their behaviral difference respectively, I pose and try to answer a latent question: how would the distribution of conflict probability look like for PTA members if they respond the way that the more conflict-prone sample of non-PTA members would do.

Figure 3: Differences in Coefficients from Logit Regressions

Let me recall the above standard logit model:

$$Log(MID) = X\beta + u$$

The only difference between this model and the previous regression model is that the key independent variable of PTA is not included, but it is included in the way of subset. The mean outcome difference between the two groups (i.e., states with signed but not in force PTAs and states without such PTAs) is:

$$D_{Log(MID)} = Log(MID)_{PTA} - Log(MID)_{non-PTA}$$
$$= X_{PTA}\beta_{PTA} - X_{non-PTA}\beta_{non-PTA}$$

The above equation then can be rewritten as:

$$D_{Log(MID)} = (X_{PTA} - X_{non-PTA})\beta_{non-PTA} + X_{PTA}(\beta_{PTA} - \beta_{non-PTA})$$

The first part of the above equation is the observable effect which is the difference in the conflict probability between PTA members and non-PTA members that can be explained by differences in observable variables (presented in figure 1). The second part of the equation is the behavioral effect which is the difference in the conflict probability that can be explained by how PTA members and non-PTA members respond to the observable variables (presented in Figure 3).

The difference between the conflict probability between PTA members and non-PTA

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Table 3: Nonlinear Decomposition of PTA and Non-PTA dyads

Variable	% Contribution to observables
lower dependence	-12.3%
alliance	-0.09%
democracy	-13.7%
contiguity	41.7%
relative power ratio	1.36%
cold war	9.1%
Total	26.07%
% Contribution to behavior	73.93%

members is approximately 0.65. Table 3 presents the nonlinear decomposition results of the observable and behavioral effect of PTA on militarized conflict. I applied a parametric bootstrapping technique in order to replicate the coeffcents. I use the means of the coefficients of each variable from bootstrapping for 1500 times. The characteristic effect of lower dependence on militarized conflict is calculated as following:

$$(mean(lowerdep_{PTA}) - mean(lowerdep_{non-PTA}) \times \beta_{lowerdepfrombootstrapping(non-PTA)} = -0.08$$

I take the mean of the value of lower dependence in the PTA member states sample and then minus it in the non-PTA members sample. The percentage contribution reported in Table 3 is calculated by dividing this characteristic/observable effect by the total gap in the conflict probability, i.e., $\frac{-0.08}{0.65} = -0.123 = -12.3\%$. In substance, this means that the difference in the lower dependence between the two samples decreases the gap in the conflict probability by 12.3%. Similarly, the variables of alliance commitment and joint democracyalso have negative contribution. The most important thing learned from the decomposition results is that PTA members and non-PTA members significantly respond differently to the same value of observable variables. The behavioral effect contributes 73.93% to the total gap in the conflict probability.

Conclusion

This paper provides a thorough analysis of the pacifying effect of PTAs on militarized conflict. I found that there is a significantly negative relatinship between PTAs and militarized conflict during the signed but not in force period, distinguishing signed PTAs from in force PTAs. Additionally, applying a decomposition technique, I found that PTA member states significantly response differently to the same observable propensity of militarized conflict while differences in observable factors affect the likelihood of conflict as well. The expectation theory might be used to explain such a heterogeneity in their response. PTAs bring member states a positive and foreseeable future benefit from

regulated trade arrangement. The positive expectations of trade significantly constrain states' aggressive actions in minor disputes. Therefore, decrease the likelihood of militarized conflict.

Although there have been many distinguished scholars who study institutional designs on conflict, this paper provides the first direct and precise empirical test on signed PTAs effect following Peterson and Rudloff's work (2015). Additionally, this paper provides the first decomposition analysis on PTAs' effect on militarized conflict. The results provide consistent evidence that institutional design itself significantly decrease conflict between member states. The paper makes the contribution to the relevant literature by isolating PTAs' influence. The results also demonstrate that there are observable differences between PTA members and non-PTA members while they respond differently to these observable factors. These results support the expectation theory used to explain conflict. Future research on institutional designs could differentiate PTAs according to their content and examine how different levels of PTAs could affect conflict. Additionally, there are also variations of trade benefit after putting PTAs in force. For instance, the trend of PTAs could cause asymmetries in member dependence and trade flows. The effect of PTAs could vary after putting in force. Future research could apply other statistical techniques to reveal these potential variations.

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