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The Design of International Trade Agreements: Introducing a New Database

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Abstract

Preferential trade agreements (PTAs) have been proliferating for the last twenty years. A large literature has studied various aspects of this phenomenon. Until very recently, however, this literature has treated all PTAs as equal although PTAs differ significantly in terms of design. In this paper, we present a new dataset on the design of trade agreements (DESTA). We illustrate the usefulness of this dataset in re-visiting the literature on the PTA-trade nexus, that is, the questions if and to what extent PTAs impact trade flows.

Key Words: preferential trade agreements, institutional design, database, trade flows, gravity model.

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Introduction

Preferential trade agreements (PTAs) have been proliferating for the last twenty years. A large literature has studied various aspects of this phenomenon. Until very recently, however, a major weakness of this literature has been its treatment of all PTAs as equal. In fact, PTAs differ significantly in terms of design. Some agreements, such as the European Union (EU) or the North American Free Trade Agreement (NAFTA), are very broad and contain major concessions for liberalizing markets. By contrast, other agreements are narrow and exhibit modest commitments. Only over the last few years, some scholars have started to pay greater attention to the design and contents of these agreements (Estevadeordal et al. 2009; Haftel 2010; Hicks and Kim 2012; Kucik 2012; Milner and Mansfield 2012).

We contribute to this literature in presenting a new dataset on the design of trade agreements (DESTA) that to our knowledge is the most comprehensive one in terms of both items coded and number of agreements included. The World Trade Organization's database on the "anatomy" of PTAs, for example, contains information on 131 agreements with respect to 52 items (World Trade Organization 2011). For our dataset, by contrast, we coded 587 agreements for more than 100 items. The comprehensiveness of our dataset is a major asset for all questions where looking only at the most prominent agreements leads to selection bias. This concerns studies of the formation of PTAs as well as analyses of the consequences of PTAs.

We illustrate the usefulness of this dataset in re-visiting the literature on the PTA-trade nexus, that is, the questions if and to what extent PTAs impact trade

flows. Our findings show that PTAs substantially increase trade flows between members, but that mainly deep agreements drive this effect. Interestingly, not only tariff cuts, but also trade-related provisions in PTAs concerning topics such as investments and intellectual property rights matter for trade flows. Beyond this literature on the PTA-trade nexus, the dataset is of much broader relevance for debates in International Relations, including on the effects of legalization in international politics, the outside-in effects of international institutions, and the role of power in international politics.

The political economy of PTAs

With the surge of the new regionalism (for this term, see Mansfield and Milner 1999) in the early 1990s, a vibrant literature on PTA formation developed.[2] Broadly, two types of research interests have dominated the field: first, research has for many years focused on why countries negotiate and sign PTAs, and second, more recently, the study of PTAs has turned to investigate the potential effects of being party to one (or multiple) PTAs.

The political economy literature has offered various explanations for why states engage in PTAs. Much work has focused on arguments drawing on competition effects among important trading nations and/or interest group mobilization (Baldwin

[2]This research note cannot do justice to all important contributions to this literature, but will summarize the major developments from a political science perspective. For research by economists, see for example Baier and Bergstrand 2004, Freund and Ornelas 2010, and World Trade Organization 2011.

1993, Grossman and Helpman 1995, Manger 2009, Dür 2010, Baccini and Dür 2012a) and industry and market characteristics (Milner 1997, Chase 2003). Other prominent arguments stress the role of democratization (Mansfield et al. 2002, Baccini 2012), the distribution of power and alliances (Gowa and Mansfield 1993), ambitions to use international trade institutions as instruments to lock-in or credibly commit to specific policies (Maggi and Rodriguez-Clare 2007), domestic veto players within political systems (Mansfield et al. 2007), bureaucratic interests (Elsig and Dupont 2012), electoral concerns (Hollyer and Rosendorff 2011), foreign direct investments (Büthe and Milner 2008, Baccini and Dür 2012b), or forum-shopping as a result of lack of progress in multilateralism (Mansfield and Reinhardt 2003).

Over time, the focus turned from formation to effects. PTAs as a type of trade institution may yield effects on a multitude of economic, political and social phenomena. For trade economists, the trade flow implications have been the key concern (Baier and Bergstrand 2007). PTAs can both create and divert trade, with member states' welfare depending on the balance of the two effects (Viner 1950). Political scientists have focused on a broader set of outcomes ranging from studying trade volatility (Mansfield and Reinhardt 2008), inducing and sustaining domestic economic reforms (Baccini and Urpelainen 2012), addressing behind-the-border protectionism (Kono and Rickard 2011), or allowing for non-trade effects, such as upholding human rights protection in PTA signatories (Hafner-Burton 2005) or reducing conflicts between PTA members (Mansfield and Pevehouse 2000).

While there is thus no short supply of explanations for PTA formation and selected outcomes, so far most of this literature suffers from lack of data on the design

of PTAs. Many studies conceptualize PTAs as a dichotomous variable, namely whether countries sign an agreement or not, and hence treat PTAs as if they were all equal in purpose and effect. As a short cut to design differences, some work has controlled for different levels of trade integration (e.g., free trade agreements, customs unions, common markets, and economic unions). Yet, only few studies focus on selected design differences (an exception is Hafner-Burton 2005), study regional specifications (Hicks and Kim 2012), or explain functional differences in design, for example with respect to dispute settlement (Smith 2000) and flexibility provisions (Kucik 2012).

The limited attention paid to differences in the design of trade institutions is problematic given that PTAs clearly vary in terms of overall ambitions and commitments reflected in depth of concessions and flexibility clauses or opt-outs. The negotiation of deep agreements that cause important losses for some sectors of society will follow a different logic than the signing of shallow agreements. And a very narrow and shallow agreement is unlikely to have the same consequences as a broad and deep one. Incorporating design differences in our models should thus assist us in understanding both why states sign PTAs and which effects these PTAs can be expected to have. Our goal in collecting data on the design of trade agreements is to remedy this shortcoming of the PTA literature.

DESTA: Description of the Dataset

We identified a total of 732 PTAs that were signed between 1945 and 2009 and that include concrete steps towards the preferential liberalization of trade in goods and/or services. The number of PTAs that we found is substantially larger than the number of agreements covered by comparable datasets. 356 of our agreements are also included in the list maintained by the World Trade Organization (WTO); 508 form part of a list held at the World Trade Institute.[3] We identified the remaining agreements via systematic search on the web pages of foreign ministries and other governmental institutions.[4] The number of initial memberships in these agreements is 3,647 (thus an average of 18 initial memberships for the 201 countries covered by the dataset); moreover, 409 members acceded after the initial signing of the agreements.

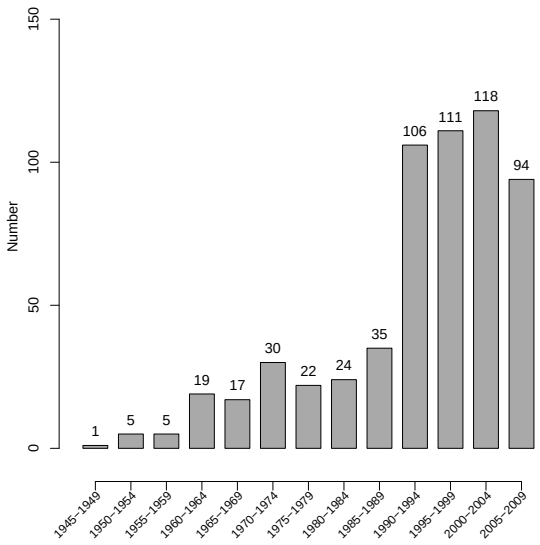
Alas, we have not been able to find full texts for all of the agreements and ended up coding 587 agreements with 3,310 members for a total of 10 broad sectors of cooperation, encompassing market access, services, investments, intellectual property rights, competition, public procurement, standards, trade remedies, non-trade issues, and dispute settlement. For each of these sectors, we coded a significant number of items, meaning that we have well beyond 100 data points for each agreement. The coding has been carried out manually by two independent coders, with any

[3] In contrast to these lists, we did not count accession agreements or services agreements that are signed at the same time as goods agreements as separate PTAs. This explains why our count of agreements notified to the WTO is smaller than the one indicated by the WTO itself.

[4] The additional agreements that we found were not notified to the WTO, and thus have not made it into many of the datasets on PTAs that are based on the WTO's PTA inventory.

differences resolved in the final data by a referee. Inter-rater agreement as measured by Cohen's kappa is higher than 0.75 for nearly all variables (with any value higher than 0.60 considered as substantial degree of agreement) and higher than 0.85 for some variables such as those capturing the depth of services provisions. Moreover, cross-checks with other datasets that have been put together independently from ours (such as Estevadeordal et al. 2009 and World Trade Organization 2011) have confirmed the reliability of our data.

Figure 1: PTAs over time.

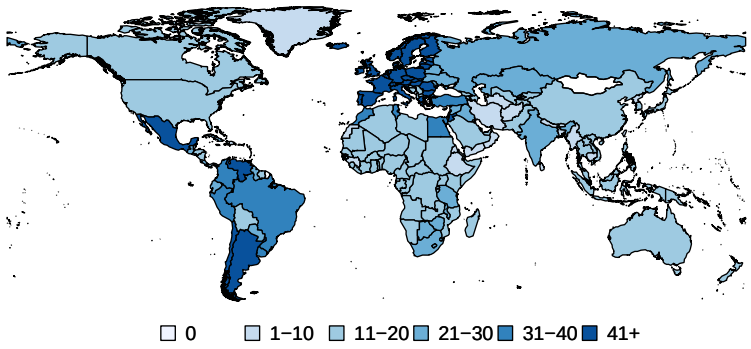


The resulting DESTA dataset is, to the best of our knowledge, the most ambitious attempt at measuring the design of PTAs in terms of agreements and sectors covered. The World Trade Organization (2011), for example, coded 131 agreements, and the chapters in Estevadeordal et al. 2009 rely on an even smaller number of

agreements. In the following we present selected information from the DESTA dataset. These examples serve to illustrate both the range of issues covered in DESTA and its potential use and application. Moreover, they offer a description of the phenomenon of regionalism that has characterized the international political economy for some time.

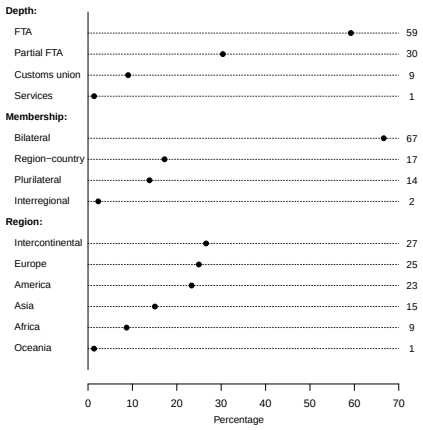
Our dataset confirms the commonly held view that countries have multiplied their efforts to sign and ratify PTAs in recent years (see Figure 1). The tip-off point is situated in the early 1990s. This surge of new agreements is in particular related to the European Union and EFTA states attempting to stabilize trade relations with new European democracies after the end of the Cold War. More recently, however, the dynamic has been driven by emerging economies concluding trade agreements with other developing countries. As a result, while European states and a majority of Latin American states are still the top ratifiers of PTAs, most countries in the world now have signed several agreements (see Figure 2). In fact, with the exception of Mongolia, all but a few tiny (island) countries have signed at least one PTA since World War II.

Figure 2: Number of PTAs signed, by country (1945-2009).



The map shows the number of PTAs that a country signed over the period 1945-2009. Some of these agreements are inactive as of 2012; some countries also withdrew from agreements.

Figure 3: Types and regional composition of PTAs.



The large majority of agreements (59%) signed since 1945 are free trade agreements; 30% are partial agreements that either focus on a sector or a few products or require only limited tariff cuts; 9% percent are customs unions that aspire not only at the dismantling of trade barriers and the free flow of products but also

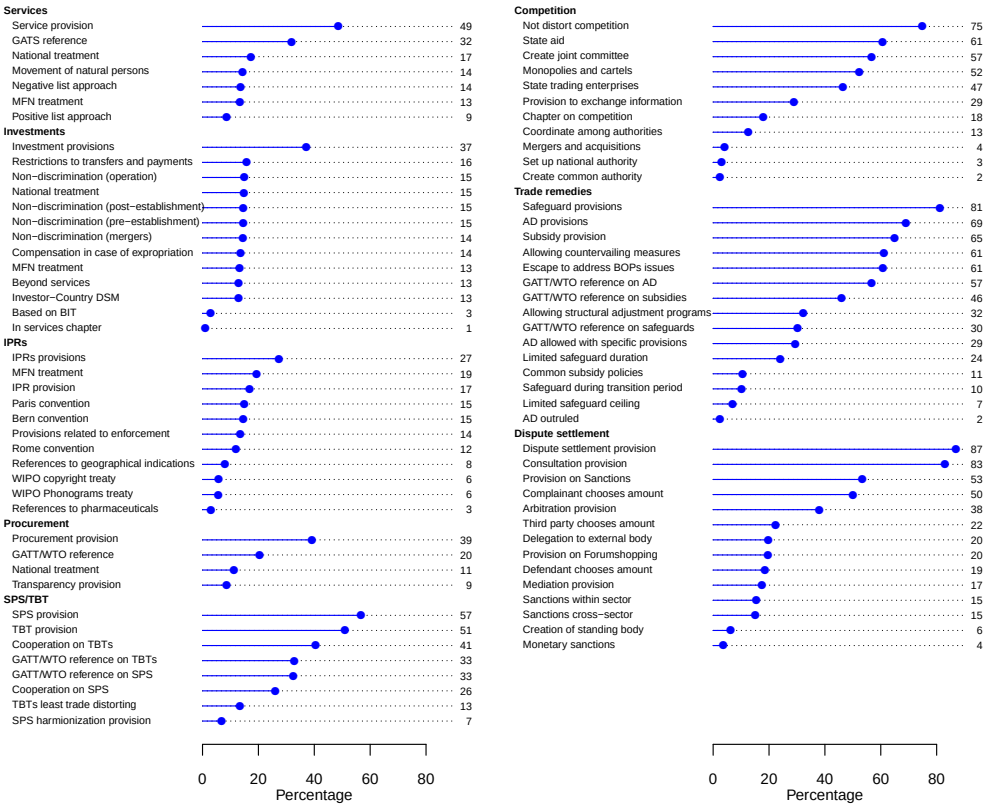
the establishment of a common external tariff system; and 1% are pure services agreements (see Figure 3). In terms of actor constellation, the most common are bilateral agreements (67 %, e.g. Australia-New Zealand). Region-country agreements (e.g. Croatia-EU) amount for 17% of the agreements, plurilateral agreements (e.g. NAFTA) for 14%, and interregional agreements (e.g. EFTA-SACU) for 2%. As to the geographic dimension, agreements are still predominantly regional. Nevertheless, Figure 3) also indicates that 27% of treaties are concluded between countries or regions that are located in different continents (e.g. Singapore-Chile).

Importantly, DESTA supports its own *raison d'être*: the data clearly show that PTAs indeed differ considerably in terms of their contents. In Figure 4, we show the percentage of agreements in our dataset that contain a selected number of provisions that we coded.[5] The figure shows that while most agreements foresee a type of enforcement mechanism to settle disputes and safeguard provisions, only few agreements substantively regulate intellectual property rights, foreign direct investments, or procurement by public authorities. The differences are even more pronounced when looking at provisions at more detail. In competition policy, for example, 75 per cent of agreements stipulate that member states may not distort competition, but only two per cent of agreements foresee the establishment of a common competition authority. No fewer than 87 per cent of agreements include some type of dispute settlement provision; and 53 per cent allow for the imposition of sanctions in case of a violation of the terms of the agreement. Overall, therefore, PTAs exhibit

[5]For space reasons, we show a selection of the items that we coded. DESTA also encompasses detailed data on market access and non-trade provisions contained in trade agreements (such as provisions on security cooperation or human rights) that we do not use in this research note.

major differences in design and contents.

Figure 4: Variation in agreement design.

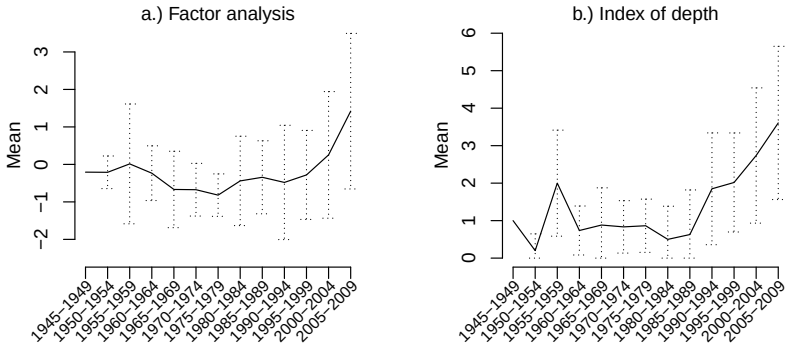


Note: the figure shows the percentage of agreements that contain the various provisions. The online appendix offers more information on the coded items.

A final expectation that we take up is that agreements have become deeper over time. Measuring "depth", defined as the extent to which an agreement restricts a country's autonomy to hamper the cross-border flow of goods and services, is tricky. We use exploratory factor analysis on a total of 58 variables that theoretically are related to the depth of an agreement (these variables pertain to such aspects as ser-

vices liberalization, trade-related investment measures, intellectual property rights and standards[6]) to arrive at a measure of depth. Factor analysis is the appropriate method in this case, since many of the items that we coded are highly correlated with one another. Moreover, not all items seem to be of equal importance in establishing the extent of countries' commitments. As such, a simple additive score of all these items would inflate our measure of depth for deep PTAs.[7] Nevertheless, as a cross-check, we also plot a simple additive index that potentially ranges from 0 to 7, depending on whether or not all tariffs are reduced to zero and the agreement includes (substantive) provisions concerning services, investments, technical barriers to trade (TBT) and/or sanitary and phytosanitary (SPS) measures, public procurement, competition and intellectual property rights.

Figure 5: Depth over time.



Note: the vertical arrows show the standard errors of the means.

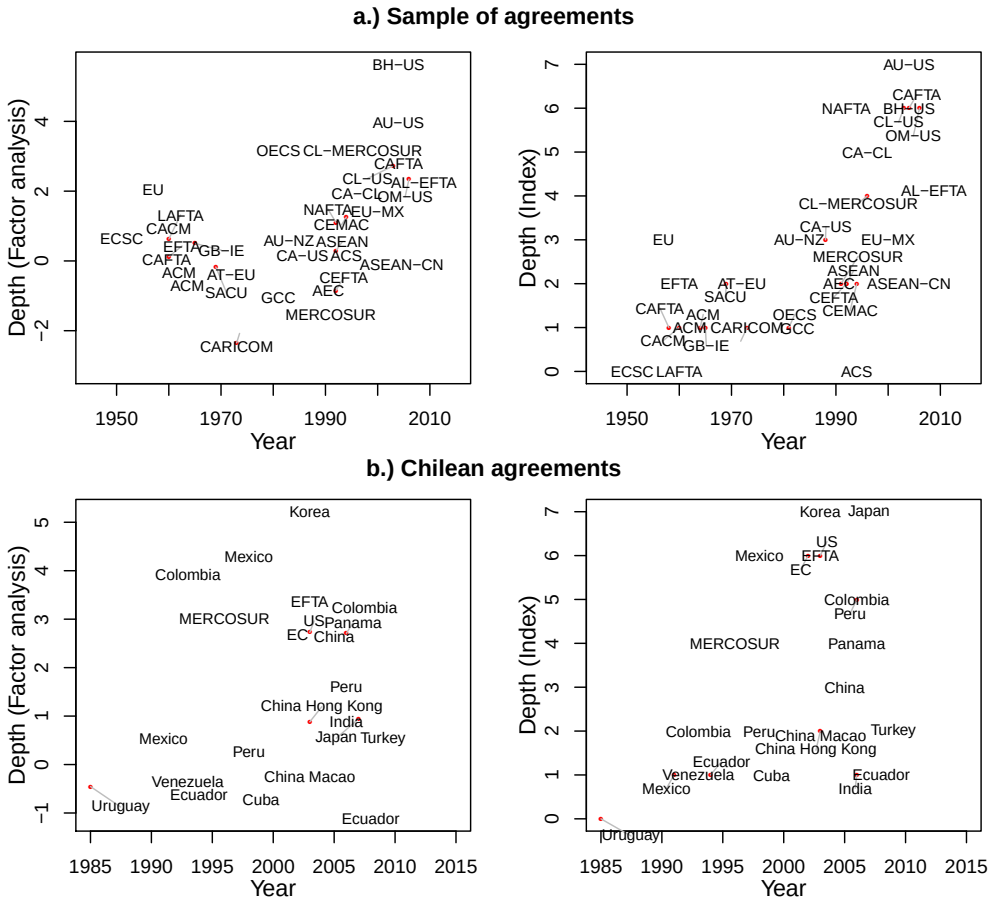
[6]The online appendix contains a list of all the variables used in this research note.

[7]For the factor analysis, we use tetrachoric correlation to establish a correlation matrix, extract two factors, and orthogonally rotate them. We then rely on the Thurstone method to calculate factor scores for the first factor. These factor scores are robust to changes in the number of factors that we extract, the rotation, and the method used to calculate scores.

The two variables are highly correlated (r=0.58, t=17.03) and both show the same picture: the depth of PTAs remained relatively stable for half a century after the end of World War II (with considerable variation across agreements), but has increased significantly for the last twenty years (see Figure 5). In fact, the thirteen agreements that receive the maximum score of seven on the additive index measure of depth all have been signed since 2000. At the same time, however, major variation across agreements exists at any point of time. The 1985 US-Israel agreement, for example, has a depth score of four, whereas two agreements that Venezuela signed with Paraguay and Uruguay as recently as 2008 both score zero. Our data thus support the common wisdom of agreements having become deeper as part of the "new regionalism"; but this trend seems to explain only a small part of the variation in depth across agreements.

Finally, in Figure 6 we offer some more micro-evidence from our dataset. The upper two figures show the depth of a selected sample of agreements, using the factor analysis (left) and the index scores of depth (right). Both figures reveal a slight trend towards deeper agreements, but the trend is more clearly visible when using the index of depth. It becomes very clear that the recent agreements signed by the United States are particularly deep, whereas several of the older, regional agreements are relatively shallow. In the two figures at the bottom, we plot the depth of agreements including Chile. Interestingly, for a single country we find large variation in the depth of agreements. Whereas most of Chile's agreements with other Latin American countries are shallow, the trans-continental agreements signed by Chile include significant obligations for market opening.

Figure 6: The depth of selected agreements.



Agreement Design and the PTA-Trade Nexus

A large literature addresses the impact of trade agreements on bilateral trade flows. Going back to Jacob Viner (1950), much of the early research tried to measure the extent to which individual PTAs create or divert trade (for example, Frankel 1997). Goldstein et al. (2007) find that PTAs tend to increase trade (concretely,

they lead to a 34 percent increase in trade, with this effect increasing over time), but also recognize that "A natural extension of the research would be to code not only the existence but also the strength of PTAs" (Goldstein et al. 2007: 51). Baier and Bergstrand (2007) stress that PTAs are not exogenous to trade flows and other variables that may impact trade flows. When controlling for this endogeneity, the trade effect of PTAs turns out to be much larger than previously estimated. In fact, they conclude that FTAs double the bilateral trade of two PTA members over a ten-year period. Baier and Bergstrand (2009) confirm this result after using matching to account for the selection effect of dyads with large trade flows signing PTAs.

We build on this literature to show the importance of considering the design of trade agreements in empirical studies on the effects of PTAs. For several reasons, PTA design should matter for the PTA-trade nexus. Most obviously, trade agreements are contracts that reduce tariffs among member countries. Lowering tariffs makes products cheaper and therefore more competitive in countries that are members of the same trade agreements. As such, PTAs should bolster trade at least in those products for which tariffs are cut. The greater the tariff cuts, therefore, the larger the expected trade effect of PTAs.

The effect of PTAs on trade, however, is not limited to tariff cuts. The larger the number of policy instruments that are covered by a PTA, the greater the lock-in of policy reforms that favor trade. The more difficult it is for a government to breach an agreement, in turn, the more likely it is that exporters and importers will make relation-specific investments that may foster trade (Yarbrough and Yarbrough 1992). Lock-in of policies, moreover, may attract foreign direct investments (on the

effect of PTAs on investments, see, for example, Büthe and Milner 2008). These investments increase vertical intra-industry trade, that is, trade in similar goods produced by the same industry, but differentiated by the unit value of the goods.

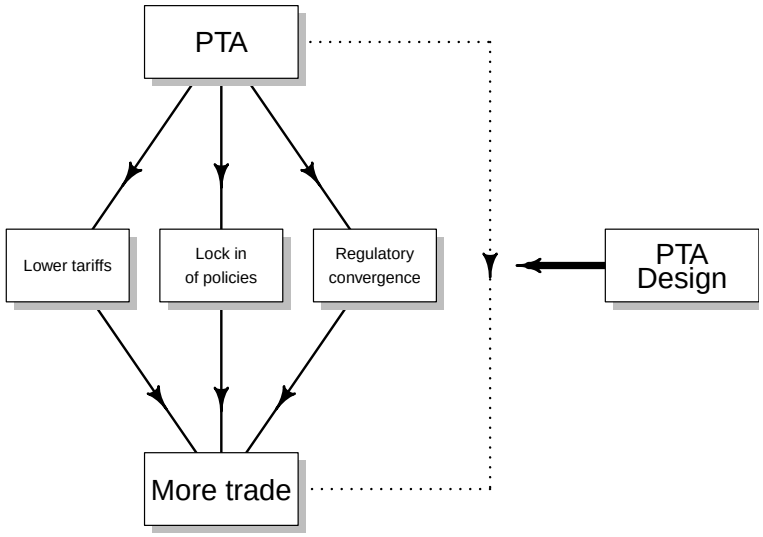
Finally, the design of PTAs should matter for the degree of regulatory convergence that countries experience as a result of integration. Regulatory convergence, for example owing to the mutual recognition of standards or the adoption of international standards, reduces the costs of trade and thus should increase trade. To give an example, in the EU-South Korea trade negotiations, the EU chief negotiator persuaded his counterpart to end the practise of demanding national and U.S. standards in the production of cars and instead to rely completely on international standards (Elsig and Dupont 2012: 501). The joint acceptance of international standards should have reduced potential market access restrictions and increased trade in cars. Overall, therefore, the design of an agreement should matter for the trade effect of PTAs. Figure 7 summarizes this argument.

Econometric Strategy

The gravity model is the workhorse model to estimate the effect of any variables on trade flows between two countries.[8] In its basic form, the amount of trade between countries is assumed to increase along with economic size, as measured by GDP, and decrease in direct proportion to increases in the cost of transportation between the two countries, as measured by the geographical distance between them. Over

[8]The gravity model does not come without shortcomings. We will address some of these in the robustness check.

Figure 7: Design and effects of PTAs.



time this basic form has been enriched by several other variables capturing political characteristics, international institutions, and cultural factors. We follow many previous studies (Rose, 2004; Carrere, 2006; Baier and Bergstrand, 2007; Goldstein et al., 2007) in relying on this model to estimate the effect of PTA design on trade flows.

Our unit of observation consists of 21,805 directed dyads comprising the 179 countries for which we were able to obtain data. We disaggregate the EU to the member-state level to evaluate the effect of the EU's PTAs on trade flows between each EU member and all the other countries in the dataset. The analysis covers the design of 536 PTAs signed between 1948 and 2009. Some dyads form more than one PTA; in these cases we analyze the impact on trade flows also of the second,

third, etc. PTAs. In other words, design variables are time varying for some dyads. Formally, we estimate the following model:

$$lnTrade_{ij,t} = \alpha + \beta_1 Depth_{ij,t-1} + \beta_2 X_{ij,t-1} + \gamma_{ij} + \theta_t + \epsilon. \quad (1)$$

where *lnTrade* is the dependent variables. *Depth* is the main independent variable. X_{ij} are vectors of control variables, β_1 and β_2 are the coefficients. α is the constant and ϵ is the error term. γ and θ are respectively directed dyad fixed effects (which among other things control for distance and contiguity) and year fixed effects.

Operationalizing the Variables

The dependent variable is $lnTrade$, which is the log of the value of exports between the two countries in the dyad. We use three different sources: the IMF's Direction of Trade Statistics (DOTS), Gleditsch's dataset (Gleditsch 2002), and a combination of these two datasets to minimize the number of missing values.

Our main independent variable captures the design of PTAs. We use a measure of depth that is based on factor analysis and that we introduced above ($Depth$). We add several control variables, which are commonly included in the gravity model, to take into account confounding factors. Since our unit of analysis is the directed-dyad-year, we include monadic variables for each country in the dyad. Table 1 summarizes the descriptive statistics and sources for these variables.

Table 1: Descriptive statistics.

Variables	Mean	Std. Dev.	Min	Max	Source
$lnTrade$	1.07	1.86	0	12.78	DOTS 2010 and Gleditsch 2002
$Depth$	.90	2.52	0	16.38	DESTA
$Depth-High(anticipatory)$	.02	.13	0	1	DESTA
$Depth-High(short-term)$	.02	.12	0	1	DESTA
$Depth-High(middle-term)$	.02	.15	0	1	DESTA
$Depth-High(long-term)$	.01	.10	0	1	DESTA
$Depth-Low(anticipatory)$	.10	.30	0	1	DESTA
$Depth-Low(short-term)$	.10	.30	0	1	DESTA
$Depth-Low(middle-term)$	.18	.09	0	1	DESTA
$Depth-Low(long-term)$	.18	.11	0	1	DESTA
PTA	.07	.25	0	1	DESTA
$GATT/WTO$	.29	.45	0	1	WTO 2012
$Regime_i$	.38	7.52	-10	10	Polity IV 2010
$Conflict_{ij}$	.001	.03	0	1	Uppsala armed conflict dataset
$Conflict_i$	.06	.23	0	1	Uppsala armed conflict dataset
$lnGDP_i$	21.52	2.28	14.09	28.44	World Bank 2011
$Distance$	8.75	.77	2.35	9.90	CEPII
$Contiguity$	.02	.13	0	1	CEPII
$CommonLanguage$	.15	.33	0	1	CEPII
$CommonColony$	.09	.28	0	1	CEPII
$CommonLegalSystem$	.33	.47	0	1	CEPII
$CommonCurrency$	.02	.13	0	1	CEPII

Baseline Analysis

Table 2 shows four models. The first model includes a dummy variable PTA, which does not distinguish among different designs. The sign is positive and statistically significant, confirming that *on average* PTAs increase trade between members. The second model includes $Depth$. The sign of the coefficient is positive and statistically significant at the 99 percent confidence interval, indicating that, as expected, the design of agreements matters. The deeper a PTA, the larger is its effect on trade flows between member countries.

In Model 3 we replaced $Depth$ with four dummy variables. Specifically, $Depth-High(anticipatory)$ scores 1 if $Depth$ is higher than its mean across all dyads with

Table 2: Baseline models.

Variables	(1)	(2)	(3)	(4)
PTA	0.26***			
	(0.00)			
$Depth$		0.04***		
		(0.00)		
$Depth - High(anticipatory)$			0.50***	
			(0.01)	
$Depth - High(short - term)$			0.56***	
			(0.01)	
$Depth - High(middle - term)$			0.57***	
			(0.01)	
$Depth - High(long - term)$			0.31***	
			(0.01)	
$Depth - Low(anticipatory)$				-0.22***
				(0.01)
$Depth - Low(short - term)$				0.17***
				(0.03)
$Depth - Low(middle - term)$				-0.01
				(0.01)
$Depth - Long(long - term)$				0.22***
				(0.03)
$Regime_i$	0.00	0.00	0.00**	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
$Regime_j$	0.00***	0.00***	0.00**	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
$Conflict_{ij}$	-0.59***	-0.59***	-0.61***	-0.57***
	(0.04)	(0.03)	(0.04)	(0.04)
$Conflict_i$	-0.12***	-0.13***	-0.14***	-0.13***
	(0.00)	(0.00)	(0.00)	(0.00)
$Conflict_j$	-0.07***	-0.07***	-0.08***	-0.07***
	(0.00)	(0.00)	(0.00)	(0.00)
$lnGDP_i$	0.55***	0.55***	0.53***	0.48***
	(0.00)	(0.00)	(0.00)	(0.00)
$lnGDP_j$	0.42***	0.42***	0.41***	0.38***
	(0.00)	(0.00)	(0.00)	(0.00)
$GATT/WTO$	0.04***	0.04***	0.03***	0.04***
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	-20.63***	-20.55***	-19.86***	-16.94***
	(0.07)	(0.07)	(0.08)	(0.10)
Dyad FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Observations	821,676	821,676	736,993	742,978
R-squared	0.42	0.42	0.42	0.38
Number of ID	22,690	22,690	22,517	22,578

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

a PTA in the five years before the signature of a PTA. $Depth - High(short - term)$ scores 1 if $Depth$ is higher than its mean in the five years after the signature of a PTA. $Depth - High(middle - term)$ scores 1 if $Depth$ is higher than its mean between five and 15 years after the signature of a PTA. Finally, $Depth - High(long - term)$ scores 1 if $Depth$ is higher than its mean after 15 years from the signature of a PTA. In doing so, we are able to estimate the effect of $Depth$ at different points in time. Moreover, $Depth - High(anticipatory)$ accounts for the issue of selection into treatment, i.e. agreements could be formed when trade flows between dyads increase due to factors unrelated with PTAs.[9]

Similarly, in Model 4 we replaced $Depth$ with four dummy variables. Specifically, $Depth - Low(anticipatory)$ scores 1 if $Depth$ is lower or equal than its mean across all dyads in the five years before the signature of a PTA. $Depth - Low(short - term)$ scores 1 if $Depth$ is lower or equal than its mean in the five years after the signature of a PTA. $Depth - Low(middle - term)$ scores 1 if $Depth$ is lower or equal than its mean between five and 15 years after the signature of a PTA. Finally, $Depth - Low(long - term)$ scores 1 if $Depth$ is lower or equal than its mean after 15 years from the signature of a PTA.[10]

Interestingly, while every $Depth - High$ dummy is positive and statistically significant (at the 1 percent level), only two of the coefficients for the $Depth - Low$ dummies (namely $Depth - Low(short - term)$ and $Depth - Low(long - term)$) are positive and statistically significant (at the 1 percent level). Conversely, there

[9]For a similar approach, see Kuziemko and Werker (2006).

[10]In Model 3 we exclude dyads that have a low-depth PTA in force. Similarly, in Model 4 we exclude dyads that have a high-depth PTA in force.

is no evidence that $Depth - Low(middle - term)$ has any impact on trade flows, whereas $Depth - Low(anticipatory)$ is negative and statistically significant (at the 1 percent level). This last result shows that selection bias is weaker for dyads forming low-depth PTAs. More importantly, shallow PTAs do not increase trade between countries as much as deep PTAs. Indeed, when positive and statistically significant, the effect of shallow PTAs is less than one third of the effect of deep PTAs (see Table 3). This finding shows that lumping these two type of PTAs, i.e. deep and shallow PTAs, together in the same dummy does not allow to correctly identify and estimate the effect of PTAs on trade flows. Neglecting the design of PTAs may thus explain why previous studies find inconsistent results on the nexus between trade and PTAs.

Table 3 shows the effects of the main variables on trade in detail. In particular, we focus on the dummy variables included in Models 1, 3 and 4. In doing so, we are able to compare the effect of our design variables on trade with the effect of PTA and $GATTWTO$, which are commonly used in the gravity model.[11] Regarding $Depth - High$ dummies, the take-home points from Table 3 are three-fold. First, there is evidence of anticipatory effects, though such effects are not as large as short-term and middle-term effects. This result is particularly welcome. There is little concern that unobserved dyad-specific trends in both dyads' ability to increase their trade and their probability of forming PTAs are driving the positive association between PTA and amount of export. Second, short-term and middle-term effects,

[11]Following Goldstein et al. (2007), we use arc elasticity, which is the appropriate way to calculate the effect of dummies on the response variable.

Table 3: The effect of PTAs on trade

Main Variables	Increase in trade	C.I.
$Depth - High(anticipatory)$	65%	[64%, 66%]
$Depth - High(short - term)$	75%	[74%, 76%]
$Depth - High(middle - term)$	77%	[76%, 78%]
$Depth - High(long - term)$	36%	[35%, 37%]
$Depth - Low(anticipatory)$	-21%	[-20%, -22%]
$Depth - Low(short - term)$	19%	[18%, 20%]
$Depth - Low(middle - term)$	-0.01%	[-0.01%, 0.01%]
$Depth - Low(long - term)$	25%	[24%, -26%]
PTA	30%	[28%, 31%]
$GATTWTO$	4%	[3%, 5%]

Note: Entries are the estimated percentage increase in trade for a dyad of countries, relative to when neither country participates in a PTA or in the GATT/WTO. Each effect is calculated as an arc elasticity, $e^{\hat{\beta}} - 1$, where $\hat{\beta}$ is the appropriate parameter estimate from Model 1 (for PTA and $GATT/WTO$), Model 3 (for $Depth - High$) and, Model 4 (for $Depth - Low$).

which are statistically not distinguishable one from another, greatly outperform long-term effects. This result implies that there is a natural ceiling to the extent by which a PTA can increase trade between dyads. Third, every $Depth - High$ dummy substantially outperforms the effect on trade of $GATT/WTO$. As a point of reference, such an increase is larger than the increase in trade between two countries that are GATT/WTO members, as estimated by Goldstein et al. (2007: 55). Finally, the signs and levels of significance of control variables are in line with other studies using the gravity model, adding plausibility to our findings.

Additional Evidence

Other Model Specifications

The gravity model suffers from several shortcomings, as we have already mentioned. Here we implement several checks to make sure that our results hold also under different specifications of our main models. First, the gravity model proves to be very sensitive to heterogeneity problems. Cheng and Wall (2005: 49) show that "unless heterogeneity is accounted for correctly, gravity models can greatly overestimate the effects of integration on the volume of trade." To check that our results are not sensitive to heterogeneity, we re-run the previous models that include *Depth*, using exporter and importer fixed effects as well as year fixed effects. By doing so, we are now able to include time-unvarying variables such as distance and contiguity. Moreover, we implement an analysis with random effects following De Rosa (2007: 6), who claims that "when appropriately applied, the random-effects approach is the preferred approach for complete estimation of the parameters of the gravity model." In both cases, the main results are unchanged (see Table 4).

Second, the presence of a large number of zeros in the dependent variable creates a selection bias when relying on a natural logarithm transformation. Helpman, Melitz and Rubinstein (2008) addressed this issue using a Heckman selection model. We follow their model specification. Specifically, in the selection equation we predict whether a dyad has no trade using a probit model whose dependent variable scores one if $Trade$ equals zero. In the outcome equation we estimate the standard gravity

Table 4: Other model specifications

Variables	(5)	(6)	(7)	(8)
$Depth$	0.03***	0.04***	0.05***	0.49***
	(0.00)	(0.00)	(0.00)	(0.01)
$\widehat{Depth}$				0.49***
				(0.01)
$Regime_i$	-0.00	-0.00***	0.01***	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)
$Regime_j$	0.00**	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)
$Conflict_{ij}$	-1.21***	-0.59***	-1.27***	-0.66***
	(0.17)	(0.04)	(0.23)	(0.05)
$Conflict_i$	-0.13***	-0.14***	-0.08***	-0.13***
	(0.01)	(0.00)	(0.01)	(0.01)
$Conflict_j$	-0.07***	-0.08***	-0.04***	-0.07***
	(0.01)	(0.00)	(0.01)	(0.01)
$lnGDP_i$	0.52***	0.58***	0.74***	0.57***
	(0.01)	(0.00)	(0.01)	(0.00)
$lnGDP_j$	0.36***	0.45***	0.56***	0.43***
	(0.01)	(0.00)	(0.01)	(0.00)
$GATT/WTO$	0.10***	0.05***	0.15***	0.03***
	(0.01)	(0.00)	(0.01)	(0.00)
$Distance$	-0.71***	-0.59***	-0.96***	
	(0.01)	(0.01)	(0.02)	
$Contiguity$	0.48***	0.73***	0.61***	
	(0.05)	(0.05)	(0.06)	
$CommonLanguage$	0.09***	0.18***	0.27***	
	(0.02)	(0.02)	(0.03)	
$CommonColony$	0.21***	0.22***	0.46***	
	(0.03)	(0.03)	(0.03)	
$CommonLegalSystem$	0.25***	0.15***	0.30***	
	(0.02)	(0.01)	(0.02)	
$CommonCurrency$	0.35***	0.45***	0.43***	
	(0.04)	(0.01)	(0.05)	
$Invmills$			1.80***	
			(0.08)	
Constant	-11.99	-16.89***	-20.35***	-20.94***
	(8.79)	(0.10)	(0.51)	(0.11)
Exporter FE	yes	no	yes	no
Importer FE	yes	no	yes	no
Dyad FE	no	no	no	yes
Dyad RE	no	yes	no	no
Year FE	yes	yes	yes	yes
Observations	749,763	749,763	459,263	821,676
R-squared	0.71	0.68	0.75	0.47
Number of id		21,295		22,690

Robust standard errors clustered by dyads in parentheses. Model (7) is a Heckman model and Model (8) an instrumental variable model. *** p<0.01, ** p<0.05, * p<0.1

model used in the previous section. However, the econometric logic of the Heckman model allows conditioning the estimated mean function in the second stage on the selection process of first stage. In other words, the estimated probability of selection is then used as a regressor in the second stage. Also in this case our main results hold (see Table 4).

Baier and Bergstrand (2007) emphasize the endogeneity problem when the variable PTA is placed on the RHS of the gravity model. To rule out the possibility that endogeneity hampers our results, we implement a two-stage estimation using data on BIT and joint membership in non-economic IGOs as instruments. These variables are good predictors of the formation and the design of PTAs, but are logically and theoretically exogenous to trade, especially after controlling for dyad fixed effects and importer/exporter fixed effects. The under-identification test (Anderson canonical test) leads us to reject the null hypothesis that models are under-identified. Moreover, both the Kleibergen-Paap Wald F statistic and the Stock and Yogo test (2002) lead us to reject the null hypothesis that the equations are weakly identified. Finally, the Hansen test does not reject the full specification of the model at the conventional level, i.e. our instruments are uncorrelated with the error terms. Again, our substantive results do not change (see Table 4).

Finally, our results are not sensitive to a different operationalization of *Depth*, e.g. excluding some variables from the factor analysis or using Pearson correlation instead of tetrachoric correlation. Moreover, our results are similar if we exclude dyads that have a PTA in force that is not included in our coding exercise (or if

we control for these dayds by adding a dummy).[12]. Furthermore, our results do not change if we use imports instead of exports as a measure of trade. All these extra findings are available upon request.

Trade-Related Sectors vs. Tariff Reduction

Our general argument is that the design of a PTA matters in increasing trade flows between member countries. Specifically, we argue that trade-related provisions are crucial instruments for boosting trade. Previous results confirm this hypothesis. However, a skeptical reader might note that the depth of a PTA captured by looking at trade-related provisions is correlated with the magnitude of tariff reductions. Put simply, deep PTAs that include provisions protecting investment, services, and intellectual property rights are likely to be the ones that also implement the largest tariff cuts between member countries. If that is the case, the underlying factor leading to an increase in trade would not be trade-related provisions, but rather the tariff reductions.

To address this concern, we implement two analyses. First, in the absence of a more direct measure of the extent of tariff cuts, we include a variable capturing the length of tariff transition, i.e. how many years it takes for the tariff cuts to be fully implemented. We label this variable $Transition$.[13] We know that tariff transition is correlated with the magnitude of tariff reduction, i.e. the larger the tariff reduction,

[12] As noted above, we were unable to find fulltexts of 146 agreements.

[13] Tariff transition data might be different for country i and country j. However, since the correlation between $Transition_i$ and $Transition_j$ is 0.98, we take the minimum of these two values to avoid multicollinearity problems.

the longer the tariff transition (Baccini et al., 2012).[14] Indeed, if tariff reductions are large, so are adjustment costs, which are spread out over several year for easing cooperation. Illustratively, the North American Free Trade Agreement, which is relatively deep, has one of the longest transition periods in our database, namely 15 years. Thus, this variable should effectively control for the magnitude of trade liberalization produced by a PTA. Table 5 shows that *Depth* remains positive and statistically significant also after including $Transition$.

Second, we estimate our main model using an error correction model (ECM). That allows us to capture both the short-term (labeled with Δ) and long-term effects of *Depth* on trade flows. If the former effect is positive and statistically significant, we can confidently infer that trade-related provisions matter for increasing trade. Indeed, since the majority of tariff cuts kick in a few years after the entry into force of a PTA, only the long-term effect of an ECM captures the impact of tariff reductions on trade flows.

Table 5 shows that this is indeed the case. Both the short-term effect and the long-term effect of *Depth* are positive and statistically significant at the conventional level. Thus, without downplaying the role of tariff reduction, trade-related provisions also increase trade flows between member countries. Finally, we note that there is conflicting evidence regarding the effect of $Transition$ on trade flows. We explain this by stressing that $Transition$ should have a negative impact on trade flows in the short term (because tariffs are not liberalized immediately) and a positive effect

[14] In fact, in our dataset full free trade areas have an average transition period of 5.7 years as compared to 1.7 years for partial trade agreements. Customs Unions also have a relatively long transition period of 4.5 years.

Table 5: Trade-related provisions vs. tariff reduction

Variable	(9)	(10)	(11)	(12)
$Depth$	0.05***	0.03***	0.05***	0.06***
	(0.00)	(0.00)	(0.00)	(0.00)
$TariffTransition$	-0.02***	0.01***	-0.01***	0.02***
	(0.00)	(0.00)	(0.00)	(0.00)
$Regime_i$	0.00**	-0.00	-0.00**	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
$Regime_j$	0.00***	0.00**	0.00***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
$Conflict_{ij}$	-0.60***	-1.21***	-0.59***	-0.31**
	(0.03)	(0.18)	(0.04)	(0.13)
$Conflict_i$	-0.13***	-0.13***	-0.14***	-0.08***
	(0.00)	(0.01)	(0.00)	(0.01)
$Conflict_j$	-0.07***	-0.07***	-0.08***	-0.03*
	(0.00)	(0.01)	(0.00)	(0.01)
$lnGDP_i$	0.54***	0.52***	0.57***	0.34***
	(0.00)	(0.01)	(0.00)	(0.00)
$lnGDP_j$	0.42***	0.36***	0.44***	0.29***
	(0.00)	(0.01)	(0.00)	(0.00)
$GATT/WTO$	0.04***	0.10***	0.05***	0.01
	(0.00)	(0.01)	(0.00)	(0.01)
$Distance$		-0.70***	-0.59***	
		(0.01)	(0.01)	
$Contiguity$		0.48***	0.73***	
		(0.05)	(0.05)	
$CommonLanguage$		0.09***	0.20***	
		(0.02)	(0.02)	
$CommonColony$		0.20***	0.23***	
		(0.03)	(0.03)	
$CommonLegalSystem$		0.25***	0.15***	
		(0.02)	(0.01)	
$CommonCurrency$		0.35***	0.42***	
		(0.04)	(0.01)	
$\Delta Depth$				0.04***
				(0.00)
$\Delta TariffTransition$				0.01***
				(0.00)
$\Delta Regime_i$				0.00***
				(0.00)
$\Delta Regime_j$				0.00***
				(0.00)
$\Delta Conflict_{ij}$				-0.12
				(0.09)
$\Delta Conflict_i$				-0.06***
				(0.01)
$\Delta Conflict_j$				-0.06***
				(0.01)
$\Delta lnGDP_i$				0.47***
				(0.01)
$\Delta lnGDP_j$				0.51***
				(0.01)
$\Delta GATT/WTO$				0.04***
				(0.01)
Constant	-20.19***	-12.22	-16.55***	-13.46***
	(0.07)	(9.88)	(0.10)	(0.14)
Exporter FE	no	yes	no	no
Importer FE	no	yes	no	no
Dyad FE	yes	no	no	no
Dyad RE	no	no	yes	no
Year FE	yes	yes	yes	no
Observations	821,676	749,763	749,763	686,064
R-squared	0.42	0.71	0.68	0.40
Number of id	22,690		21,295	

Robust standard errors clustered by dyads in parentheses (except Model (9)). Model (12) is an ECM. *** p<0.01, ** p<0.05, * p<0.1

in the middle to long term (because *Transition* is correlated with the depth of tariff cuts; so once the transition period is over, agreements with a high value for *Transition* should see a greater increase in trade).

Conclusion

We have used a new dataset on the design and contents of PTAs to revisit the literature on the PTA-trade nexus. As suggested in the existing literature, PTAs increase trade. Our additional insight is that this effect is driven by deep agreements, whereas shallow agreements have little impact on trade flows. Of particular interest is the result that provisions included in PTAs that do not directly concern trade - such as those protecting investments and intellectual property rights and those opening government procurement to foreign bidders - have a significant impact on trade. We do not claim that this analysis resolves the question of the PTA-trade nexus once and for ever as it neglects – among other things – the extra-dyadic effects of PTAs (Egger et al. 2011). Nevertheless, the central finding that design matters is very robust to changes in operationalization and model choice.

Future research on PTAs thus should open the black box of trade agreements and concentrate on variation across PTAs in design and contents rather than treat all PTAs as if they were the same. The dataset presented here may be used to replicate a number of existing studies such as those that link the presence of PTAs with peace, reforms of domestic economic policy, adherence with human rights, and cooperation in trade-related fields. The data might not only speak to existing debates and dis-

agreements within the research community, but also help detect empirical anomalies that suggest alternative explanations. Studies taking PTA design seriously may also address new questions such as, what type of obligations coupled with what type of enforcement mechanisms are susceptible to induce domestic policy change? How do certain design features in isolation or in conjunction with other variables affect implementation?

DESTA might also prove useful in studying the relationship between bilateralism, plurilateral approaches and the multilateral trading system. What type of PTAs will prove to be stepping stones for multilateral cooperation, and which features of PTAs might turn out to be stumbling blocs? Which PTAs are driven by competitive liberalization and which ones by attempts to discriminate against third countries and protect specific sectors? More fine-grained data might also allow scholars to tackle new questions, such as whether PTAs serve as a laboratory for future multilateral regulation, how design innovation comes about and how design features diffuse, and which types of bilateral commitments that are currently explored might proof susceptible to be multilateralized.

Finally, PTAs are only one form of institutions, however expanding in scope and depth over time. Studying the design of PTAs will allow the PTA literature to better engage with the broader literature on international cooperation and international organizations, creating possibilities to contribute actively to ongoing debates and advancements in research programmes as diverse as legalization (Abbott et al. 2001), rational design (Koremenos et al. 2001, Rosendorff and Milner 2001), diffusion (Simmons and Elkins 2004, Braun and Gilardi 2006), or overlapping regimes

(Drezner 2006, Busch 2007). Many international organizations have been extensively studied in terms of design. Connecting PTAs more to non-trade institutions would be beneficial for situating the role of trade institutions more broadly. The DESTA database will be of major use in developing this research agenda.

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