The Design of International Trade Agreements: Introducing a New Dataset[1]

Andreas Dür, University of Salzburg

Leonardo Baccini, LSE

Manfred Elsig, University of Bern

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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 recently, however, many large-N studies have paid only scant attention to variation across PTAs in terms of content and design. Our contribution to this literature is a new dataset on the design of trade agreements that is the most comprehensive in terms of both variables coded and agreements covered. We illustrate the dataset's usefulness in re-visiting the questions if and to what extent PTAs impact trade flows. The analysis shows that on average PTAs increase trade flows, but that this effect is largely driven by deep agreements. In addition, we provide evidence that provisions that tackle behind-the-border regulation matter for trade flows. The dataset's contribution is not limited to the PTA literature, however. Broader debates on topics such as institutional design and the legalization of international relations will also benefit from the novel data.

Keywords: preferential trade agreements, new regionalism, institutional design, dataset, trade flows, gravity model.

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Introduction

Since the early 1990s, countries across the world have signed a large number of preferential trade agreements (PTAs). PTAs thus have become an important instrument of foreign economic policy-making for nearly all governments. A substantial literature has emerged that studies various aspects of this phenomenon, known as new regionalism (Mansfield and Milner, 1999). Until recently, however, much of this literature failed to take account of the differences in substance and content across PTAs. Some agreements, such as the European Union (EU) or the North American Free Trade Agreement (NAFTA), are very broad and contain provisions that lead to a far-reaching liberalization of markets. By contrast, other agreements are narrow and exhibit modest commitments. Only over the last few years, have some scholars started to pay greater attention to the scope and depth of these agreements (Estevadeordal et al. 2009; Haftel 2010; Hicks and Kim 2012; Kucik 2012; Mansfield and Milner 2012).

We contribute to this emerging literature by presenting a new dataset on the design of trade agreements (DESTA) that to our knowledge is the most comprehensive in terms of both items coded and number of agreements included. The World Trade Organization (WTO)'s dataset on the "anatomy" of PTAs, for example, contains information on 131 agreements with respect to 52 items (World Trade Organization 2011). The chapters in Estevadeordal et al. (2009) rely on an even smaller number of agreements. For our dataset, by contrast, we coded 587 agreements for more than 100 items. For instance, our dataset contains twelve variables coding intellectual property rights; the WTO dataset one. The scope and coverage of DESTA is a major asset when tackling questions where looking only at the most prominent agreements leads to selection bias. This applies to both studies of the formation of PTAs and analyses of the consequences of PTAs.

To illustrate DESTA's potential, we revisit the literature on the PTA–trade nexus, that is, the questions if and to what extent PTAs impact trade flows. Our analysis produces three major findings: first, we present the so far most sophisticated operationalization of the concept of depth of agreements and show that deep agreements matter significantly more than shallow ones. Second, we corroborate findings that PTAs have an anticipatory, short-term and long-term effect on trade flows. Third, not only tariff cuts, but also other market access and trade-related provisions in PTAs concerning topics such as investments and intellectual property rights matter for trade flows. In the conclusion we look beyond the literature on the PTA–trade nexus and suggest that the dataset is of much broader relevance for debates in International Relations, including on the effects of legalization in international politics and the design of international institutions.

The political economy of PTAs

With the surge of the new regionalism in the early 1990s, a vibrant literature on PTA formation developed (for reviews of this literature, see Mansfield and Milner 1999; World Trade Organization 2011). Broadly, two types of research interests have dominated the field: first, on why countries negotiate and sign PTAs, and second, more recently, on the potential effects of being party to one or more 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 and industry and market characteristics (Baldwin 1993; Baccini and Dür 2012; Chase 2003; Dür 2007; Grossman and Helpman 1995; Manger 2009; Milner 1997). Other prominent arguments stress the role of democratization, the distribution of power and alliances, ambitions to use international trade institutions as instruments to lock-in or credibly commit to specific policies, domestic veto players within political systems, bureaucratic interests, electoral concerns, foreign direct investments, or forum-shopping as a result of lack of progress in multilateralism (see for example Büthe and Milner 2008; Gowa and Mansfield 1993; Hollyer and Rosendorff 2012; Maggi and Rodriguez-Clare 2007; Mansfield and Milner 2012; Mansfield et al. 2002 and 2007; Mansfield and Reinhardt 2003).

Over time, the focus has shifted 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). Political scientists have focused on a broader set of outcomes ranging from studying trade volatility, inducing and sustaining domestic economic reforms, addressing behind-the-border protectionism, or allowing for non-trade effects, such as upholding human rights protection in PTA signatories or reducing conflicts between PTA members (see for example, Hafner-Burton 2005; Kono and Rickard 2014; Mansfield and Pevehouse 2000; Mansfield and Reinhardt

2008).

While there is thus no shortage 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 proxy for design differences, some work has controlled for different levels of trade integration (e.g., Magee 2008, customs union, free trade agreements, partial scope agreements). Yet, 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 logics of signing deep or shallow agreements will differ, as the former may cause important losses for some sectors of society. 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 better understanding both why states sign PTAs and what effects these PTAs can be expected to have. Our goal in collecting and disseminating systematic data on the design of trade agreements is to allow the PTA literature to take into account these differences.

DESTA: Description of the Dataset

We identified a total of 733 PTAs 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. The list maintained by the WTO includes 356 of our agreements; 507 form part of a list held at the World Trade Institute.[2] We identified the remaining agreements via systematic searches of the web pages of foreign ministries and other governmental institutions.[3] The number of initial memberships in these agreements is 3,659 (thus an average of 18 signed agreements for the 201 countries covered by the dataset); moreover, in 419 instances countries acceded after the initial signing of the agreements.

Regrettably, we have not been able to find full texts for all of the agreements and ended up coding 587 agreements with 3,318 (initial) 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 over 100 data points for each agreement. The coding has been carried out manually by two independent coders, with any differences resolved by a referee for the final dataset. Inter-rater

[2] In contrast to these lists, we did not count accession agreements, and 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.

[3] 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.

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 as high as 0.85 for some variables such as those capturing the depth of services provisions. Moreover, cross-checks against other datasets that have been put together independently from ours have confirmed the reliability of our data.[4]

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. In the following we present selected information from the dataset to illustrate both the range of issues covered in DESTA and its potential use and application. The discussion also offers 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 tipping point was in the early 1990s. This surge of new agreements is in particular related to the efforts of European Union and European Free Trade Agreement (EFTA) states to stabilize trade relations with new European democracies after the end of the Cold War. Competition for market access motivated other countries to follow suit (Baccini and Dür 2012; Baldwin and Jaimovich 2012) with many of the more recent agreements being signed between emerging economies and developing countries. As a result, while European states are still the top signatories of PTAs, most countries in the world now are part of several active agreements (see Figure 2). In fact, with the exception of Mongolia, all but a few tiny (island) countries have signed at least

[4]For these other datasets, see Estevadeordal et al. (2009) and World Trade Organization (2011).

one PTA since World War II. Overall, we count 393 agreements that were in force as of 2009.

[Figure 1 about here]

[Figure 2 about here]

The large majority of agreements (60%) signed since 1945 are free trade agreements that liberalize tariffs on a majority of goods; 29% are partial agreements that either focus on a sector or a few products or require only limited tariff cuts; 9% are customs unions that aspire not only to the dismantling of trade barriers and the free flow of products but also to 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., EU–Mexico) account for 17% of the agreements, plurilateral agreements (e.g., NAFTA) for 14%, and interregional agreements (e.g., EFTA–South African Customs Union) 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).

[Figure 3 about here]

Importantly, DESTA supports its own *raison d'être*: the data clearly reveal that PTAs 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 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 specific provisions. In competition policy, for example, 70% of agreements stipulate that member states may not distort competition, but only two percent foresee the establishment of a common competition authority. No fewer than 87 percent of agreements include some type of dispute settlement provision; and 6 percent foresee the creation of a standing legal body to adjudicate cases. Overall, PTAs exhibit major differences in design and contents.

[Figure 4 about here]

The data presented above also suggest that agreements differ in their "depth," defined as "the extent to which (an agreement) requires states to depart from what they would have done in its absence" (Downs et al. 1996: 383). We use two different measures to operationalize depth.[6] On the one hand, we produce an additive index that combines seven key provisions that can be included in PTAs (see Table 1). The

[5]In the online appendix, which is available at this journal's website, we also show variation by level of development (Figure A-1) and across time (Figure A-2) in the inclusion in PTAs of a few key provisions.

[6]A third measure, relying on tetrachoric factor analysis and the Thurstone method to calculate factor scores, is highly and positively correlated with the two measures we present here and produces the same substantive findings (r=0.64 and r=0.63, respectively).

first provision captures whether the agreement foresees that all tariffs (with limited exceptions) should be reduced to zero (that is, whether the aim is to create a full free trade area). The other six provisions capture cooperation that goes beyond tariff reductions, in areas such as services trade, investments, standards, public procurement, competition and intellectual property rights. For each of these areas, we code whether the agreement contains any substantive provisions. A substantive provision, for example, is a national treatment clause in the services chapter. A statement that the contracting parties desire to open their services markets, by contrast, does not count as a substantive provision.

[Table 1 about here]

On the other hand, we rely on latent trait analysis on a total of 48 variables that theoretically are related to the depth of an agreement (these variables pertain to such aspects as services liberalization, trade-related investment measures, intellectual property rights and standards) to arrive at a measure of depth.[7] Latent trait analysis is a type of factor analysis for binary data (Bartholomew et al. 2011). Concretely, we apply the Rasch model that assumes that all items capture one underlying latent dimension, but with different discriminatory power.[8] Doing so allows us to deal with highly correlated data and to account for the fact that not all items are of equal importance in establishing the extent of countries' commitments.

[7]We thus leave out all flexibility and enforcement provisions. The online appendix contains a list of all the variables used in the latent trait analysis.

[8]The online appendix discusses this approach and shows the extent to which each variable is related to the latent trait.

The two variables are highly correlated (r=0.90, t=48.80) and both show a similar 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 over the last twenty years (see Figure 5).[9] 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 in time. The 1985 US–Israel agreement, for example, has a depth index 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 that agreements have become deeper over the past twenty years; but this trend only explains a part of the variation in depth across agreements.

[Figure 5 about here]

Substantial variation also exists in the depth of agreements signed by different countries. Figure 6 shows the average depth by country of all agreements that were still active as of 2009. It shows that the United States and Japan sign the deepest agreements, whereas African countries sign the shallowest.

[Figure 6 about here]

[9]For the following figures we rescaled the variable resulting from latent trait analysis to have a minimum of 0 (rather than a mean of 0).

In Figure 7 we offer some more micro-evidence from our dataset. Figure 7a shows the depth of a selected sample of plurilateral agreements, using the index scores of depth (left) and the measure based on latent trait analysis (right). The panel shows only moderate change over time, with most plurilateral agreements being quite shallow. In Figure 7b, we plot the depth of all agreements signed by Chile, a country that has been at the forefront of the new regionalism for the last twenty years. 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 7 about here]

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, much of the early research tried to measure the extent to which individual PTAs create or divert trade (Viner 1950; Frankel 1997). Judith Goldstein, Michael Tomz and Douglas Rivers find that PTAs tend to increase trade (concretely, they lead to a 34% 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).

Scott Baier and Jeffrey Bergstrand, for their part, stress that PTAs are not exogenous to trade flows and other variables that may impact trade flows (Baier and Bergstrand 2007). When controlling for this endogeneity, the trade effect of PTAs turns out to be much larger than previously estimated. In fact, they conclude that PTAs double the bilateral trade of two members over a ten-year period. Baier and Bergstrand confirm this result after using matching to account for the selection effect of dyads with large trade flows signing PTAs (Baier and Bergstrand 2009).

More recently, attempts have been made to differentiate the effects by types of trade agreements (partial scope agreements vs. free trade agreements vs. customs unions, see Baier, Bergstrand and Feng 2011). Relying on WTO-notified agreements, Magee (2008) shows that the long-run cumulative effects of customs unions (up to 18 years) are around 129%, whereas the cumulative effects for free trade agreements are around 66%. Partial scope agreements have no statistically significant effects on trade flows. Similary, Roy (2010) shows that customs unions increased trade by 90% after five years in existence, whereas free trade agreements increased trade flows on average by 25%. Magee (2008) further provides evidence that anticipatory effects are notable in particular in the four years leading up to the actual entry into force of the agreement.

We build on this literature to show the importance of considering the design of trade agreements when estimating PTAs' trade effects. Our analysis, however, relies on a substantially higher number of agreements and a more refined measurement of the depth of agreements (beyond simple categorizations). Even within the category of free trade agreements, there are important differences as to the provisions to allow for new or increased market access. Following from this observation, we conjecture that various dimensions of design might matter for the PTA–trade nexus. Most obviously, agreements differ in the extent to which they reduce tariffs. Lower tariffs make goods cheaper and therefore more competitive in countries that are members of the same trade agreement. As such, the larger the tariff reduction agreed upon in a PTA, the greater the expected increase in trade.

Other PTA provisions can have a similar effect. A rule that grants national treatment to service providers from the other member state(s), for example, should facilitate trade in services. As much trade in goods depends on the provision of services, services liberalization may also have a positive effect on trade in goods. Similarly, the liberalization of government procurement policies, by enabling exporters to compete for public contracts, should increase trade in goods and services. Some agreements also foresee the mutual recognition of standards or the adoption of international standards. In the EU–South Korea trade negotiations, for example, the EU chief negotiator persuaded his counterpart to end the practice of demanding national and U.S. standards in the production of cars and instead to rely completely on international standards (Elsig and Dupont 2012). By reducing the costs of trade, such provisions should lead to an increase in trade.

Some PTAs also liberalize investment policies or offer protection to foreign direct investments. By doing so, they may allow member countries to attract additional foreign direct investments.[10] These investments increase vertical intra-industry trade, that is, trade in similar goods produced by the same industry, but differentiated by

[10]On the effect of PTAs on investments, see, for example, Büthe and Milner (2008).

the unit value of the goods. Moreover, the provisions protecting intellectual property rights included in some PTAs may stimulate trade to the extent that they curtail the domestic production of counterfeited goods. Finally, even competition-related provisions can affect trade if they facilitate foreign direct investments or reduce state aid to domestic companies. Overall, therefore, the design of an agreement should matter for the trade effect of PTAs. Stated in the form of a hypothesis, *the deeper a PTA, the larger its positive impact on trade flows between member countries.*

Econometric Strategy

The gravity model is the workhorse model to estimate the effect of a series of variables on trade flows between two countries. In its basic form, this model assumes the amount of trade between two countries to increase along with economic size, as measured by gross domestic product (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 time this basic form has been enriched by several other variables capturing political characteristics, international institutions, and cultural factors. We follow many previous studies in relying on this model to estimate the effect of PTA design on trade flows (Rose 2004; Carrère 2006; Baier and Bergstrand 2007; Goldstein et al. 2007).

The analysis covers the design of 536 PTAs signed between 1945 and 2009 (we lose some agreements because of missing values for covariates). Our unit of observation consists of up to 22,690 directed dyads comprising the 179 countries for which we were able to obtain data.[11] 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 state and all the other countries in the dataset. Formally, we estimate the following model:

$$lnTrade_{ij,t} = \alpha + \beta_1 PTA_{ij,t-1} + \beta_2 Depth_{ij,t-1} + \beta_3 X_{ij,t-1} + \gamma_{ij} + \theta_t + \epsilon. \qquad (1)$$

where *lnTrade* is the dependent variable, *PTA* is a dummy variable capturing whether two countries form part of a PTA at $t-1$, and *Depth* is the main independent variable. X_{ij} are vectors of control variables, β_1, β_2 and β_3 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. While in most specifications we use yearly data, we rely on five-yearly data when including country-year fixed effects, as otherwise the number of right-hand side variables becomes too large.

$lnTrade$ is measured as the log of the value of exports between two countries in the dyad. We rely on a combination of two sources for these data, namely the International Monetary Fund's Direction of Trade Statistics (DOTS) and the dataset put together by Kristian Gleditsch, to minimize the number of missing values (Direction of Trade Statistics 2010; Gleditsch 2002). For *Depth*, we mainly rely on the operationalization via the index described above, but also cross-check the results

[11] Also Baier and Bergstrand (2007) and Goldstein et al. (2007) use directed dyads. The results do not change when using undirected dyads.

using the latent trait measure.[12] Some dyads form more than one PTA; in these cases we also analyze the impact on trade flows of the second and any subsequent PTA. *Depth* thus is time varying for some dyads.

Our design variable enters the model at the date of signature of an agreement. Opting for the date of entry into force instead does not affect our results, because the large majority of agreements enter into force after a relatively short period where states seek domestic ratification[13] As control variables we use those commonly included in the gravity model. Importantly, we always include the variable *Depth* together with the dummy variable PTA, which captures the average effect of PTAs on trade. Since our unit of analysis is the directed-dyad-year, we include monadic variables for each country in the dyad. Table A-1 in the online appendix summarizes the descriptive statistics and sources for these variables.

Baseline Analysis

Table 2 shows six models. The first model only includes the dummy variable PTA, which does not distinguish among different designs, and a few covariates. The sign for PTA is positive and statistically significant, confirming that *on average* PTAs increase trade between members.[14] The second and third models include

[12]We rescaled the latent trait measure to have positive values for all dyads that signed a PTA.

[13]Of 617 agreements for which we have this information, 459 entered into force within a year of signature and another 81 within two years of signature. Moreover, some agreements are provisionally applied immediately after signature.

[14]If we add five-year and ten-year lags, the coefficients for PTA and the two lags are positive and statistically significant. The total effect, i.e., the sum of the coefficients of PTA and its lags, is 0.34. Results are reported in Table A-3 (Model A5) in the online appendix. If we add five-year and ten-year lags without including *Depth*, the total effect of PTA and its lags is 0.50.

Depth, first measured via the index and then via latent trait analysis. The signs of the coefficients are positive and statistically significant at the 99 percent level, indicating that, as expected, the design of agreements matters. The deeper a PTA, the larger its effect on trade flows between member countries. While in the following we only show results with *Depth* (*index*), all substantive findings remain the same when using *Depth* (*latent*) instead. In the online appendix (see Table A-3, Models A6 and A7), we also report models with five-year and ten-year lags of the treatment *PTA*. While the total effect remains positive, the coefficient of *PTA* turns negative and statistically significant. This happens because *PTA* and its lags are highly collinear with *Depth*.

[Table 2 about here]

In Model 4 we replace *Depth* with eight dummy variables. For all dyads with a value of *Depth* (*index*) that is higher than the median across all dyads, these dummies are coded one in the five years prior to the signature of the PTA (*Deep_anticipatory*); in the five years after the signature of a PTA ($Deep\_short - term$); between five and 15 years after the signature of a PTA ($Deep\_middle - term$); and 15 and more years after the signature of a PTA ($Deep\_long - term$). In doing so, we are able to estimate the effect of *Depth* at different points in time. Moreover, we include *Deep_anticipatory* as a test to see if unobserved trends drive our results.[15] Simi-

[15] For a similar approach, see Kuziemko and Werker 2006. We also include other leads to capture an anticipatory effect between six and ten year before the signature of a PTA as well as between 11 and 15 years before the signature of a PTA. Whereas our main results do not change, 15-year

larly, we replaced *Depth* (*index*) with four dummy variables that are operationalized as discussed, with the exception that they are coded one for dyads that have a value of *Depth* (*index*) that is lower than or equal to the median across all dyads (*Shallow_...*).

Seven of the eight coefficients for these dummies are positive and statistically significant (at the 99 percent level). The negative and statistically significant coefficient for *Shallow_anticipatory* suggests that shallow agreements are signed by countries that trade with each other less than expected by the gravity model (indicating that non-economic reasons may play a role in countries' decisions to sign shallow agreements) and that exporters find it difficult to anticipate these PTAs. While the signs and levels of significance of control variables are in line with the results of other studies using the gravity model, the coefficient of *PTA* is negative, though it is not statistically significant. Moreover, as for Models 1, 2, and 3, we report a model with five-year and ten-year lags of the treatment *PTA* in the online appendix (Model A8 in Table A-3). Including these lags does not affect our finding with respect to the depth of agreements. The coefficient for *PTA*, however, turns out to be negative and statistically significant, even if the combined effect of *PTA* and the two lags is positive. This negative sign for *PTA* again is best explained as a result of the collinearity between *PTA* and *Depth*.

Table 3, which shows the effects of the main variables in Models 1 and 4 on trade, presents several interesting results.[16] First, the *Deep_...* dummies clearly

leads are statistically significant. Results are shown in the online appendix (Model A1 in Table A-2).

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

outperform the $Shallow\_...$ dummies with the exception of the long-term effects, which are not statistically distinct one from another. We likely underestimate the long-term effect of deep PTAs because many of the deepest agreements have only been signed recently, making it impossible to estimate their long-term effects. We therefore re-ran Model 4 only considering agreements that are at least 15 years old (see Model A2 in Table A-2 in the online appendix). In this model specification, as expected $Deep\_long-term$ by far outperforms $Shallow\_long-term$. Specifically, in the long term trade increases by 106% for dyads with deep PTAs. Deep agreements thus increase trade more than shallow ones.

[Table 3 about here]

Second, Model 4 also offers evidence of anticipatory effects for deep agreements. Third, the estimated effect of the $GATT/WTO$ is small when compared to the effect of PTAs. We may, however, underestimate the actual effect of the GATT/WTO as our analysis does not take into account the existence of "nonmember participants" and formal members that opted out from obligations (Goldstein et al. 2007). Most importantly, however, the findings show that it is not possible to correctly identify and estimate the effect of PTAs on trade flows if deep and shallow PTAs are lumped together.

elasticity of one variable with respect to another between two given points. As the two points get closer together, arc elasticity approaches point elasticity. More formally, the arc elasticity is defined as $\frac{\Delta Trade/Trade}{\Delta PTA/PTA}$ (Goldstein et al. 2007, 47).

In Models 5 and 6 in Table 2, we follow Baier and Bergstrand (2007) to better account for the endogeneity coming from omitted variables. In our case, this is clearly an issue since one of the leads was positive and statistically significant in Model 4.

First, in Model 5 we estimate a model including *Depth*, PTA, and a battery of dummies on the right hand-side of the equation. Specifically, we include time-varying exporter fixed effects (i.e., it), time-varying importer fixed effects (jt), as well as dyads fixed effects (i.e., ij) as in the previous models.[17] While the coefficient for PTA remains positive and statistically significant (which confirms Baier and Bergstrand's (2007) results), the coefficient for *Depth* is also positive and statistically significant, highlighting the importance of agreement design for trade flow effects.[18]

Second, in Model 6 we estimate a model including the eight dummies of Model 4 as well as it, jt, and ij dummies. We report the arc elasticities for this model in Table 3. In line with Model 4, the *Deep_...* dummies clearly outperform the *Shallow_...* dummies. This is true also for the long-term effect. Moreover, differently from Model 4, the middle- and long-term effects are larger than the short-term effect. All in all, there is robust and consistent evidence that deep agreements increase trade substantially more than shallow agreements.

[17] We also implement first-differenced panel gravity equation estimates as suggested by Baier and Bergstrand (2007). Specifically, we take the first differences of $Trade$, PTA, and *Depth* and regress them on it, jt, and ij dummies. Then, we get the residuals for these estimations. Finally, we run a simple ordinary least squares regression with robust standard errors in which $Trade$ residuals are the dependent variable and PTA and *Depth* residuals are the independent variables. The coefficients of both PTA and *Depth* remain positive and statistically significant. Results are reported in Model A3 in Table A-2 in the online appendix.

[18] The results (available upon request) do not change if we include one-year and two-year lags of PTA and *Depth* in the five-year dataset. Specifically, the coefficient of these lags are positive and statistically significant.

Additional Evidence

Other Model Specifications

As the gravity model suffers from several shortcomings, we implement some checks to make sure that our results also hold under different specifications. Results are shown in Table 4. First, we follow Silva and Tenreyro (2006) and estimate a pseudo-Poisson model to control for the large number of zeros in the outcome variable.[19] In this case we do not use the logarithmic transformation of $Trade$, but its raw value. We include all the standard covariates of the gravity model, e.g., distance and contiguity, as well as exporter and importer fixed effects. Our main results are confirmed, showing that the selection bias coming from a large number of zeros does not affect our findings (see Model 7 in Table 4).

[Table 4 about here]

Second, Helpman et al. (2008) addressed the selection bias issue relying on a natural logarithm transformation and using several model specifications. Unfortunately, we are unable to estimate the non-linear estimator developed by Helpman et al. (2008) because we have too many fixed effects (many more than Helpman et al. 2008). In particular, the estimation of the second stage regression produces problematic results in a large sample because of the large number of exporter and

[19]We use the command PPML, written by Silva and Tenreyro (2006) in STATA 12.

importer dummies required. Nevertheless, we estimate another model specification implemented by Helpman et al. (2008), known as the bins approach.[20]

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.[21] In line with Helpman et al. (2008), we include all the covariates in Model 7 in addition to a dummy for common religion (across dyads) as the excluded variable.[22] Next, we partitioned the obtained predicted probability ($\hat{\rho_{ij}}$, using Helpman et al.'s (2008) notation) into a number of bins with equal numbers of observations and assign an indicator variable to each bin. Finally, we include this set of indicator variables in the second stage and we report results with 50 bins.[23] In this case, too, our main results hold (see Model 8 in Table 4).[24] In models 7 and 8, the coefficients of *Depth* are smaller than the ones in models 2 and 5, but the coefficients are not statistically significant different one from another.

Third, Model 9 reports the results for the subsample of PTAs that have been notified to the WTO. This reduces the number of PTAs included in our analysis from 536 to 348. The purpose of doing so is to make sure that our results are not driven by the inclusion of a large number of shallow PTAs that do not feature in

[20]This specification does not allow to separate the selection effect from the firm heterogeneity effect. However, we can "obtain our key results for the intensive-margin contribution of the various trade barriers" (Helpman et al. 2008, 465).

[21]Any cumulative distribution function instead of the normal distribution would work here. We estimate a probit model following Helpman et al. (2008).

[22]Data on the variable religion come from the CIA World Factbook. This variable is positive and statistically significant in the first stage.

[23]If we use 100 bins, we obtain the same results, which are available upon request.

[24]Differently from Helpman et al. (2008), the coefficient of PTA is positive and statistically significant. That might be explained by the fact that our sample is much larger than the one of Helpman et al. (2008).

other studies. The reduction in the number of PTAs included, however, does not affect the main results. Finally, our results are similar if we drop dyads from the analysis that signed one of the 145 PTAs that we identified but could not code because we were unable to locate their full texts (or if we control for these dyads by adding a dummy).[25]

Trade-Related Sectors vs. Tariff Reduction

Our general argument is that design matters for a PTA's effect on trade flows between member countries. Specifically, we argue that not only tariff cuts, but also trade-related provisions are crucial instruments for boosting trade. Previous results support this hypothesis. A possible objection to our analysis so far, however, is that the depth of a PTA captured by looking at trade-related provisions is correlated with the magnitude of tariff reductions. Deep PTAs that include provisions liberalizing services, and protecting investments 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 might not be trade-related provisions, but rather the tariff reductions.

To address this concern, in the absence of a more direct measure of the extent of tariff cuts, we include a variable capturing the length of tariff transition, that is, how many years it takes for the tariff cuts to be fully implemented. We label this variable $Transition$.[26] Tariff transition is correlated with the magnitude of

[25]Results are reported in Model A4 (Table A-2) in the online appendix.

[26]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

tariff reduction, i.e., the larger the tariff reduction, the longer the tariff transition.[27] Indeed, if tariff reductions are large, so are adjustment costs, which are spread out over several years to make cooperation possible. Illustratively, the North American Free Trade Agreement, which cut tariffs to zero on basically all products, has one of the longest transition periods in our database, namely 15 years. This variable should thus effectively control for the magnitude of tariff cuts envisaged by a PTA. Model 10 in Table 4 shows that *Depth* remains positive and statistically significant after including $Transition$. The coefficient for $Transition$ is negative, though it is not statistically significant.

Conclusion

We have presented a new dataset on the design and contents of PTAs. DESTA contains information on a total of 733 PTAs and a detailed analysis of the design of 587 PTAs. To our knowledge, it is the most comprehensive dataset on the design of trade agreements currently available. We thus expect that DESTA will be a major asset in addressing several long-standing questions relating to the new regionalism and international institutions more broadly.

The novel data has allowed us to revisit the literature on the PTA–trade nexus, with the results corroborating earlier studies that showed that PTAs increase trade. Our additional insight is that this effect is driven by deep agreements, whereas shal-

values to avoid multicollinearity problems.

[27]In fact, in our dataset full free trade agreements 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.

low agreements have a substantially smaller impact on trade flows. Of particular interest is the result that provisions included in PTAs that do not directly concern tariffs – such as those liberalizing services trade or protecting investments and intellectual property rights – have a significant impact on trade. We do not claim that this analysis resolves the question of the PTA–trade nexus once and for all. Future studies should look more precisely at questions such as which provisions increase trade by how much; what type of trade – inter-industry or intra-industry – is affected most; and which sectors see the largest increase in trade. The central finding that design matters, however, is very robust to changes in operationalization and model choice.

Future research on PTAs thus should further open the black box of trade agreements and concentrate on variation across PTAs in design and content rather than treat all PTAs as if they were the same. Studies taking PTA design seriously may address new questions such as, which design elements bring about significant distributional consequences in participating member states? What type of obligations coupled with what type of enforcement mechanisms are likely to induce domestic policy change? How do certain design features in isolation or in conjunction with other variables affect implementation? And do design features travel from one agreement to another, that is, is there a diffusion of institutional design?

Of course, PTAs are only one among many types of international institutions, albeit expanding in number 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 tightly to non-trade institutions would be beneficial for situating the role of trade institutions more broadly. The DESTA dataset will be of major use in developing this research agenda.

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Table 1: Operationalization of depth (additive index).

Variable	Value
More than a partial scope agreement?	0/1
Substantive provision on services?	0/1
Substantive provision on investments?	0/1
Substantive provision on standards?	0/1
Substantive provision on public procurement?	0/1
Substantive provision on competition?	0/1
Substantive provision on intellectual property rights?	0/1
Total range	0/7

Table 2: Baseline models.

VARIABLES	(1) ln(Trade)	(2) ln(Trade)	(3) ln(Trade)	(4) ln(Trade)	(5) ln(Trade)	(6) ln(Trade)
PTA	0.265***	0.053***	0.093***	-0.007	0.209***	0.205***
	(0.015)	(0.017)	(0.017)	(0.022)	(0.015)	(0.021)
$Depth\,(index)$		0.155***			0.125***	
		(0.006)			(0.006)	
$Depth\,(latent)$			0.279***			
			(0.013)			
$Shallow\_anticipatory$				-0.100***		0.040***
				(0.012)		(0.014)
$Shallow\_short-term$				0.087***		-0.014
				(0.021)		(0.022)
$Shallow\_medium-term$				0.175		0.107***
				(0.022)		(0.022)
$Shallow\_long-term$				0.286***		0.122***
				(0.031)		(0.030)
$Deep\_anticipatory$				0.269***		0.212***
				(0.015)		(0.012)
$Deep\_short-term$				0.452***		0.236***
				(0.020)		(0.019)
$Deep\_medium-term$				0.363***		0.384***
				(0.019)		(0.020)
$Deep\_long-term$				0.207***		0.372***
				(0.034)		(0.031)
$Regime_i$	0.000	-0.000	0.000	0.000		
	(0.001)	(0.001)	(0.001)	(0.001)		
$Regime_j$	0.001	0.001	0.002*	0.001		
	(0.001)	(0.001)	(0.001)	(0.001)		
$Conflict_{ij}$	-0.594***	-0.575***	-0.543***	-0.593***		
	(0.128)	(0.128)	(0.127)	(0.128)		
$Conflict_i$	-0.124***	-0.133***	-0.134***	-0.125***		
	(0.010)	(0.010)	(0.010)	(0.010)		
$Conflict_j$	-0.073***	-0.084***	-0.082***	-0.076***		
	(0.010)	(0.010)	(0.010)	(0.010)		
$lnGDP_i$	0.551***	0.545***	0.541***	0.547***		
	(0.012)	(0.012)	(0.012)	(0.012)		
$lnGDP_j$	0.424***	0.420***	0.417***	0.421***		
	(0.011)	(0.011)	(0.011)	(0.011)		
$GATT/WTO$	0.042***	0.041***	0.044***	0.040***		
	(0.011)	(0.011)	(0.011)	(0.011)		
Constant	-20.642***	-20.423***	-20.291***	-20.502***	0.128	0.052
	(0.361)	(0.360)	(0.361)	(0.358)		
Dyad FE	yes	yes	yes	yes	yes	yes
Exporter-year FE	no	no	no	no	yes	yes
Importer-year FE	no	no	no	no	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Observations	821,676	821,676	816,601	821,676	230,571	230,571
R-squared	0.419	0.424	0.423	0.426	0.590	0.591
Number of id	22,690	22,690	22,641	22,690	28,859	28,859

Robust standard errors clustered by dyad in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Note: Models (1) to (4) are calculated using annual data; Models (5) and (6) rely on 5-yearly data.

Table 3: The effect of PTAs on trade

Main variables	Increase in trade (%)	C.I.
	Model 1 & Model 4	
Deep_anticipatory	31	[27, 35]
Deep_short − term	57	[51, 63]
Deep_middle − term	44	[39, 49]
Deep_long − term	23	[15, 32
Shallow_anticipatory	-10	[-12, -7]
Shallow_short − term	9	[5, 14]
Shallow_middle − term	19	[14, 24]
Shallow_long − term	33	[25, 41]
PTA	31	[27, 34]
GATT/WTO	4	[2, 7]
	Model 6	
Deep_anticipatory	24	[21, 27]
Deep_short − term	27	[22, 31]
Deep_middle − term	47	[41, 53]
Deep_long − term	45	[36, 54]
Shallow_anticipatory	4	[1, 7]
Shallow_short − term	-1	[-5, 3]
Shallow_middle − term	11	[7, 16]
Shallow_long − term	13	[7, 20]
PTA	23	[18, 28]

Note: the table reports the estimated percentage increase in trade for a dyad, 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 4, and Model 6 (for *Deep_...* and *Shallow_...*). 95% confidence interval in parentheses.

Table 4: Additional models.

VARIABLES	(7) ln(Trade)	(8) ln(Trade)	(9) ln(Trade)	(10) ln(Trade)
PTA	0.119***	0.327***		0.231***
	(0.019)	(0.024)		(0.017)
$Depth\,(index)$	0.115***	0.077***		0.124***
	(0.0075)	(0.009)		(0.006)
$PTA - WTO\ only$			0.236***	
			(0.018)	
$Depth\,(index) - WTO\ only$			0.121***	
			(0.006)	
$Distance$	-0.614***	-0.704***		
	(0.009)	(0.025)		
$Contiguity$	0.404***	0.439***		
	(0.020)	(0.057)		
$CommonLanguage$	0.000	0.227***		
	(0.018)	(0.024)		
$CommonColony$	0.213***	0.320***		
	(0.047)	(0.031)		
$CommonLegalSystem$	0.288***	0.147***		
	(0.012)	(0.015)		
$CommonCurrency$	0.256***	0.141***		
	(0.024)	(0.041)		
$Regime_i$	0.026***	0.023***		
	(0.002)	(0.002)		
$Regime_j$	0.024***	0.002		
	(0.002)	(0.002)		
$Conflict_{ij}$	-1.764***	-0.841***		
	(0.147)	(0.219)		
$Conflict_i$	0.010	-0.083***		
	(0.019)	(0.017)		
$Conflict_j$	0.005	-0.359***		
	(0.020)	(0.045)		
$lnGDP_i$	1.010***	0.526***		
	(0.018)	(0.016)		
$lnGDP_j$	0.929***	0.460***		
	(0.016)	(0.017)		
$GATT/WTO$	0.313***	0.218***		
	(0.022)	(0.016)		
$Transition$				-0.001
				(0.001)
Constant	-36.486***			
	(0.360)			
Exporter FE	yes	yes	no	no
Importer FE	yes	yes	no	no
Exporter-year FE	no	no	yes	yes
Importer-year FE	no	no	yes	yes
Year FE	yes	yes	yes	yes
Observations	749,763	615,152	230,571	227,282
R-squared	0.878	0.669	0.590	0.590
Number of id	21,295	21,295	28,859	28,755

Robust standard errors clustered by dyad in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Note: Model (7) is a pseudo-Poisson model. Models (9) and (10) rely on 5-yearly data.

Figure 1: PTAs over time.

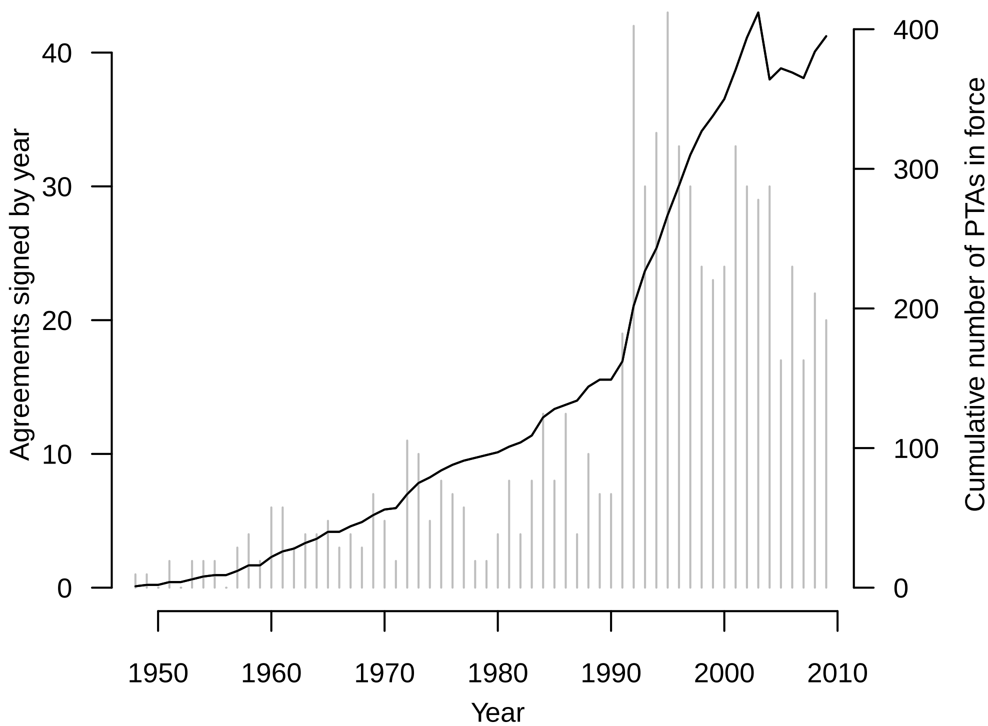
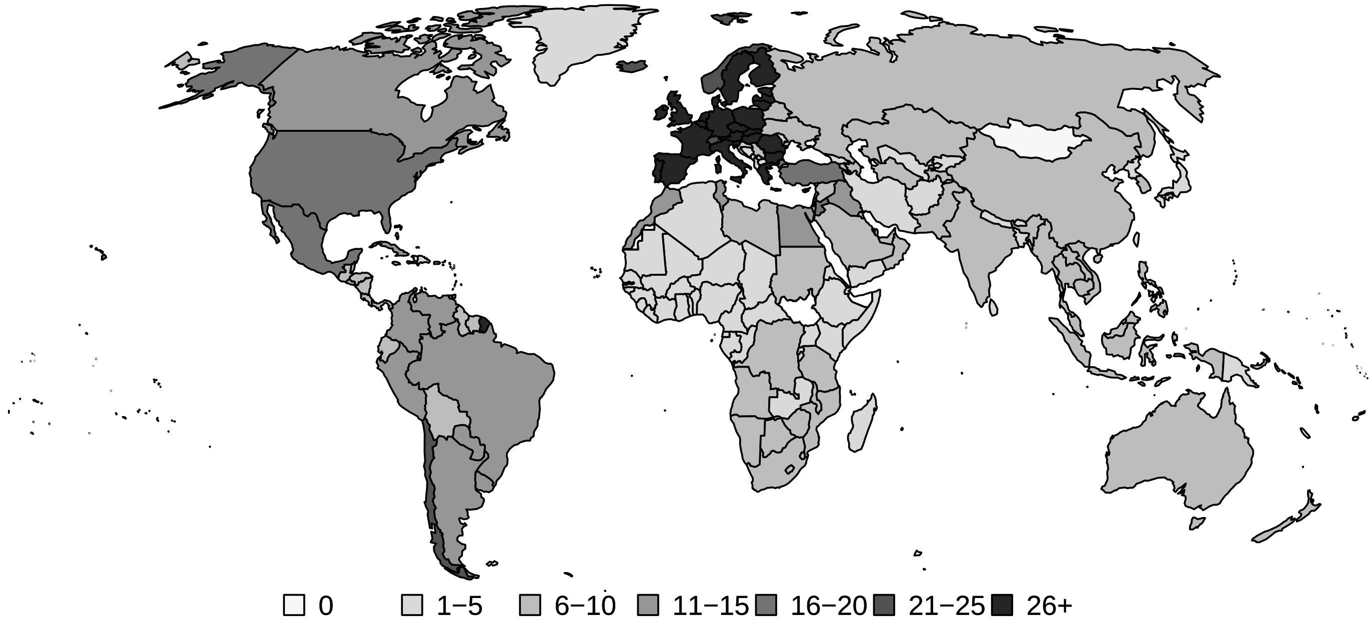
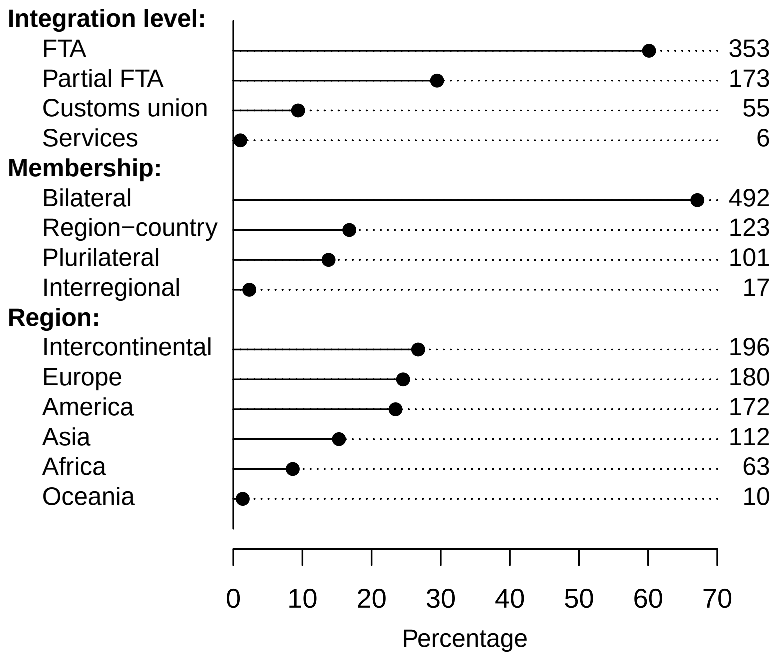


Figure 2: Number of PTAs signed, by country (1945–2009).



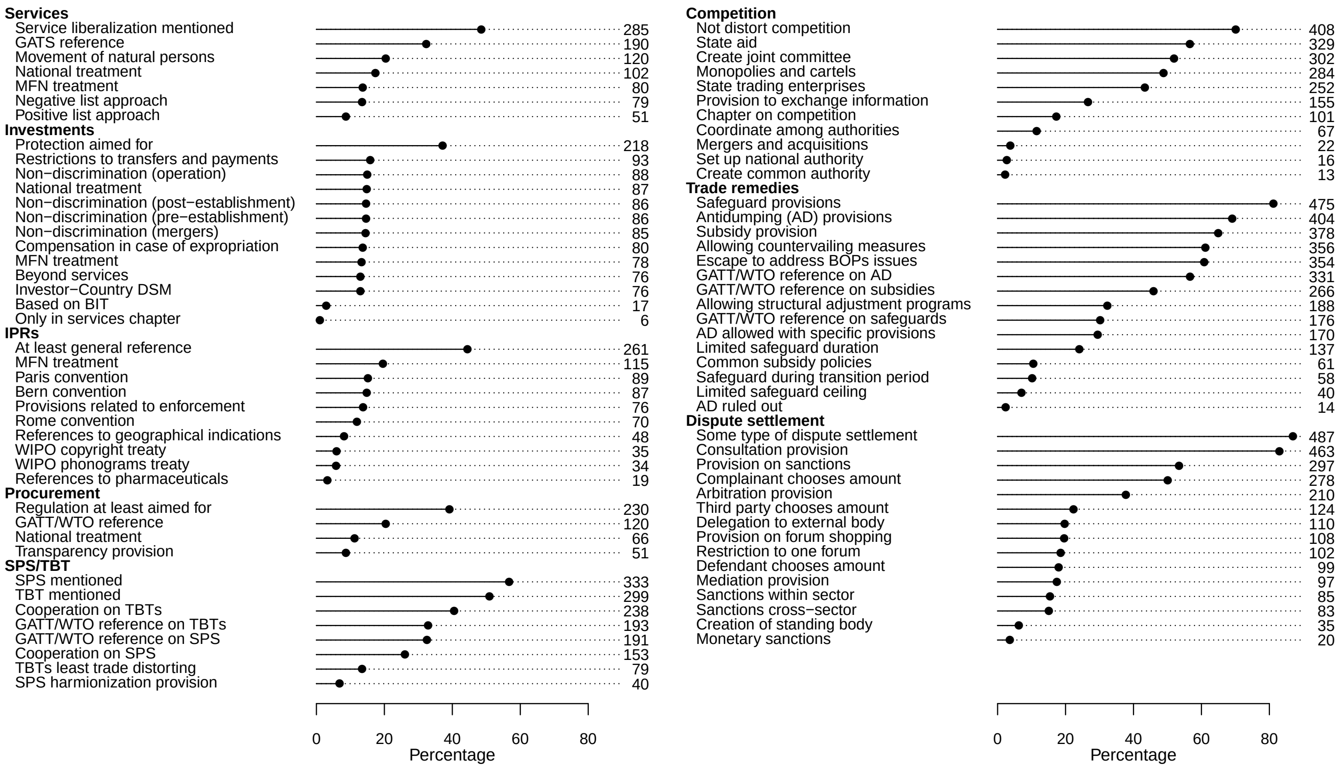
The map shows the number of PTAs that a country signed over the period 1945–2009 and that were still active as of 2009.

Figure 3: Types and regional composition of PTAs.



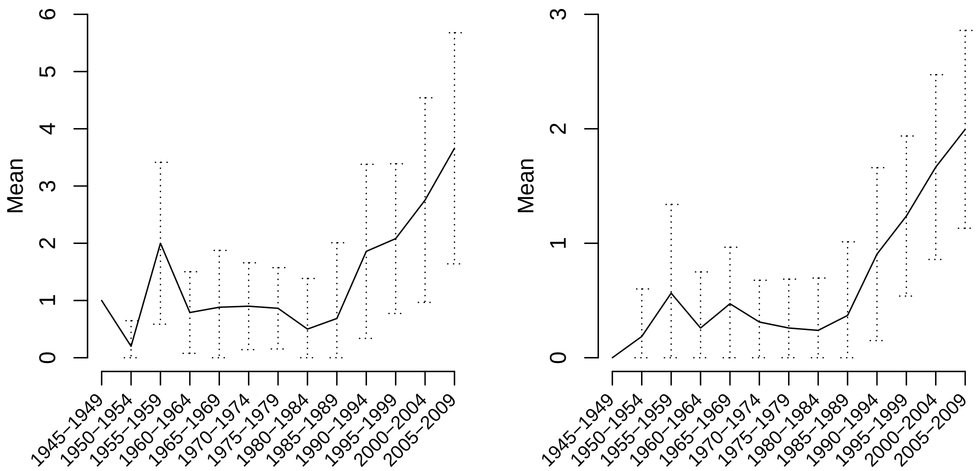
We show absolute frequencies to the right. We only coded the level of integration for PTAs for which we have a full text.

Figure 4: Variation in agreement design.



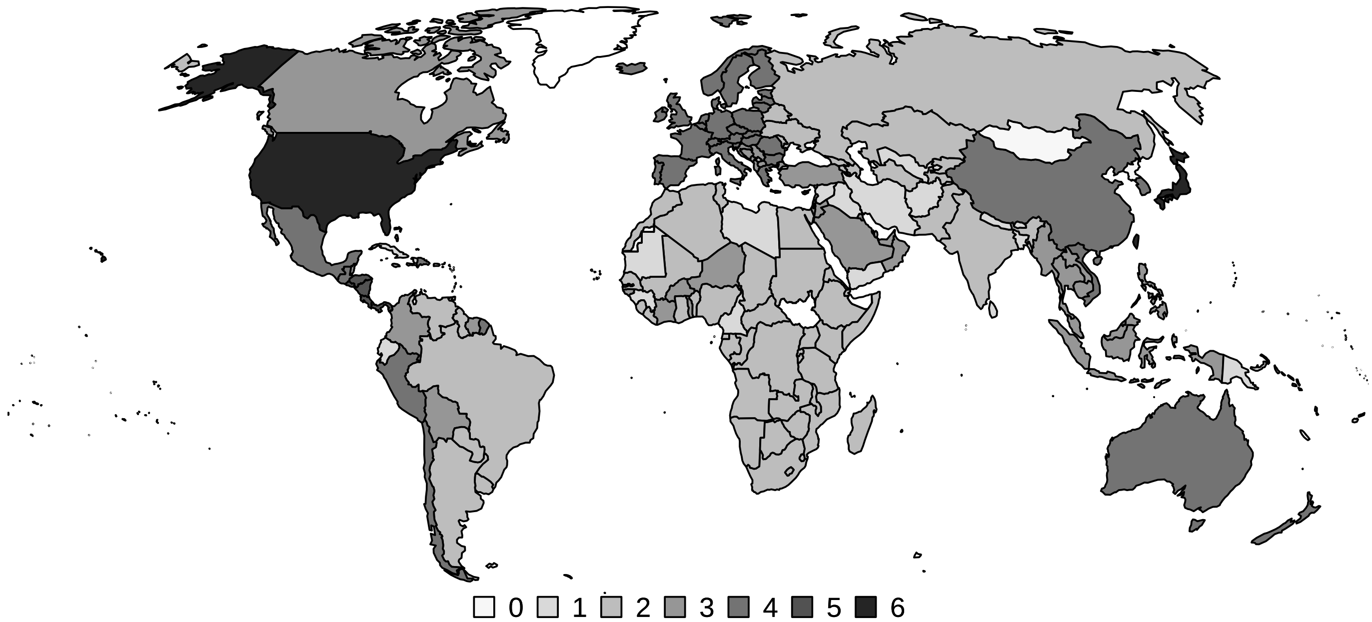
The figure shows the percentage of agreements that contain the various provisions. To the right, we show the absolute frequencies. Note that the denominator for calculating the percentages slightly varies as a result of missing values for trade remedies and dispute settlement variables.

Figure 5: Depth over time.



The vertical bars show the standard errors of the means.

Figure 6: Depth across countries.



The map shows the average depth (index) by country of the agreements that were still active as of 2009. The map looks virtually the same when using the depth measure that relies on latent trait analysis.

Figure 7: The depth of selected agreements.