Deep Trade Agreements and Global Value Chains

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Abstract

Preferential Trade Agreements (PTAs) have become deeper over time, often encompassing a set of disciplines that go beyond traditional trade policy such as investment, competition, and intellectual property rights protection. In the policy and theory literature, a prominent argument why countries sign "deep" PTAs is to promote and facilitate the operation of Global Value Chains (GVCs). This paper exploits a new dataset on the content of PTAs and data on trade in value added and in parts and components to quantify the impact of deep trade agreements on bilateral cross-border production linkages. Results show that the positive impact of deep trade agreements on GVC integration is driven by value added trade in intermediate rather than in final goods and services. Adding a policy area to a PTA increases domestic value added of intermediates (forward GVC linkages) and foreign value added of intermediates (backward GVC linkages) by 0.48 and 0.38 percent, respectively. At the sectoral level, the positive impact of deep PTAs is higher for higher value-added services suggesting that deep agreements help countries to integrate in industries with higher levels of value added. On a larger sample of countries and years, results confirm that adding a provision to a PTA increases bilateral trade in parts and components by 0.3 percent. The content of PTAs also matters for GVC integration, but the impact varies by income group. Provisions outside the current WTO mandate (e.g. investment, competition policy) drive the effect of deep PTAs on value added trade and on North-South trade in parts and components. Provisions under the current WTO mandate (e.g. tariff reduction, customs facilitation) drive the effect of deep PTAs on South-South trade in parts and components.

Keywords

1. Introduction[*]

All members of the World Trade Organization (WTO) signed at least one Preferential Trade Agreement (PTA).[1] The content of these agreements changed over time as they now encompass a number of disciplines that go beyond traditional trade policy (Hofmann, Osnago and Ruta, 2018). Through PTAs, member countries commit to cut their tariffs and undertake additional obligations in policy areas covered by the WTO such as customs administration or contingent protection. But they more and more break new grounds in policy domains that are not regulated by the WTO, such as investment and competition policy. This new generation of "deep" trade agreements is at the core of a number of policy and research debates, as economists try to assess their economic effects and provide guidance on how to efficiently design and implement them.

This paper contributes to this broader debate on trade agreements by empirically investigating the relationship between deep trade agreements and Global Value Chains (GVCs). Using a new dataset on the content of PTAs developed by the World Bank, our analysis allows us to i) quantify the relationship between deep trade agreements and GVC integration among PTA partners, ii) disentangle the importance of specific sets of provisions in PTAs, and iii) shed light on the role of deep trade agreements in shaping the pattern of integration across countries with different levels of development. Our key finding is that the depth of trade agreements contributes to increase GVC trade among parties. The relationship is stronger in higher value-added industries, suggesting that deeper trade arrangements may help countries to integrate in high value added industries. We also find that for trade agreements between developed and developing countries, this effect is mostly driven by the presence of provisions that are currently outside the domain of the WTO and that deal with behind the border policies, such as investment and competition policy. For trade agreements between developing countries, the impact of trade agreements on GVC trade is mostly driven by the reduction of traditional trade barriers such as tariffs and other border measures.

The argument that the rise of deep trade agreements and the increasing importance of GVCs are related is not new and has been informally made in influential studies by Lawrence (1996), Baldwin (2010) and WTO (2011), among others. Intuitively, the unbundling of stages of production across borders creates new forms of cross-border policy spillovers and time-consistency problems. Deeper forms of integration may allow to solve these coordination and commitment problems, because they discipline those national policies that are needed for the smooth operation of GVCs. Formal models of the relationship between GVCs and trade agreements are presented in Antràs and Staiger (2012) and Bickwit, Ornelas and Turner (2017). Few studies have looked at related questions from an empirical point of view: Orefice and Rocha (2011), Johnson and Noguera (2016), Osnago, Rocha and Ruta (2015, 2016).[2] Differently from the current study, these papers either abstract from the depth of trade agreements (Johnson and Noguera, 2016), are based on a smaller database developed by the WTO

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[1]   As common in the recent trade literature, the term PTAs will be used throughout the paper and is preferred to the term 'regional trade agreements (RTAs)' since some of these agreements are not necessarily between countries within the same region or in regional proximity. We will also often refer to PTAs as 'deep (trade) agreements', in recognition of the fact that several provisions in PTAs are not preferential in nature (Baldwin and Low, 2007).

[2]   For a survey of the literature, see Limão (2016). A companion paper by Mattoo, Mulabdic and Ruta (2017) uses the new World Bank database on the content of PTAs to revisit the classic Vinerian question of trade creation and trade diversion.

(WTO, 2011) covering only 100 agreements or use different measures for GVC related trade (Orefice and Rocha, 2011; Osnago, Rocha and Ruta, 2015, 2016).[3]

In the econometric analysis, we use a structural gravity model at the aggregate and sectoral levels to estimate the relationship between cross-border production linkages and the depth of PTAs. To control for selection bias deriving from the presence of zero trade flows, our estimations are preformed using a Poisson Pseudo Maximum Likelihood (PPML) model. PTA depth measures are based on the new World Bank dataset on the content of PTAs which covers 260 agreements signed by around 180 countries between 1958 and 2015. This is the entire realm of PTAs in force and notified to the WTO as of December 2015. [4] We build several indicators of PTA depth that capture the scope and legal enforceability of trade agreements. Bilateral GVC integration is measured in two ways: value added trade and trade in parts and components.

Value added trade comes from Wang et al. (2012) and is based on the World Input Output dataset (WIOD) for the years 1995-2011. Value added trade provides a more accurate measure of GVCs involvement. It also allows us to investigate the impact of deep trade agreements on both goods and services trade and across industries with different levels of value added. The information on value added trade, however, covers a limited sample of countries (40). Trade in parts and components records gross trade flows, which can be subject to double counting, but has the advantage of being available for the full set of countries and years covered by the new dataset on PTAs. Having the whole sample of countries allows us to investigate how the effect of deep PTAs varies with the level of development of countries involved in an agreement. It also provides some insight on whether certain types of provisions included in PTAs are more relevant for agreements between countries with different levels of development.

We first study how the depth of PTAs affects GVC integration in aggregate and for goods and services separately. We look at total domestic value added (DVA) in gross exports and foreign value added (FVA) in gross exports. The main finding is that deep PTAs are associated with increases in the domestic value-added content of exports mainly through GVCs. Adding a provision to a PTA boosts domestic value added of intermediate goods and services exports (i.e. forward GVC linkages) by 0.48 percent, while an additional provision in a PTA increases foreign value added of intermediate goods and services exports (i.e. backward GVC linkages) by 0.39 percent. We also find evidence that deep trade agreements are particularly significant to improve forward linkages into more complex GVCs, i.e. GVCs where exported intermediates cross borders two times or more, while we do not find a significant impact of deep trade agreements on domestic and foreign value added of final goods and services exports.

Estimations performed separately for services and goods show that the impact of deep trade agreements is usually higher for value added trade in services compared to value added trade in goods. In addition, the positive impact of deep trade agreements on intermediates that cross the border more than once is only significant for exports in intermediate services. This suggests that agreements going beyond pure market access and including behind the border provisions are particularly important for services GVC integration.

We also analyse whether the impact of deep trade agreements on GVC integration is heterogeneous across industries. We estimate sectoral regressions with the addition of an interaction term between depth and the share of value added in overall production of a sector . The results suggest that deep trade agreements are particularly relevant for GVC integration in high value-added industries. These industries are usually services sectors, often characterized by non-tangible activities such as research and development or retail services for which deeper commitments and beyond the border policies are important.

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[3] Contemporaneous work by Rubinova (2017) and Boffa, Jansen and Solleder (2017) also use the new World Bank database on the content of PTAs to analyze various aspects of the relationship between deep agreements and GVCs.

[4] In our analysis we exclude partial scope agreements.

Next, we empirically explore potential heterogeneity in the effects of deep PTAs by splitting the provisions into two categories, depending on their relationship with WTO rules.[5] WTO+ provisions fall under the current mandate of the WTO and are already subject to some form of commitment in WTO agreements. WTO-X provisions, on the contrary, refer to policy obligations that are outside the current mandate of the WTO, relating to areas that are not yet regulated by the WTO. We focus on the larger sample of countries available for trade in parts and components to explore whether the impact of different provisions is heterogeneous across countries with different levels of development. The estimates suggest that WTO-X provisions are very important for GVC-related trade between North and South countries. On the other hand, WTO+ provisions are still relevant for trade among developing countries.

To address potential endogeneity, we include in our regressions a set of fixed effects that partially deals with the issue (Baier and Bergstrand, 2007; Piermartini and Yotov, 2016). As an alternative approach, a set of leads and lags of the variable capturing the depth of trade agreements are included in the regression. This allows to control for the dynamic effect of the impact of deep trade agreements on GVC-related trade. The results suggest that there is some anticipation effect of deep trade agreements, but this is limited to one year before the agreement enters into force. The positive trade effect of deep agreements persists after the first year and it generally stabilizes over time. This is especially true for domestic value added of intermediates. As to the dynamics for trade in parts and components, the results show that there are no anticipation effects but the impact of deep agreements persists after the entry into force of the agreements involving North and South countries.

Finally, a concern is that in a world where production is fragmented across countries, GVC trade between two countries is not only affected by their trade agreements but also by the trade agreements signed by any country along the value chain (Noguera, 2012). As deep agreements may have a stronger impact on bilateral GVC trade than shallow agreements, it is well possible that the level of depth of preferential trade agreements signed by third countries along the supply chain could indirectly affect GVC-related trade between two countries. We build on the approach by Noguera (2012) to control for the indirect effect of deep trade agreements and find that the coefficients of the modified gravity regressions are larger than those of the standard gravity confirming the existence of indirect effects of signing deep PTAs through third countries.

The rest of the paper is organized as follows. Section 2 discusses the data used in the paper. Section 3 presents the empirical analysis focusing on the impact of PTA depth on GVC integration, while Section 4 focuses on the differential impact that different sets of provisions in deep trade agreements have on countries with different levels of development. Section 5 presents robustness tests. Concluding remarks follow.

2. Data

In this section, we take a first look at the data on the content of trade agreements and present the measures of PTA depth and GVC trade used in the analysis.

a. Deep trade agreements

In the literature, the effects of PTAs on trade are generally estimated by including a dummy equal to one when two countries are involved in an agreement (Limão, 2016). In our econometric analysis, we also estimate the coefficient of a dummy for PTAs but we take a step forward by estimating the effects of deep trade agreements using three new measures of depth. The data on the content of deep agreements come from a new database at the World Bank that covers 260 PTAs, which is the realm of preferential

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[5]   See Horn, Mavroidis and Sapir (2010)

agreements excluding partial scope agreements in force and notified to the WTO up to the end of 2015 (Hofmann, Osnago and Ruta, 2018). The methodology is based on the work of Horn, Mavroidis and Sapir (2010), which was also used in the World Trade Report 2011 (WTO, 2011). The data provide information on two key aspects of the content of PTAs: (i) what policy areas are covered in each agreement, based on a list of 52 policy areas; (ii) whether each provision is legally enforceable or not, based on an analysis of the legal language of the treaty text and the possibility of recourse to dispute settlement.[6]

As a first measure of depth, we use the number of legally enforceable provisions that are included in an agreement from the World Bank database. While an imperfect metric, this is a logical first step to capture the level of depth of PTAs, as the extent of policy commitments depends on the number of areas that are covered by an agreement. Specifically, we define the variable $TotalDepth_{ijt} = \sum_{k=1}^{52} Prov_{ijt}^k$ - i.e. the simple count of -legally enforceable- provisions ($Prov_{ijt}^k$) included in the agreement between country i and j at time t.[7]

An alternative measure of depth can be constructed on a subset of "core" border and behind the border provisions –i.e. those provisions that have a clear economic content, as opposed to other provisions that do not (e.g. cultural cooperation, anti-terrorism). Core provisions include tariff liberalization for industrial and agriculture goods, technical barriers to trade (TBT) and sanitary and pythosanitary (SPS) measures, export taxes and anti-dumping and countervailing measures, trade related intellectual property (TRIPs) and trade related investment measures (TRIMs), movement of capital, state owned enterprises, state aid, competition policies, intellectual property rights (IPR), investment, public procurement and services. The 18 "core" provisions are also those most often included in PTAs (Hofmann, Osnago and Ruta, 2018). We define the variable $CoreDepth$ as the number of core provisions ($Prov_{ijt}^c$) included in the agreement between country i and j at time t: $CoreDepth_{ijt} = \sum_{c=1}^{18} Prov_{ijt}^c$.

Finally, we use Principal Component Analysis (PCA) to reduce the dimensionality of our dataset. PCA transforms the 52 provisions into a set of orthogonal variables called components. The first component is a weighted average of the provisions that takes into account around 27 percent of the variation in the data.[8] The structure of the weights assigned to each provision in the first component suggests that the first component captures the "scope" of the agreement and it can be used as an alternative measure of depth.[9] In fact, the correlation between the first component and the number of provisions in a PTA is equal to 0.94. We then define $PCADepth$ as the weighted average of provisions using the coefficients of the first component as weights (ω_k): $PCADepth_{ijt} = \sum_{k=1}^{52} \omega_k Prov_{ijt}^k$.

The database on the content of trade agreements is also useful to examine which type of provisions is more important for GVCs. To do this, we divide provisions into 2 categories following Horn et al. (2010). WTO+ provisions fall under the current mandate of the WTO and are already subject to some form of commitment in WTO agreements, such as tariffs, customs and anti-dumping. WTO-X provisions, on the contrary, refer to policy obligations that are outside the current mandate of the WTO, such as investment and competition policy. We then split $TotalDepth$ into 2 parts capturing how many

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[6]   Annex Table A1 presents the list of provisions. More details on the methodology and the data on deep trade agreements can be found in Hofmann, Osnago and Ruta (2018). The data are freely available at the following website: https://datacatalog.worldbank.org/dataset/content-deep-trade-agreements.

[7]   Unless otherwise stated, all provisions included in measures of PTA depth are legally enforceable. We also create an index that summarizes the depth of a PTA into three categories: shallow PTA if it includes less than 10 provisions, deep PTA if it includes between 11 and 20 provisions and very deep PTA if more than 21 provisions are included. Results obtained with this categorical variable are similar to the one reported for $TotalDepth_{ijt}$.

[8]   The components are not weighted averages of the variables in a strict sense since the coefficients (or loadings) associated to each variable in each component can also be negative and do not sum to one. In this paper, we use the term weights when referring to the coefficients of the components.

[9]   Other components still incorporate important information in the data but their economic interpretation is difficult.

legally enforceable WTO+ and WTO-X provisions are included in a PTA. The variables are defined as $WTOplus_{ijt} = \sum_{p=1}^{14} Prov_{ijt}^{p}$ and $WTOextra_{ijt} = \sum_{x=1}^{38} Prov_{ijt}^{x}$, where $Prov_{ijt}^{p}$ are 14 WTO+ provisions and $Prov_{ijt}^{x}$ are 38 WTO-X provisions included in an agreement between countries i and j in year t.

b. Global Value Chains

In our analysis, we use different datasets and measures to capture the intensity of GVC relationships between two countries. First, we use data from the World Input-Output Database (WIOD) and the decomposition of value added proposed by Wang et al. (2016) to measure bilateral value-added trade flows.[10] Specifically, Wang et al. (2016) decompose gross trade into several value-added components (see Figure 1). Our first measure of interest is domestic value added (DVA). It simply measures the amount of value added by the exporting country contained in its exports, i.e. the sum of the first 4 components in the figure. While this is not a direct measure of GVCs, the comparisons of the results for this variable with our second variable of interest (discussed next) sheds light on the relationship between deep trade agreements and GVCs.

The second variable of interest is value added in intermediates. It includes the value of exports that has been produced domestically, exported as an intermediate good, reprocessed by the importing countries and either directly absorbed there (component (2) in the figure), further exported to third countries (component (3)) or re-exported to the original country (component 4). We define a third variable from the sub-set of re-exported intermediates (components (3) and (4)). Re-exported intermediates represent the most fragmented parts of a production process in which goods and services cross at least two borders before being eventually absorbed. These two variables capture the bilateral forward linkages between two countries.

We also use foreign value added in gross exports that can be further decomposed between final and intermediate goods and services (components (5) and (6)). It measures all value that has not been produced domestically and that is contained in gross exports. This variable captures backward linkages. At this stage, the decomposition does not allow us to identify the country of origin of the foreign value and hence it is an imperfect measure of bilateral GVC linkages.[11]

Second, for the analysis based on gross trade flows, we use trade in parts and components to proxy for global production sharing. There is no broadly accepted definition of trade in parts and components that we can refer to, so our classification builds on the existing literature in this, which are (WTO, 2011 and Orefice and Rocha, 2011). Specifically, for our analysis, we define as parts and components all non-fuel intermediates from the Broad Economic Categories (BEC) classification (codes 111, 121, 21, 22, 42 and 53), supplemented with unfinished textile products in division 65 of the SITC classification.

These various measures have advantages and disadvantages, which is the reason why we chose to employ a broader set of indicators rather than focusing on a single one. In particular, measures based on value added trade are more precise as they allow to directly deal with the problem of double counting in gross trade data and account for the input-output relationships in production. WIOD data also have the advantage of covering trade in both goods and services. The data on (goods) trade in parts and components are available for a large set of countries and years,[12] thus allowing us to rely on a broader

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[10] The WIOD database covers 40 countries in the period 1995-2011.

[11] The sum of the six above mentioned value-added components do not match exactly the official trade statistics in gross value terms. The difference is due to double counting (column (7)) that tends to increase when goods and services cross borders multiple times. The work of Wang et al. (2016) contributes to a body of the literature that develops measures of the positioning of countries and industries in GVCs (see Fally (2012), Antràs et al. (2012), Antràs and Chor (2013)).

[12] Regressions using gross trade data are estimated for 184 countries between 1995-2014.

panel, which includes many more developing countries than WIOD.[13] The correlation between gross and value-added trade variables for the sub-sample of WIOD countries and years is however large and ranges between 0.75 and 0.88 (see first column of Table 1).

3. Depth of trade agreements and GVC integration

In this section, we present the empirical strategy and the analysis of the impact of deep agreements on value added trade. We also investigate whether the impact of deep trade agreements is heterogeneous for industries with high and low value added incorporated in their production.

a. Empirical strategy

To assess the impact of deep agreements on GVC integration, we estimate the following structural gravity equation for the time period 1995-2011 with a Pseudo-Poisson Maximum Likelihood (PPML) estimator. We use the PPML approach to deal with zeros in the dependent variables and to have a consistent estimate in presence of heteroskedasticity. The regression equation is:

$$GVC\ trade_{ijt} = exp\{\beta_1 Depth_{ijt} + \beta_2\ PTA_{ijt} + \beta_3 BIT_{ijt} + \delta_{ij} + \delta_{it} + \delta_{jt}\} + \varepsilon_{ijt} \qquad (1)$$

where $GVCtrade_{ijt}$ is a measure of value added trade between country i and j at time t and is captured either by different components of value added trade or by gross trade in intermediates; $Depth_{ijt}$ is one of the three measures of the depth of PTAs and are defined in section 2a above. BIT_{ijt} controls for the presence of a Bilateral Investment Treaties between country i and country j at time t;[14] PTA_{ijt} is a dichotomous variable that takes the value of 1 whenever there is a preferential trade agreement, either active or inactive, between two countries at time t;[15] δs are sets of country-pair, importer-time and exporter-time fixed effects.

It is important to note how the variables of depth have been constructed for inactive PTAs. In practice, there are two types of inactive PTAs: i) agreements that expired or that have been terminated (such as the first Yaounde convention or the Arusha convention), and ii) agreements that have been replaced by more recent agreements (such as the interim agreements signed between the European Union and all the acceding countries). None of the inactive PTAs have been coded in Hofmann et al. (2018) and therefore there is no consistent information on their content. In this paper, we assume that the inactive PTAs in the first category were shallow and we assigned a value of depth equal to 0. On the other hand, we assume that the PTAs replaced by other agreements were similar to the newer PTAs. Thus, in our data, the depth of the replaced agreements is equal to the depth of the replacing agreement.[16]

Our estimates might suffer from endogeneity deriving from omitted variables and simultaneity bias. Omitted variables bias arises when the error term is correlated with some unobservable country-specific policy variables (e.g. restrictive domestic policy regulation), which at the same time affect both GVC-

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[13] We tested our work on two other trade in value added datasets based on the Eora and GTAP Inter-Country Input-Output tables. Despite offering wide country coverage (189 for Eora and 121 for GTAP) these two datasets do not perfectly suit our empirical context, leading to either non-significant or weakly significant results. The Eora dataset relies on several assumptions to generate the underlying time series for developing countries, which might distort our variables of interest. Being only available for selected years (2004, 2007 and 2011), the GTAP data mutes a lot of variation from our sample. Possibly for this reason, we find that our key result on the relationship between deep agreements and GVC is supported only with weak significance using this database. Results are available upon request.

[14] Data on BITs come from UNCTAD. The exclusion of this variable from the regressions does not affect the results.

[15] The variable PTA_{ijt} is taken from Egger and Larch (2008).

[16] This assumption may overestimate the depth of older PTAs but we believe that the error introduced should be negligible since most of the replaced PTAs are agreements between the European Union and acceding countries.

related trade and the probability of forming a deep PTA. Reverse causality may arise from the fact that firms in country pairs involved in GVC may lobby for deeper trade agreements to secure supply of intermediates in partner countries and therefore to decrease the probability of trade diversion. The set of fixed effects included in the structural gravity estimation partially deals with both sources of endogeneity (Baier and Bergstrand, 2007; Piermartini and Yotov, 2016). As an alternative approach, a set of leads and lags of the variable capturing the depth of trade agreements are included in the regression and presented as a robustness check.

b. Baseline results

Table 2 reports the coefficients of total depth, core depth and PCA depth for the regressions using DVA and FVA as dependent variables. All coefficients of depth are positive and significant suggesting that deep PTAs have a positive impact on both forward and backward linkages.

Adding a policy area is associated to an average increase 0.4 percent of total domestic value added and an average increase of 0.26 percent of foreign value added. The coefficients increase substantially when looking at core depth only, suggesting that those policy areas are particularly important as they reduce the governance gap between countries in areas that are relevant for GVC—related trade.[17] Also, the coefficients of PCA depth show a similar pattern to the one of total number of provisions. Part of the difference in the magnitude of the coefficients is due to the different range of the independent variables. A one standard deviation increase in the number of provisions is associated with a 0.07 increase in domestic value added and 0.05 increase in foreign value added; similarly, a one standard deviation increase in PCA depth is associated with a 0.06 increase in domestic value added and 0.10 increase in foreign value added.

The in force or inactive PTA dummy is non-significant in most of the estimations. This variable controls for the presence of shallow PTAs and for agreements no longer in force for which we have no information on depth. The lack of statistical significance indicates that it is the depth of PTAs, and not the mere presence of shallow agreements, that matters for GVC trade.

Control variables such as BITs have the expected sign suggesting that signing BITs has a positive impact on GVC-related trade. The magnitude of the BITs coefficient needs to be interpreted carefully, given that these agreements often focus on specific sectors or areas. Therefore, in our regressions, which are aggregated at the country level, their impact might be positively biased.

A concern is that the trade variables in our first set of regressions may be driven by traditional trade in final goods and services rather than by GVC trade. To address this concern, we assess the impact of deep trade agreements on FVA and on DVA separately for intermediate and final goods and services. Results presented in Table 3 decompose domestic value added into DVA in final exports (columns 1-3), DVA in intermediate exports (columns 4-6) and DVA of re-exported intermediates (columns 7-9). The coefficients capturing PTA depth are only significant for DVA of intermediate exports, suggesting that deep trade agreements are particularly important in the context of global value chains compared to trade in final goods. Our results indicate that countries tend to export more goods incorporating their domestic intermediate goods and services to partners with which they signed a PTA covering more policy areas.

In terms of magnitudes, the coefficients capturing the impact of adding one additional provision on domestic value added in intermediates are slightly higher compared to the aggregate variables presented in Table 2 and are equal to 0.48 percent on average. In addition, the positive relationship between deeper trade agreements and GVC integration is particularly important for the sub-set of re-exported intermediates that cross the border at least twice suggesting that deep agreements are particularly important in the context highly fragmented production processes. A one standard deviation increase in

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[17] See Baldwin (2011) and WTO (2011).

the number of provisions is associated with a 0.04 increase in domestic value added of final exports and 0.09 increase in domestic value added of intermediate exports.

Results on the impact of deep agreements on foreign value-added trade of final and intermediate exports are presented in Table 4. Also in this case the positive impact of our variable of interest is significant only for FVA of intermediate exports. As for domestic value added, our findings suggest that countries tend to export more goods incorporating foreign intermediate goods and services to partners with which they signed a PTA covering more policy areas. In other words, our estimates indicate that deeper agreements could increase the integration in value chains in middle stages of production (i.e. a country exports intermediate goods containing foreign value added) rather than in assembling (i.e. a country exports final goods made of foreign value added).

The magnitude of the coefficients is also higher compared to the baseline regression. Adding an extra provision in an agreement increase foreign value added of intermediate exports by 0.38 percent. A one standard deviation increase in the number of provisions is associated with a 0.01 increase in foreign value added of final exports and 0.07 increase in foreign value added of intermediate exports. In Table 5 and Table 6 the results on the impact of deep trade agreements on GVC integration are presented for goods and services separately. For simplicity results are presented for one of our depth variables.[18] In the case of goods, the relationship between deep trade agreements and forward GVC linkages is mainly driven by domestic value added in intermediate exports and is significant only at a 10 percent level. For foreign value added, depth is positive and significant only for intermediates. For services, deeper agreements have a positive impact on domestic value-added services with results once again driven by intermediate exports, and foreign value-added services. Notice that the coefficients of deep trade agreements tend to be larger for services than for goods, suggesting that agreements going beyond pure market access are particularly important for GVC integration in services. A one standard deviation increase in the number of provisions is associated with a 0.04 increase in domestic value added of intermediate goods exports and 0.08 increase in domestic value added of intermediate services exports.

c. Sector level regressions

In this section we investigate whether the impact of deep trade agreements on GVC participation is heterogeneous across industries with different levels of value added shares in total production. We estimate the following specification:

$$GVC\ trade_{ijkt} = exp\left\{\beta_1 Depth_{ijt} + \beta_2 Depth_{ijt} * Industry\ VA_k + \beta_3 PTA_{ijt} + \beta_4 BIT_{ijt} + \delta_{ijk} + \delta_{ikt} + \delta_{jkt}\right\} + \varepsilon_{ijkt} \tag{2}$$

where $GVCtrade_{ijtk}$ is a measure of GVC integration between country i and j in sector k at time t; $Industry\ VA_k$ is a variable capturing the value added of a certain industry and it is measured either as the share of value added that an industry has in total production (see annex Table A2) or with a dummy variable equal to one when the share of value added of an industry is above the median and zero otherwise; $Depth_{ijt}$, PTA_{ijt}, and BIT_{ijt} are defined as in equation (1); δ_{ijk}, δ_{ikt}, and δ_{jkt}, represent respectively country-pair industry, reporter industry time and partner industry time fixed effects.

Results for goods presented in Table 7 suggest that deeper agreements are equally relevant on average for higher value-added industries compared to lower value industries. On the other hand, results for services GVC integration presented in Table 8 show that the interaction term between depth and industry value added is always positive and significant for domestic value added, in the case of foreign value added the results are less robust. The absence of significant differentiated impacts in the case of goods

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[18]   Results for the other depth variables are qualitatively similar and available upon request.

might be explained by the fact that the variation across industries in the level of value added is much lower for goods compared to services. In addition, the value added incorporated in services production is usually higher than the one incorporated in goods production. This is in line with the concept of the smile-curve in the global value chains literature.[19] The magnitude of the impact of depth on higher value-added industries is usually higher for services GVC integration suggesting that deep trade agreements help countries to integrate in industries with higher levels of value added.

4. Content of trade agreements, GVC integration and income level

Different groups of provisions may matter more for PTAs between countries at different levels of development. Intuitively, this is because the reason for signing trade agreements could be different depending on the countries involved and on the level of liberalization already achieved. Moreover, as shown in Hofmann et al. (2018) the scope of PTAs varies across different groups of countries: PTAs signed between developed countries (North) are roughly as deep as agreements signed between developed and developing (South) countries; on the other hand, PTAs signed among developing countries are on average shallower. We study how the content of PTAs affects GVC trade between North-North, North-South and South-South country pairs.[20]

For this exercise, we use the data on trade in parts and components to exploit the information from a larger sample. As a first step we investigate the relationship between deep PTAs and trade in parts and components on a sample of 184 countries for the time interval 1995-2014. In particular we estimate the structural gravity model in equation (1) using trade in parts and components as dependent variable. As a second step we add to our baseline regression the interactions of our variables of depth with three different dummies that identify three mutually exclusive country groups: North-North, North-South and South-South. The specification is as follows:

$$GVC\ trade_{ijt} = exp\{\beta_1 WTO\ plus_{ijt} + \beta_2 WTO\ extra_{ijt} + \beta_3\ WTO\ plus_{ijt} * LevDev_{ij} +$$

$$\beta_4\ WTO\ extra_{ijt} * LevDev_{ij} + \beta_5 PTA_{ijt} + \beta_6 BIT_{ijt} + \delta_{ij} + \delta_{it} + \delta_{jt}\} + \varepsilon_{ijt}, \tag{3}$$

where $LevDev_{ij}$ represents a vector of any two dummy variables among the three country groups defined above.

The results from the PPML estimations, presented in Table 9, are in line with the ones using trade in value added. In particular, including one more provision increases trade in parts and components by 0.3 per cent on average. An additional core provision has a larger impact of 0.6 percent on average. A one standard deviation increase in the number of provisions is associated with a 0.02 increase in gross imports of parts and components and a one standard deviation increase PCA depth is associated with a 0.18 increase in gross imports of parts and components.

We find that deep PTAs affect trade in parts and components differently depending on the income group of countries involved (Table 10). Column 1 shows that the average impact of WTO+ and WTO-X provisions is not significant. Column 2 includes the interactions of the number of WTO+ and WTO-X provisions with binary variables that identify South-South and North-South country-pairs. Thus, the coefficients of the number of provisions have to be interpreted as the coefficients for the omitted category, i.e. North-North pairs. Columns 3 and 4 have the same structure but with South-South and North-South pairs as omitted categories respectively. The effect of PTA depth on North-South GVC-

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[19] The smile-curve concept, which was introduced by Acer founder Stan Shih in the early 1990s, asserts that value-added is becoming more concentrated at the upstream and downstream ends of the value chain.

[20] North is defined as the group of high income WTO Members while South comprises low and middle income and LDC WTO members.

trade is driven by WTO-X provisions such as investment, competition policy and other behind the border provisions. On the other hand, South-South GVC-trade is mostly affected by WTO+ provisions. For North-North agreements, the coefficients on WTO+ and WTO-X are not significant.[21]

While, there is no formal theory to guide the analysis, the differential effects of deep agreements across countries' levels of development may have a simple intuitive explanation. Deep trade agreements affect GVC trade directly, as they lower trade barriers between members, and indirectly, as they improve institutions through commitments to reform. Deep PTAs may matter less for developed countries as trade is already liberalized and domestic institutions are robust. On the contrary, weak institutions in developing economies are likely to be a constraint for GVC integration with developed countries and deep provisions can offer a commitment device and should therefore increase GVC-related trade. Finally, since tariffs and other border barriers are often still high between developing countries, PTAs may affect GVC trade mostly through traditional trade liberalization in South-South relationships.

5. Robustness

In this section, we undertake three robustness tests.

a. PTAs indirect effects

In a world where production is fragmented across countries, the level of depth of preferential trade agreements signed by third countries along the supply chain could indirectly affect GVC-related trade between two countries. Intuitively, deeper trade agreements in third countries lower trade costs along the entire supply chain, thus encouraging trade in intermediates also among countries that are not part of the agreement. To control for the indirect effect of deep trade agreements, we follow Noguera (2012) and estimate the impact of deep PTAs on the level of integration in GVCs using the following modified gravity framework:

$$GVC\ trade_{ijt} = exp\{\beta_1\left(\sum_k s_{ikjt}Depth_{kjt} + \sum_k \sum_l \varphi_{ikljt}Depth_{klt}\right) + \beta_2 PTA_{ijt} +$$

$$\beta_3 BIT_{ijt} + \delta_{ij} + \delta_{it} + \delta_{jt}\} + \varepsilon_{ijt} \tag{4}$$

Where the variables and the set of controls and fixed effects are the same as in equation (1), but the PTA depth variable is weighted using two different shares. Specifically, s_{ikjt} is the share of value added from country i to country j embodied in country k's final products that reaches country j; φ_{ikljt} is the share of value added from country i embodied in intermediate inputs produced in country k that are absorbed as final demand in country j after travelling through possibly multiple countries l.

The estimates in Table 11 are in line with the standard gravity estimates for the total depth variable.[22] Deep PTAs tend to increase forward and backward linkages, with stronger effects for exports in intermediates. The coefficients of the modified gravity regressions are larger than those of the standard gravity suggesting the existence of indirect effects of signing deep PTAs through third countries.

b. Adjustment to trade policy changes

As suggested by Trefler (2004), the adjustment of trade flows between two countries after signing a PTA is not instantaneous but it may take some time. Therefore, estimations using consecutive years will

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[21] Estimations using WIOD, which covers only a few developing countries, are similar to this last set of results.

[22] Results for the other depth variables are qualitatively similar and available upon request.

not allow our dependent variable to properly adjust. To reduce this bias, estimations are performed using 3-year intervals. Results presented in

Table 12 have the same sign as the ones presented in the baseline regressions and are slightly higher in terms of magnitude, confirming the positive relationship between PTA depth and GVC-related trade.[23] In particular, adding a policy area is associated to an average increase of 0.43 per cent of total domestic value added (column (1) Table 12), an average increase of 0.49 per cent of value added in intermediate exports (column (3) Table 12), and an average increase of 0.37 per cent of foreign value added in intermediates (column (7) Table 12). With respect to gross trade flows, including one more provision increases trade in parts and components by 0.44 per cent on average (column (8) Table 12).

c. Dynamic effects

To control for reverse causality and shed light on potential adjustment of trade over time, regressions are performed including leads and lags using our full samples. More specifically, we run the following regression

$$GVC\ trade_{ijt} = exp\left\{\sum_{s=t-3}^{t+3}\beta_s Depth_{ijs} + \beta_2 PTA_{ijt} + \beta_3 BIT_{ijt} + \delta_{ij} + \delta_{it} + \delta_{jt}\right\} + \varepsilon_{ijt} \qquad (5)$$

where we add all the lags of depth until $t-3$ and the leads until $t+3$ to our baseline specification.

Results for trade in value added, presented in Figure 2, suggest that there are some anticipation effects of deep PTAs on intermediate domestic value added and, to a lesser extent, on intermediate foreign value added. These effects are however limited to one year before the agreement enters into force. The time gap between the time an agreement is signed by the parties and the time it enters into force may help explaining such anticipation patterns. Figure 2 also disentangles the dynamic effects of deep PTAs on the value-added components of gross exports by splitting domestic and foreign value added intermediate and final goods value added. The key insight is that both contemporaneous and cumulative effects tend to be larger for domestic and foreign intermediate value added than domestic and foreign final value added.

In the case of trade in parts and components, the results point to some interesting patterns in the data across different income groups. Figure 3 shows the values of the coefficients of three different measures of depth between $t-3$ and $t+3$ for the three country groups analyzed above (North-North, North-South and South-South). While the coefficients of depth are not significantly different from zero in any year before the entry into force of the agreement for any income groups, the figure suggests that the effect of deep PTAs cumulates over time for the North-South and for South-South pairs. For the former group of trade agreements, the cumulative effect is particularly strong, consistently with the view that deep agreements may have offered a commitment device for reforms in developing economies that have helped them anchor to GVCs. The cumulative effect for the South-South country-pairs is not significant.

6. Conclusions

This paper contributes to the existing literature on the relationship between trade agreements and cross-border production linkages. There are three main novelties in the paper. First, it uses new data on trade in value added in addition to more standard data on trade flows of parts and components to separately assess the impact of trade agreements on goods and services and to investigate whether the relationship between trade agreements and GVC participation is heterogeneous across industries with different levels of value added shares. Second, it exploits new information on the content of a larger number of PTAs

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[23] Similar results are also found when regressions are performed using 4- and 5-year intervals. Results for the other depth variables are qualitatively similar and available upon request for the data in value added (Table 12).

and attempts to identify which type of provisions matter the most for GVC-related trade. Third, it looks at how the effect of the content of deep PTAs change depending on the level of development of the countries involved in trade agreements.

With this new approach, we are able to establish three main results.

1. The depth of trade agreements is associated with more GVC-related trade among participating countries. The positive relationship between deep agreements and GVC integration is driven by value added trade in intermediates rather than in final goods and services. Adding a policy area to a PTA increases domestic value added of intermediates (forward GVC linkages) and foreign value added of intermediates (backward GVC linkages) by 0.48 and 0.38 percent, respectively.

2. At the sectoral level, deep trade agreements are more relevant for higher value-added industries suggesting that deeper trade arrangements help countries to integrate in industries with higher levels of value added.

3. Provisions outside the current WTO mandate such as competition policy and investment are key drivers of the relationship between deep trade agreements and GVC-related trade, particularly for North-South PTAs. Border provisions are still an important driver of GVC trade for South-South PTAs.

As a venue for future research, there is still little knowledge on and understanding of the relationship between the content of specific provisions in trade agreements and trade, GVC participation or other variables of interest. Recent work at the World Bank aims at collecting data by core provision and studying how this metric of depth affects economic outcomes.

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Tables and figures

Figure 1: Decomposition of gross exports
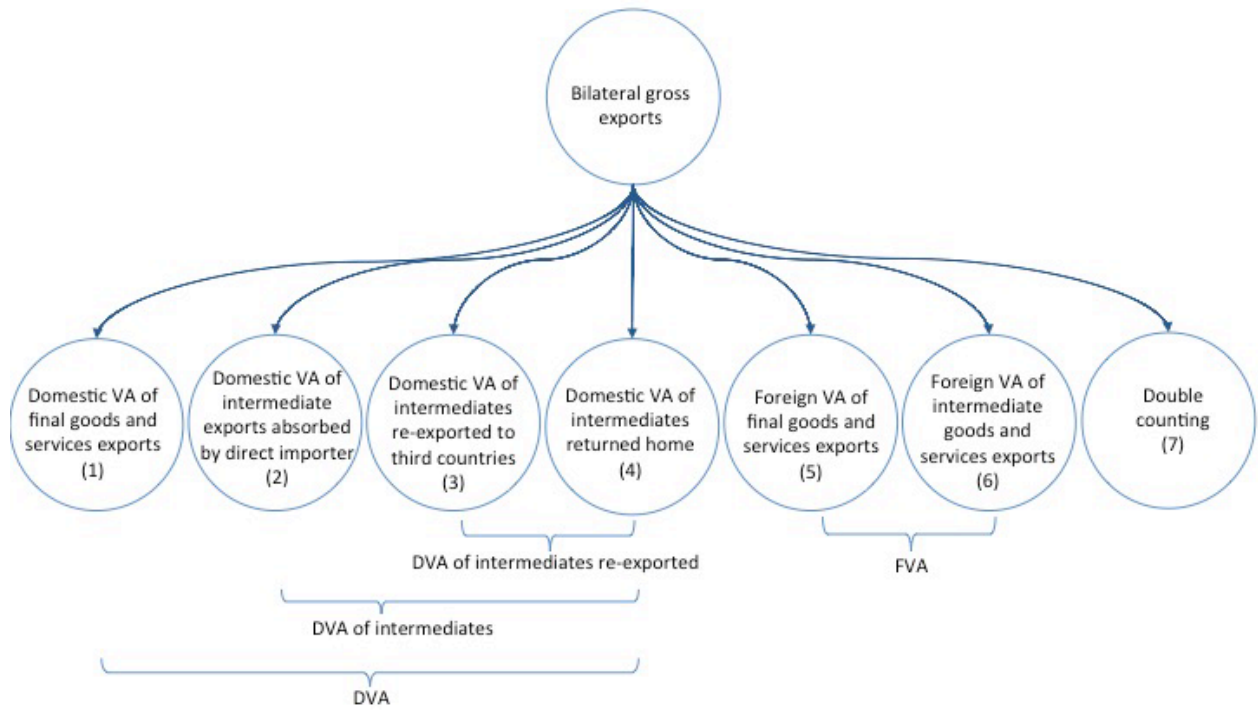
Source: Authors' re-elaboration of Wang et al. (2016).

Figure 2: Dynamic effects of deep PTAs on intermediate and final DVA and FVA
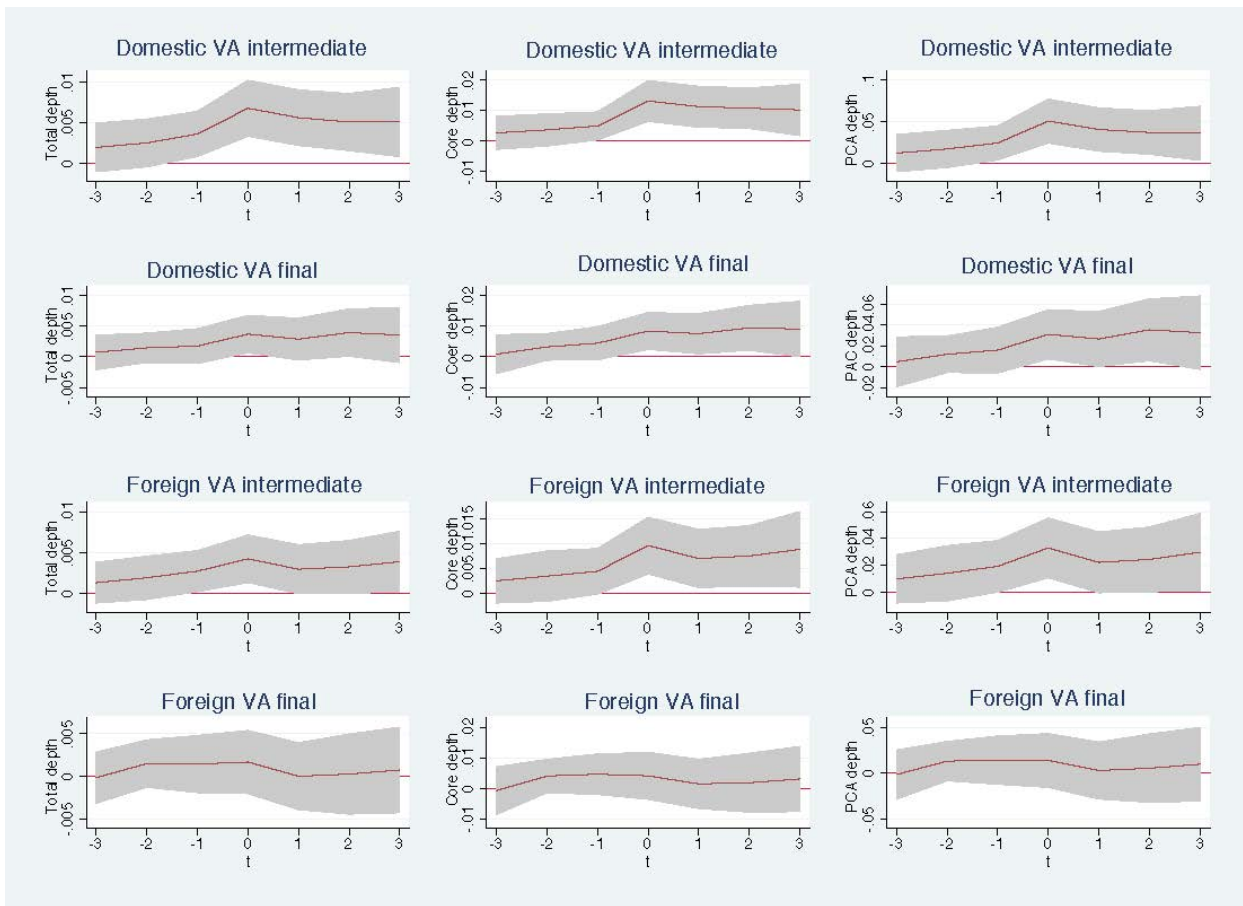
Note: All figures use 95 percent confidence intervals.

Figure 3: Dynamic effects of deep PTAs on parts and components
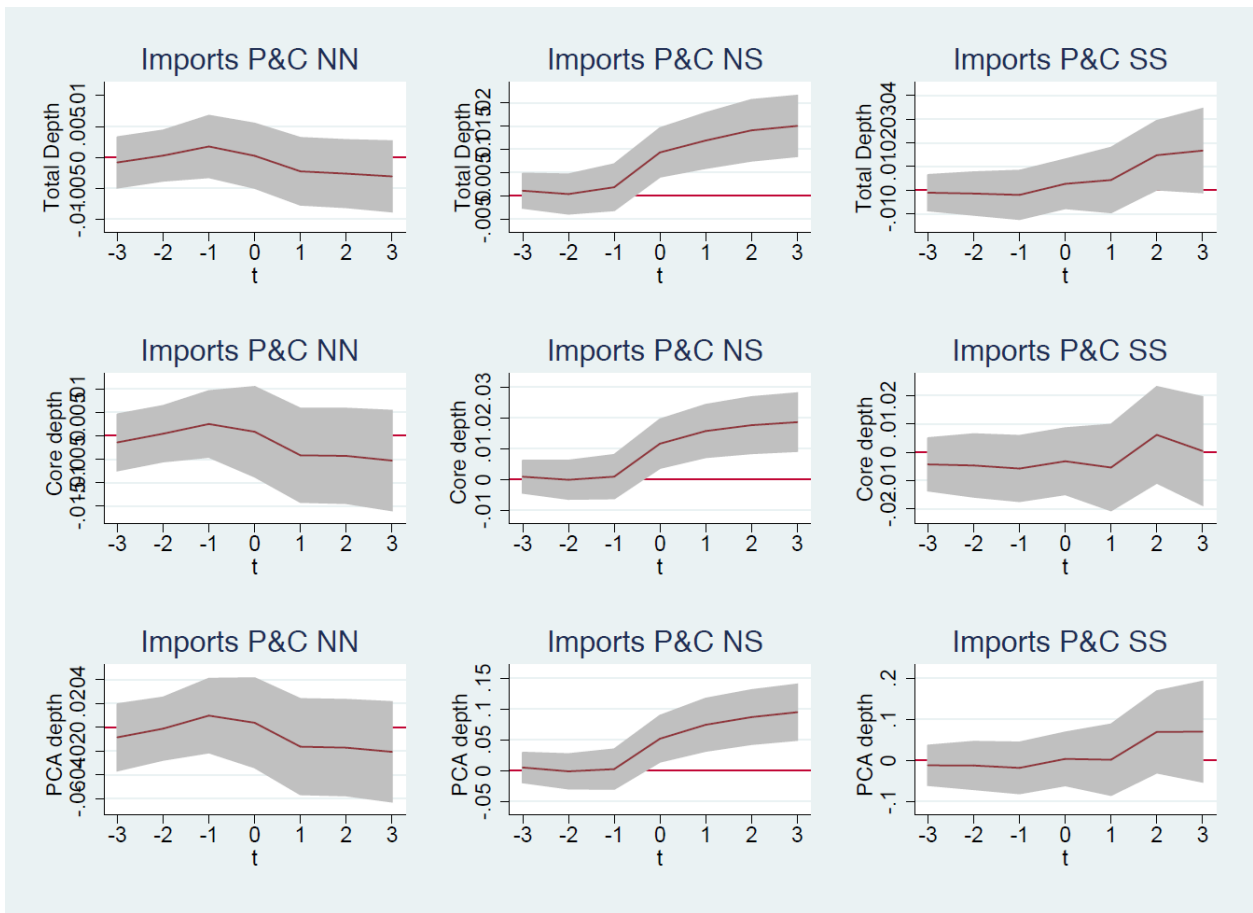
Note: All figures use 95 percent confidence intervals.

Table 1: Correlation between gross and value-added trade in good

	Parts and components	DVA	DVA final	DVA interm.	DVA interm. re-exported	FVA	FVA final	FVA interm.
Parts and components	1.00							
DVA	0.87	1.00						
DVA final	0.80	0.97	1.00					
DVA intermediate	0.88	0.97	0.88	1.00				
DVA int. re-exported	0.82	0.85	0.72	0.91	1.00			
FVA	0.79	0.89	0.87	0.85	0.67	1.00		
FVA final	0.77	0.88	0.90	0.81	0.63	0.98	1.00	
FVA intermediate	0.75	0.84	0.77	0.85	0.68	0.96	0.88	1.00

Table 2: Deep trade agreements and GVC integration, PPML

	(1)	(2)	(3)	(4)	(5)	(6)
	DVA of exports			FVA of exports		
No. of provisions	0.00400***			0.00258*		
	(0.00125)			(0.00133)		
Core provisions		0.00777***			0.00520*	
		(0.00266)			(0.00273)	
PCA depth (1st)			0.0292***			0.0203*
			(0.0101)			(0.0105)
BIT	0.121***	0.118***	0.119***	0.0924**	0.0910**	0.0914**
	(0.0440)	(0.0441)	(0.0441)	(0.0379)	(0.0379)	(0.0379)
PTA (in force or inactive)	-0.0296	-0.0611	-0.041	-0.00848	-0.0302	-0.0189
	(0.0433)	(0.0492)	(0.0461)	(0.0410)	(0.0481)	(0.0440)
Observations	26,520	26,520	26,520	26,520	26,520	26,520
R-squared	0.994	0.994	0.994	0.996	0.996	0.996
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors at the country pair level in parentheses.

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

Table 3: Deep trade agreements and Domestic Value-added exports – intermediates vs final-, PPML

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	DVA of final exports			DVA of intermediate exports			DVA of intermediates re-exported		
No. of provisions	0.00220			0.00480***			0.00484***		
	(0.00158)			(0.00139)			(0.00158)		
Core provisions		0.00424			0.00940***			0.0106***	
		(0.00312)			(0.00300)			(0.00331)	
PCA depth (1st)			0.0181			0.0345***			0.0376***
			(0.0122)			(0.0113)			(0.0126)
BIT	0.117**	0.116**	0.116**	0.121**	0.117**	0.119**	0.115**	0.111**	0.113**
	(0.0551)	(0.0552)	(0.0551)	(0.0472)	(0.0472)	(0.0473)	(0.0528)	(0.0526)	(0.0527)
PTA (in force or inactive)	0.118***	0.0990*	0.106**	-0.107**	-0.144***	-0.118**	-0.0754	-0.124**	-0.0937
	(0.0442)	(0.0539)	(0.0485)	(0.0492)	(0.0553)	(0.0519)	(0.0578)	(0.0628)	(0.0597)
Observations	26,520	26,520	26,520	26,520	26,520	26,520	26,520	26,520	26,520
R-squared	0.996	0.996	0.996	0.991	0.991	0.991	0.989	0.989	0.989
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors at the country pair level in parentheses.

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

Table 4: Deep trade agreements and foreign value-added exports -intermediates vs final-, PPML

	(1)	(2)	(3)	(4)	(5)	(6)
	FVA of final exports			FVA of intermediate exports		
No. of provisions	0.000645			0.00385***		
	(0.00168)			(0.00124)		
Core provisions		0.000806			0.00765***	
		(0.00340)			(0.00265)	
PCA depth (1st)			0.00553			0.0290***
			(0.0131)			(0.0101)
BIT	0.105**	0.105**	0.105**	0.0736*	0.0710*	0.0720*
	(0.0473)	(0.0474)	(0.0473)	(0.0413)	(0.0412)	(0.0413)
PTA (in force or inactive)	0.143***	0.142**	0.139**	-0.106**	-0.134***	-0.117**
	(0.0503)	(0.0592)	(0.0542)	(0.0451)	(0.0507)	(0.0474)
Observations	26,520	26,520	26,520	26,520	26,520	26,520
R-squared	0.996	0.996	0.996	0.995	0.995	0.995
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors at the country pair level in parentheses.

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

Table 5: Deep trade agreements and GVC integration in goods, PPML

	(1) DVA	(2) DVA final	(3) DVA intermediate	(4) DVA int. re-exported	(5) FVA	(6) FVA final	(7) FVA intermediate
No. of provisions	0.00235*	0.00195	0.00230*	0.00111	0.00161	5.89e-05	0.00259**
	(0.0013)	(0.0017)	(0.0013)	(0.0015)	(0.0014)	(0.0017)	(0.0013)
BIT	0.139***	0.131**	0.142***	0.148***	0.0920**	0.110**	0.0608
	(0.0436)	(0.0596)	(0.0443)	(0.0468)	(0.0389)	(0.0502)	(0.0398)
PTA (in force or inactive)	0.0254	0.174***	-0.0667	-0.0527	0.00409	0.159***	-0.0939**
	(0.0425)	(0.0455)	(0.0464)	(0.0646)	(0.0428)	(0.0521)	(0.0413)
Observations	26,520	26,520	26,520	26,520	26,520	26,520	26,520
R-squared	0.997	0.997	0.996	0.996	0.997	0.996	0.997
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors at the country pair level in parentheses.

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

Table 6: Deep trade agreements and GVC integration in services, PPML

	(1) DVA	(2) DVA final	(3) DVA intermediate	(4) DVA int. re-exported	(5) FVA	(6) FVA final	(7) FVA intermediate
No. of provisions	0.00474**	0.00310	0.00468**	0.00493**	0.00450**	0.00353	0.00453*
	(0.0022)	(0.0024)	(0.0023)	(0.0024)	(0.0023)	(0.0023)	(0.0025)
BIT	0.0632	-0.0670	0.0868	0.0980	0.133	0.0394	0.173**
	(0.0759)	(0.0948)	(0.0750)	(0.0765)	(0.0830)	(0.0938)	(0.0841)
PTA (in force or inactive)	-0.0856	-0.108	-0.0476	0.0323	0.0188	0.0334	0.0298
	(0.0833)	(0.0964)	(0.0797)	(0.0744)	(0.0904)	(0.110)	(0.0828)
Observations	26,401	26,401	26,401	26,401	26,401	26,401	26,401
R-squared	0.959	0.959	0.957	0.966	0.951	0.946	0.951
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors at the country pair level in parentheses.

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

Table 7: Deep trade agreements and GVC integration in goods -sectoral estimations-, PPML

	(1)	(2)	(3)	(4)	(5)	(6)
		DVA			FVA	
No. of provisions	0.00208***	-0.000205	0.00293***	0.00127	-0.00315	0.00230*
	(0.000808)	(0.00471)	(0.00108)	(0.00103)	(0.00611)	(0.00134)
No. of provisions* VA share		0.00734			0.0145	
		(0.0140)			(0.0185)	
No. of provisions*High VA share {0,1}			-0.00252*			-0.00355**
			(0.00133)			(0.00151)
BIT	0.122***	0.122***	0.122***	0.0848***	0.0845***	0.0848***
	(0.0232)	(0.0232)	(0.0232)	(0.0253)	(0.0254)	(0.0253)
PTA (in force or inactive)	0.0368	0.0373	0.0354	0.0357	0.0365	0.0350
	(0.0297)	(0.0297)	(0.0296)	(0.0362)	(0.0361)	(0.0361)
Observations	365,535	365,535	365,535	365,370	365,370	365,370
R-squared	0.975	0.975	0.975	0.990	0.990	0.990
Country-pair-industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-industry-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-industry-time FE	Yes	Yes	Yes	Yes	Yes	Yes
p-value F-test No. of provisions		0.4472	0.6487		0.3600	0.1808

Clustered standard errors at the country pair level in parentheses.

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

Table 8: Deep trade agreements and GVC integration in services -sectoral estimations-, PPML

	(1)	(2)	(3)	(4)	(5)	(6)
		DVA			FVA	
No. of provisions	0.00288*	-0.0140*	-0.00155	0.00249	-0.00635	-0.000882
	(0.00170)	(0.00760)	(0.00216)	(0.00167)	(0.00726)	(0.00218)
No. of provisions* VA share		0.0320**			0.0178	
		(0.0143)			(0.0139)	
No. of provisions*High VA share {0,1}			0.00730***			0.00734***
			(0.00282)			(0.00282)
BIT	0.00389	0.00397	0.00348	-0.0252	-0.0253	-0.0263
	(0.0608)	(0.0608)	(0.0609)	(0.0531)	(0.0532)	(0.0532)
PTA (in force or inactive)	-0.0442	-0.0385	-0.0455	0.0563	0.0647	0.0589
	(0.0657)	(0.0667)	(0.0662)	(0.0602)	(0.0619)	(0.0618)
Observations	295,381	295,381	295,381	295,076	295,076	295,076
R-squared	0.922	0.922	0.922	0.950	0.950	0.950
Country-pair-industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-industry-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-industry-time FE	Yes	Yes	Yes	Yes	Yes	Yes
p-value F-test No. of provisions		0.0117	0.0095		0.1017	0.0020

Clustered standard errors at the country pair level in parentheses.

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

Table 9: Deep trade agreements and trade in parts and components, PPML

	(1)	(2)	(3)
No. of provisions	0.00294**		
	(0.00130)		
Core provisions		0.00589**	
		(0.00273)	
PCA depth			0.0224**
			(0.0107)
BIT	0.127***	0.126***	0.127***
	(0.0316)	(0.0316)	(0.0316)
PTA (in force or inactive	-0.0492	-0.0737	-0.0574
	(0.0470)	(0.0505)	(0.0489)
Observations	336,976	336,976	336,976
R-squared	0.990	0.990	0.990
Country-pair FE	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes

Clustered standard errors at the country pair level in parentheses.

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

Table 10: The content of PTAs and trade in parts and components by income groups, PPML

	(1)	(2)	(3)	(4)
	Imports of parts and components			
No. of WTO+ provisions	0.00557	0.0160	0.0125*	-0.00984
	(0.00553)	(0.00989)	(0.00661)	(0.00683)
No. of WTO-X provisions	0.00102	-0.00956*	0.0151	0.0220***
	(0.00328)	(0.00538)	(0.00959)	(0.00663)
No. of WTO+ provisions * South-South		-0.00359		0.0223**
		(0.0112)		(0.00990)
No. of WTO-X provisions * South-South		0.0246**		-0.00691
		(0.0110)		(0.0113)
No. of WTO+ provisions *North-South		-0.0259**	-0.0223**	
		(0.0117)	(0.00990)	
No. of WTO-X provisions * North-South		0.0315***	0.00691	
		(0.00896)	(0.0113)	
No. of WTO+ provisions *North-North			0.00359	0.0259**
			(0.0112)	(0.0117)
No. of WTO-X provisions * North-North			-0.0246**	-0.0315***
			(0.0110)	(0.00896)
BIT	0.127***	0.130***	0.130***	0.130***
	(0.0316)	(0.0319)	(0.0319)	(0.0319)
PTA (in force or inactive)	-0.0619	-0.0744	-0.0744	-0.0744
	(0.0490)	(0.0465)	(0.0465)	(0.0465)
Observations	336,976	336,976	336,976	336,976
R-squared	0.990	0.991	0.991	0.991
Country-pair FE	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes

Clustered standard errors at the country-pair level in parenthesis.

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

Table 11: Deep trade agreements and GVC integration, indirect effect PPML

	(1) DVA	(2) DVA final	(3) DVA intermediate	(4) DVA int. re-exported	(5) FVA	(6) FVA final	(7) FVA intermediate
No. of provisions	0.0133***	0.00982***	0.0138***	0.0150***	0.0104***	0.00815***	0.0107***
	(0.00209)	(0.00255)	(0.00213)	(0.00231)	(0.00201)	(0.00241)	(0.00184)
BIT	0.380***	0.322***	0.359***	0.334***	0.309***	0.291***	0.276***
	(0.0944)	(0.0947)	(0.0914)	(0.0933)	(0.0785)	(0.0817)	(0.0820)
PTA (in force or inactive	0.143	0.359***	0.0224	0.127	0.221**	0.500***	0.0208
	(0.113)	(0.0943)	(0.115)	(0.120)	(0.102)	(0.110)	(0.0942)
Observations	26,520	26,520	26,520	26,520	26,520	26,520	26,520
R-squared	0.980	0.987	0.974	0.972	0.988	0.988	0.986
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors at the country pair level in parentheses.

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

Table 12: Deep trade agreements and GVC integration- interval estimations, PPML

	(1) DVA	(2) DVA final	(3) DVA intermediate	(4) DVA int. re-exported	(5) FVA	(6) FVA final	(7) FVA intermediate	(8) P&C
No. of provisions	0.00431***	0.00308*	0.00488***	0.00565***	0.00337**	0.00227	0.00379***	0.00439***
	(0.00137)	(0.00173)	(0.00151)	(0.00179)	(0.00142)	(0.00179)	(0.00130)	(0.00158)
BIT	0.123***	0.0827	0.145***	0.119**	0.0794**	0.0491	0.104**	0.146***
	(0.0452)	(0.0580)	(0.0486)	(0.0551)	(0.0385)	(0.0513)	(0.0414)	(0.0349)
PTA (in force or inactive)	-0.0457	0.154***	-0.148***	-0.138*	-0.000971	0.233***	-0.149***	-0.0520
	(0.0514)	(0.0559)	(0.0570)	(0.0715)	(0.0486)	(0.0592)	(0.0478)	(0.0560)
Observations	9,360	9,360	9,360	9,360	9,360	9,360	9,360	116,400
R-squared	0.995	0.996	0.992	0.990	0.997	0.996	0.996	0.988
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period	3-year	3-year	3-year	3-year	3-year	3-year	3-year	3-year

Clustered standard errors at the country pair level in parentheses.

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

Annex

Table A1: Description of the 52 Provisions in the Content of Deep Trade Agreements Database

WTO-plus areas	
AD	**Retention of antidumping rights and obligations under the WTO Agreement (Art. VI GATT). Unfair trade practices.**
Customs	**Provision of information; publication on the internet of new laws and regulations; training. Incl. provisions on trade facilitation.**
CVM	**Retention of countervailing measures rights and obligations under the WTO Agreement (Art VI GATT).**
Export Taxes	**Elimination of export taxes. Examples: Elimination of customs duties on exports, elimination of duties, taxes or other charges on exports.**
FTA Agriculture	**Tariff liberalization with regard to agriculture goods; elimination of non-tariff measures.**
FTA Industrial or Customs	**Tariff liberalization with regard to industrial goods; elimination of non-tariff measures.**
GATS	**Liberalization of trade in services.**
Public Procurement	**Progressive liberalization; national treatment and/or non-discrimination principle; publication of laws and regulations on the internet; specification on public procurement regime.**
SPS	**Affirmation of rights and obligations under the WTO Agreement on SPS; harmonization of SPS measures.**
State Aid	**Assessment of anticompetitive behavior; annual reporting on the value and distribution of state aid given; provision of information. Incl. export subsidies on products.**

STE	**GATT Art. XVII. Establishment or maintenance of a state enterprise in accordance with and affirming provisions of GATT. Non-discrimination regarding production and marketing condition; provision of information. Incl. provisions on public undertakings.**
TBT	**Affirmation of rights and obligations under WTO Agreement on TBT; provision of information; harmonization of regulations; mutual recognition agreements.**
TRIMs	**Provisions concerning requirements for local content and export performance on FDI. Applies only to measures that affect trade in goods.**
TRIPs	**Harmonization of standards; enforcement; national treatment; most-favored nation treatment and any other policy covered by TRIPs. International treaties referenced in TRIPS: Paris Convention, Berne Convention, Rome Convention, IPIC Treaty.**

WTO-X areas	
Agriculture	Policies and technical assistance to conduct modernization projects; exchange of information.
Anti-Corruption	Regulations concerning criminal offence measures in matters affecting international trade and investment.
Approximation of Legislation	Application of international legislation in national legislation. Any form of legislation that provides for approximation of laws. [Appears mainly in customs unions.]
Audio Visual	Promotion of the industry; encouragement of co-production.
Civil Protection	Implementation of harmonized rules and policies.
Competition Policy	**Chapter/provision on competition policy in general, could include prescriptions as regards anticompetitive business conduct; harmonization of competition laws; establishment or maintenance of an independent competition authority, among others.**
Consumer Protection	Harmonization of consumer protection laws and policies; exchange of information and experts; training.
Cultural Cooperation	Promotion of joint initiatives and local culture.
Data Protection	Exchange of information and experts; joint projects.
Economic Policy Dialogue	Exchange of ideas and opinions; joint studies.
Education and Training	Measures to improve the general level of education.
Energy	Exchange of information; technology transfer; joint studies.
Environmental Laws	Development of environmental standards or policies; enforcement of national and international environmental laws; establishment of sanctions for violation of environmental laws; publications of laws and regulation.
Financial Assistance	Policies and rules guiding the granting and administration of financial assistance.
Health	Monitoring of diseases; development of health information systems; exchange of information.

Human Rights	Respect for human rights; policies.
Illegal Immigration	Conclusion of re-admission agreements; prevention and control of illegal immigration.
Illicit Drugs	Treatment and rehabilitation of drug addicts; joint projects on prevention of consumption; reduction of drug supply; information exchange.
Industrial Cooperation	Assistance in conducting modernization projects; facilitation and access to credit to finance.
Information Society	Exchange of information; dissemination of new technologies; training. Cooperation and exchange of information (often in the context of other policies).
Innovation Policies	Participation in framework programs; promotion of technology transfers.
Investment	**Information exchange; Development of legal frameworks; Harmonization and simplification of procedures; National treatment; Establishment of mechanism for the settlement of disputes. Incl. investment policies not covered by TRIMs (e.g. promotion, protection, liberalization of investment measures, among other).**
IPR	**Accession to international treaties not referenced in the TRIPs Agreement. Incl. intellectual property policies and/or the regulation of different types of IPRs not covered by TRIPs.**
Labor Market Regulation	Regulation of the national labor market; affirmation of International Labor Organization (ILO) commitments and standards; enforcement.
Mining	Exchange of information and experience; development of joint initiatives.
Money Laundering	Harmonization of standards; technical and administrative assistance.
Movement of Capital	**Liberalization of capital movement; prohibition of new restrictions.**
Nuclear Safety	Development of laws and regulations; supervision of the transportation of radioactive materials.
Political Dialogue	Convergence of the parties' positions on international issues; encouragement for increased political dialogue.
Public Administration	Technical assistance; exchange of information; joint projects; training.
Regional Cooperation	Promotion of regional cooperation; technical assistance programs.
Research and Technology	Joint research projects; exchange of researchers; development of public-private partnership.
SMEs	Technical assistance; facilitation of access to finance.
Social Matters	Coordination of social security systems; non-discrimination regarding working conditions.
Statistics	Harmonization and/or development and/or exchange of statistical methods and statistics; training.
Taxation	Policies and/or assistance in conducting fiscal system reforms.
Terrorism	Exchange of information and experience; joint research and studies.
Visa and Asylum	Exchange of information; drafting legislation; training. Incl. international movement of persons.

In bold provisions included in the definition of core depth.

Table A2: Shares of value added by sector

Industry name	WIOD sectors	Average value added share
Goods		
Food, Beverages and Tobacco	3	0.268
Textiles and Textile Products	4	0.337
Leather, Leather and Footwear	5	0.307
Wood and Products of Wood and Cork	6	0.328
Pulp, Paper, Paper, Printing and Publishing	7	0.357
Chemicals and Chemical Products	9	0.305
Rubber and Plastics	10	0.323
Other Non-Metallic Mineral	11	0.372
Basic Metals and Fabricated Metal	12	0.299
Machinery, Nec	13	0.337
Electrical and Optical Equipment	14	0.302
Transport Equipment	15	0.276
Manufacturing, Nec; Recycling	16	0.347
Services		
Electricity, Gas and Water Supply	17	0.425
Construction	18	0.386
Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	19	0.532
Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	20	0.577
Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	21	0.613
Hotels and Restaurants	22	0.487
Inland Transport	23	0.495
Water Transport	24	0.357
Air Transport	25	0.316
Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	26	0.478
Post and Telecommunications	27	0.570
Financial Intermediation	28	0.598
Real Estate Activities	29	0.743
Renting of M&Eq and Other Business Activities (has R&D)	30	0.563
Public Admin and Defense; Compulsory Social Security	31	0.651
Education	32	0.772
Health and Social Work	33	0.623
Other Community, Social and Personal Services	34	0.535
Private Households with Employed Persons	35	0.649

Note: value added shares of gross output averaged across the whole WIOD countries sample over 1995-2011.

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