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Abstract

The paper investigates two policies geared toward stimulating and shaping Global Value Chains (GVCs), namely Deep Regional Trade Agreements (DRTAs) and Bilateral Investment Treaties (BITs). In an augmented gravity model, we test the impact of both policies on a variety of trade in value added indicators. We find that both policies are likely to increase GVC trade, although their transmission channels differ. While backward linkages are stimulated through both BITs and DRTAs, forward linkages respond only to DRTAs. The estimates suggest that negotiating a DRTA with investment provisions has a higher impact on trade in value added than signing a shallow RTA and a separate BIT.

JEL Classification: F13, F14, L15

Keywords: Deep Trade Agreements, Bilateral Investment Treaties, Global Value Chains, Trade Policy, Economic Integration.

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Introduction

North-South trade in parts and components results from the reorganization of supply chains between countries (Baldwin and Lopez-Gonzalez 2015). As trade costs fell, and the digital revolution allowed for better monitoring, firms reorganized their production structures. The ensuing paradigm is a production chain fragmented across borders aimed to exploit lower costs of factors of production. The mix between flows of know-how and capital across high income and low income economies is known as Global Value Chains (GVCs) (Baldwin 2016).

For low income countries, one of the benefits of participating in GVCs is the structural transformation push generated by the technological cooperation with high income economies. Such transformation results in the reallocation of labor to higher value added activities, which in turn increase real wages for the local workforce. From the perspective of economic development, it is important to ask which trade policies may help firms in developing countries participate in GVC trade.

Trade in GVCs obeys different contractual settings than trade in final goods. For instance, a popular way of outsourcing production processes is through foreign ownership (Taglioni and Winkler 2016). However, an unknown foreign legal apparatus could make firms worry about the safety of their investment. If in contrast firms look for technical cooperation, they need to ensure that their intellectual property (IP) is respected and that violations are punishable (Antràs 2005). Both Regional Trade Agreements (RTAs) – including investment provisions and intellectual property provisions – and Bilateral Investment Treaties (BITs) play a role in reducing legal uncertainties and homogenizing procedures.

Since their inception, BITs have been designed to protect investment from developed countries in developing economies (Vandevelde 2005). Historically, BITs have been handed to developing countries mostly as a template, in which the burden of enforcement was on them because they were, most often, net receivers of Foreign Direct Investment (FDI). The negotiation framework is different in the case of Deep Regional Trade Agreements (DRTAs) which differ from typical RTAs as they cover a wide range of issues (Hofmann, Osnago and Ruta 2017). In fact, by committing in policy areas that are not covered by the traditional WTO mandate, such as investment, labor and competition, the payoff of the deal hinges both on investment and trade.[2]

The paper examines BITs and DRTAs in a common framework. The goal is to highlight the different channels though which trade in GVCs benefits from RTAs – taking into account their depth – and BITs. We study trade in GVCs along two dimensions, distinguishing between GVC integration as a "buyer" of value added (also referred to as backward GVC linkages) and as a "seller" of value added (also referred to as forward GVC linkages). The tool of choice for the exercise is the standard GVC decomposition of value added in gross exports at the bilateral level (Johnson and Noguera 2012; Koopman, Wang and Wei 2014; and Wang, Wei and Zhu 2013).

We expect a heterogeneous impact of BITs and DRTAs on GVCs for one main reasons. BITs deal exclusively with investment protection. As such, they should facilitate capital flows and the establishment of foreign affiliates. Instead, DRTAs introduce commitments that span beyond investment. As such, they include harmonization policies and trade facilitation efforts that may stimulate compliance with international standards, making participation in GVCs easier.[3] In fact, some of the commitments also favor integration with non-member countries because behind-the-border reforms occur in areas where it is difficult to discriminate between trading partners, thus also benefiting countries that are not signatories to the agreement.

Therefore, the hypothesis to test is that BITs generally contribute to strengthening backward linkages, while DRTAs may in addition foster the development of forward linkages because these linkages are more demanding in terms of policy coordination. Backward linkages are mostly about processing and assembling foreign inputs and exporting the resulting products. To that effect, the protection of investment and IP are essential prerequisites. Forward linkages focus more on the control of the production process and, in addition

[2] Throughout the paper, we define the depth of an RTA as the sum of the policy areas that contain legally enforceable provisions. Quantitatively, the term DRTA refers to those agreements that contain more policy areas than an average RTA.

[3] These policy areas used to be outside of the WTO negotiations and studies related to trade in final goods, but started coming to the forefront with value chain trade, or trade in tasks and components (Baldwin 2011), leading to the inception of the term "WTO-extra" provisions of trade agreements. Such provisions are becoming increasingly common (see Table 4 for the frequency of such provisions appearing in trade agreements).

to the protection of investment and IP rights, may require a stronger cross-border alignment of the competition policies and regulatory environment, e.g. product standards, data protection regulations, and labor laws. Finally, we consider the possibility that the effect of the trade policy varies according to the development level of the ratifying signatory countries.

The econometric analysis tests the impact of RTAs and BITs on GVCs by exploiting the information of three databases. First, we compute measures of integration into GVCs from the EORA input-output tables. These are based on the decomposition of gross exports into domestic value added and foreign value added together with various double counted items. We employ the techniques introduced by (Wang, Wei and Zhu 2013) and implemented by (Quast and Kummritz 2015). We gather the information on deep agreements from the World Bank Content of Preferential Trade Agreements Database (Hofmann, Osnago, and Ruta 2017). Lastly, we use the UNCTAD database on bilateral investment treaties (UNCTAD 2009).

The main finding is that the two policies have heterogeneous effects along the two dimensions of GVC trade, and that the depth of the ratified RTA matters. First, both RTAs and BITs stimulate backward linkages, but the magnitude of the impact of RTAs with investment provisions is systematically higher than the impact of BITs. Second, only RTAs affect forward linkages. This effect is proportional to the agreement's depth. A striking fact is that the effect of an RTA of average depth and a BIT on GVC trade is lower than negotiating trade and investment together in the context of a DRTA. A potential explanation is that for GVC trade necessitates a greater coherence in trade and investment policies as multinational enterprises (MNEs) interact with their foreign affiliates through both channels. In particular, the estimates suggest that an RTA with legally enforceable investment provisions increases the foreign value added in exports sourced from the other signatory party by 3.2%, in contrast to 2.8% for BITs. The depth of an RTA also plays an important role. The increase would be of 10% if the two countries were to sign the deepest RTA in the sample.

We also investigated spillovers in backward linkages and found that BITs have a weak (0.8%), if any, effect on the foreign value added in exports imported from all partners. An effect of the same magnitude applies to RTAs of average depth. In contrast, RTAs with legally enforceable investment provisions increase the foreign content from all sources by 2.3%, while signing the deepest RTA increases this content by 7.4%.[4]

Concerning forward linkages, BITs show neither an increase in trade in parts and components nor in the domestic value added in intermediate exports re-exported to third countries. Only RTAs appear to play a role along this dimension. An RTA with legally enforceable investment provisions increases forward linkages by 2%.[5] This compares to 1.3% for an RTA of average depth and close to 7% if the two countries were to sign the deepest possible RTA. Once we expand the analysis to asymmetric deals, we still find that BITs have systematically lower impact on GVC trade than RTAs.

The paper contributes to an increasingly prolific strand of literature on the effects of RTAs on trade.[6] The literature has greatly benefited in recent years from the availability of databases on the design and content of trade agreements.[7] Our paper contributes to the existing empirical literature on the effect of trade agreements by extending the analysis to GVC trade in developing countries, and running a horse race between RTAs and BITs.

The idea that GVC and deep integration are connected goes back to Lawrence (1996) and Baldwin (2010). It was formalized in theoretical papers by Antràs and Staiger (2012) who show that offshoring of intermediate inputs creates problems of global policy cooperation that require DRTAs, and by Ornelas, Turner and Bickwit (2018) that model international sourcing decisions under incomplete contracting and endogenous matching, resulting in underinvestment that can be mitigated by RTAs. Some empirical tests have been undertaken in Laget et al. (2018), Orefice and Rocha (2014), and Rubínová (2017). All three papers are unanimous in establishing a link between DRTAs and an increase in value chain linkages, and in the stronger effect of North-South agreements. In addition, Laget et al. (2018) and Orefice and Rocha (2014) find that the effect is larger for higher value added industries, while Rubinova (2017) shows that provisions on investment and

[4] The deepest possible RTA in our sample encompasses 44 legally enforceable policy areas.

[5] Measured by domestic value added in intermediate exports re-exported to third countries.

[6] An extensive survey of the literature on the effects of trade agreements is available in Limão (2016).

[7] There are three major databases on the design and content of trade agreements, respectively produced by the WTO (WTO 2011), World Trade Institute (Dür, Baccini and Elsig 2014) and the World Bank (Hofmann, Osnago and Ruta 2016). We use the database of the World Bank as it provides the most extensive coverage.

trade in services are important for integration of least developed economies in global value chains.The paper fills a gap by calculating the impact of yet another policy instrument, BITs.

The literature on BITs mostly focuses on their impact on FDI. While some studies have concluded that there is no effect, the most recent ones find that BITs effectively reduce investment transaction costs and result in more FDI (see for a survey of literature Sauvant and Sachs 2009, as well as Osnago, Rocha and Ruta 2016, and Osnago, Rocha and Ruta (forthcoming) for specific examples in cross-country settings). At the firm level, Egger and Merlo (2012) show, using data on German MNEs, that BITs act at various margins at the firm level. BITs reduce the investment risks and generate both more active firms in the country receiving investment (extensive margin) and more sales per firm (intensive margin). We build on their econometric evidence to argue that since MNEs are at the heart of GVC trade, it is likely that there is an effect of BITs on GVC trade.

The remainder of the paper is structured as follows. Section 2 presents the data and defines the variables of interest for the empirical analysis. Section 3 outlines the identification strategy, which revolves around the gravity equation. Section 4 comments on the magnitude of the results. Section 5 concludes.

1. Data Description

The econometric analysis uses three major sources. The EORA multi-regional input-output tables (Lenzen, Moran, Kanemoto and Geschke 2013), the World Bank database on the Content of RTAs (Hofmann et al. 2017) and the UNCTAD database on Bilateral Investment Treaties (UNCTAD 2009).

The input-output tables from EORA have the advantage of providing the greatest country coverage available for this type of data. They cover intra and inter-industry trade flows for 26 industries and 189 economies (listed in Table 9 of the Annex). In contrast to other multi-regional input-output tables, EORA covers many developing countries. However, such a large coverage comes at a cost. For countries where national input-output tables are not available, they are imputed from countries with similar economic characteristics. In spite of this caveat, they are the only input-output tables with enough coverage to make some inference on developing countries. We apply the algorithm developed in Quast and Kummritz, (2015) to the EORA tables to extract the bilateral trade in value added indicators developed by Wang, Wei and Zhu (2013).[8] Their methodology decomposes gross exports in 16 separate terms, which can be grouped in four categories. Thus, exports from country *i,* to country *j* are the sum of four major aggregates*:*

$$Exports_{ij} = VAX_{ij} + RDV_{ij} + FVA_{ij} + PDC_{ij} \qquad (1)$$

Each term on the right-hand side of equation (1) accounts for the use of exports, which serve either final demand or contribute to the production of exports. The first term, *VAX*, stands for value added exports. It is the domestic value added in exports absorbed abroad. The second term, *RDV*, represents the returned domestic value added in exports. These are the part of exports that are shipped back (after further processing) to be absorbed in country *i.* The third term, *FVA*, is the foreign value added in exports. It accounts for all the value in exports that originated from foreign sources. Lastly, *PDC*, are referred to as pure double counted items.

As described by Wang, Wei, & Zhu (2013), each element in equation (1) can be further decomposed into particular items, that are helpful to distinguish between backward and forward GVC linkages.

Backward linkages refer to the contribution from foreign inputs to the production of domestic exports. For example, a cell phone assembled in country *i* may have been designed and contain R&D content from country *j* or a third country. In equation (1), the element that captures such foreign contribution is *FVA*, and hence it is our first indicator of backward linkages. Furthermore, the decomposition allows to extract from *FVA* the foreign contribution from the direct partner, *MVA,* and the contribution of any other partner, *OVA*:[9]

$$FVA_{ij} = MVA_{ij} + OVA_{ij} \qquad (2)$$

[8] See the Annex for an explanation on the methodology.

[9] The separation of foreign value added of intermediate exports and final exports is intentionally avoided to simplify the exposition.

The term *MVA* is of particular importance as it captures the purely bilateral foreign content of exports, while *FVA* encompasses all the trading partners of country *i*. This is our second variable measuring backward linkages.

Forward linkages are the reverse of the medal. They represent the contribution made through a country's exports to the production of exports to third countries. Since they refer to the domestic content of exports, they are part of *VAX* in equation 1 which can be separated into two categories. Domestic value added in intermediate and final goods that is going to be absorbed for final consumption in the importing country, *DVA*, and domestic value added in intermediate goods that is going to be re-exported by country *j, DVA_int_rex*.

$$VAX = DVA_{ij} + DVA\_int\_rex_{ij} \qquad (3)$$

To focus on forward linkages of GVCs, we need to focus on intermediate goods that are going to be processed and re-exported by the partner country. Thus, *DVA_int_rex* is a suitable indicator of forward linkages. For completeness, exports of intermediate goods are proposed as an alternative indicator of forward linkages. The four indicators (see Table 1) of forward and backward GVC integration are computed for each available country-pair and time period.[10]

Table 1 Value added indicators

Variable name	Variable description	Interpretation
MVA	Foreign value added in (final and intermediate goods) exports sourced from direct importer.	Measure of backward linkages in value chains with a specific partner. It represents integration as a "buyer" of value added in a purely bilateral sense.
DVA_INTrex	Domestic value added in intermediate exports re-exported to third countries.	Measure of forward linkages in value chains with a specific partner. It represents integration as a "seller" of value added via the direct partner.
EXP_INT	Exports of intermediate goods.	Measure of forward linkages in value chains. In gross terms, this is trade in parts and components, and indicator of GVC integration as a "seller".
FVA	Foreign value added in (final and intermediate goods) exports.	Measure of backward linkages in value chains. It represents integration as a "buyer" of valueadded accounting for all the foreign value in bilateral exports.

Note: Variables extracted form EORA multi-regional input-output tables using the R statistical package decompr from Quast and Kummritz (2015). We compute the variables according to the procedure in developed by Wang, Wei, Yu and Zhu (2017). All indicators are bilateral.

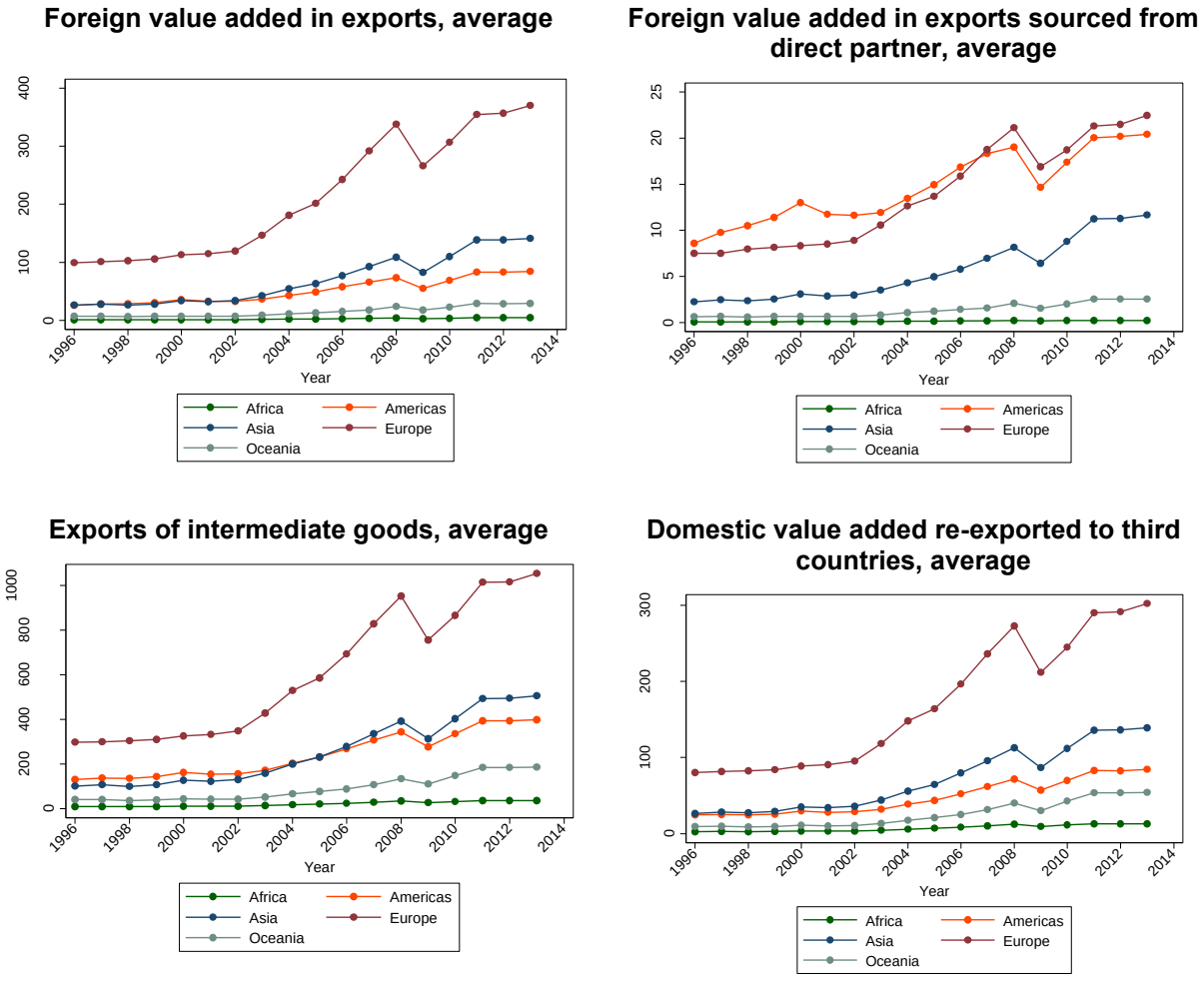
Summary statistics on the four variables are presented in Table 10 of the Annex. By construction. foreign value added in exports, *FVA*, has a higher average (75.9 mln US dollars) than foreign value added in exports

[10] The industries in EORA are aggregated to match the data variability available on BITs and RTAs.

sourced from direct partner, *MVA*, (7.6 mln US dollars) across all country-pairs and time periods in our dataset. Exports of intermediate goods have a relative higher average magnitude (average of 256.9 mln US dollars), while the domestic value added in intermediate goods re-exported to third countries is of the same order of magnitude as the backward integration variables (average of 68.5 mln US).

Developed countries show stronger forward integration into value chains; while developing countries exhibit relatively stronger backward linkages (see Table 11 of the Annex for the specific values of each indicator for selected countries of different income levels and geographic regions). All measures of value chain integration went up during the 1996-2013 period covered by the paper, with a slump in 2008-2009 as a result of the financial crisis. Africa is the only region with stagnating GVC trade. European countries top all four dimensions, following by Asian countries leading over the Americas on all reported indicators but one (Figure 1).[11]

Figure 1 Evolution of value added trade, by region



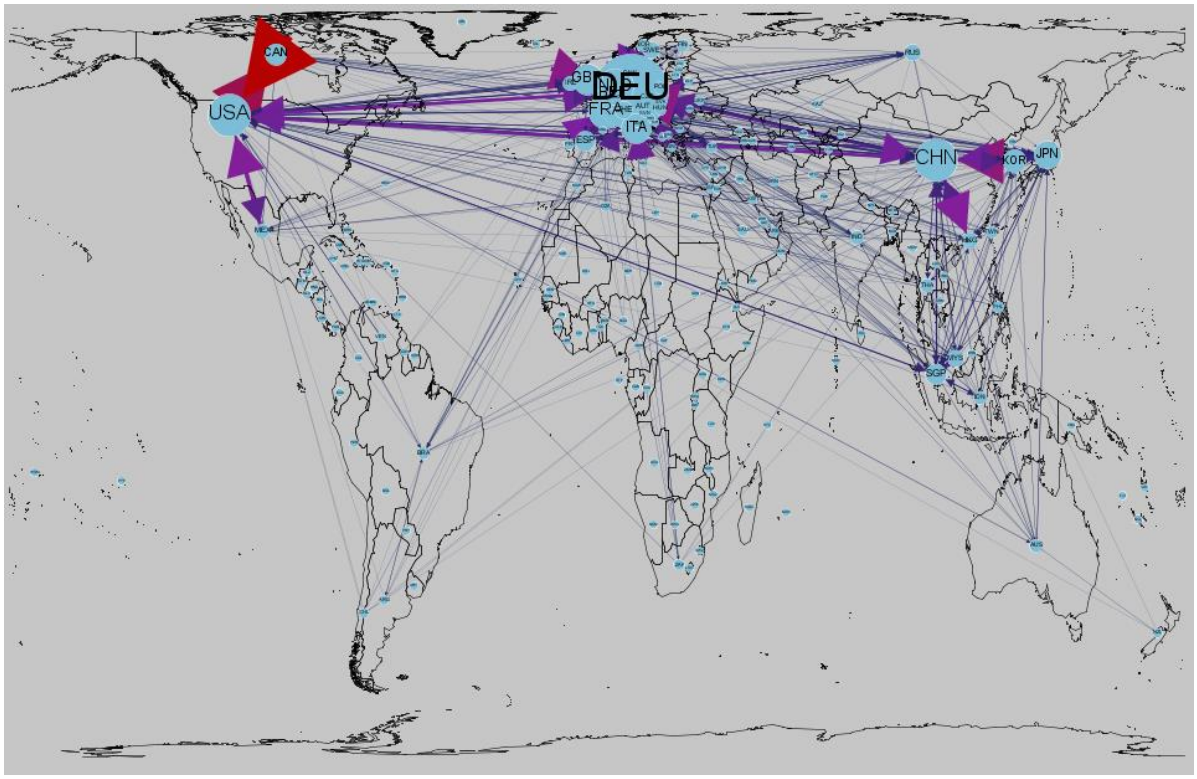
Note: Variables are computed at the country-pair level according to the procedure in developed by Wang, Wei, Yu and Zhu (2017), and aggregated, first, to the origin country using simple averages across partner countries, and, second, to the origin regions, using a simple average of origin countries. Regions are defined based on standard definitions by UN Stat.

Source: Variables extracted form EORA multi-regional input-output tables using the R statistical package decompr from Quast and Kummritz (2015).

[11] Trends in the value chain trade are documented and analyzed in Johnson and Noguera 2012, 2017.

The network of value added in 2013 according to the GVC indicators consists of three main hubs (Figure 2): Germany, the United States and China. In addition, some countries such as Korea, Japan, France, Great Britain and Italy are also big players. The observation is consistent with the findings of Taglioni and Winkler (2016) using the OECD Trade in Value added (TiVA) database. Overall, the image shows that there are similar patterns in the EORA and TiVA databases. North America, Europe and Asia are the most interconnected regions, while GVC trade is less important in South Asia, Africa and South America.

Figure 2 Network of vertical trade



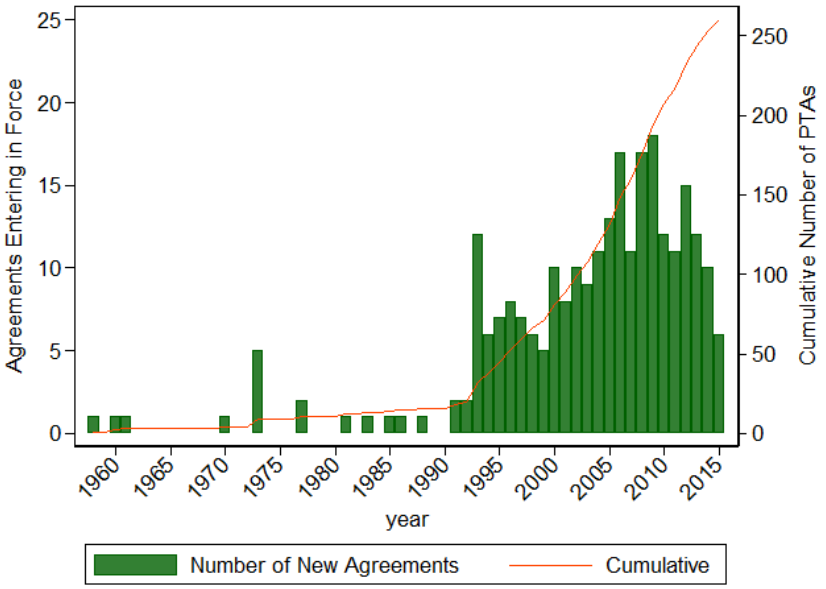
Note: Included are all the 179 country pairs in out estimation sample. The size of the arrows is proportional to the amount of vertical trade. Vertical trade is the sum between domestic value-added re-exported and foreign content of exports. We plot flows that are at least 1% as large as the largest flow. The technicality is needed to avoid having a too dense network in the graphical representation.

Source: Authors' calculations based on EORA multi-regional input-output tables.

The second source of information is the database put together by the World Bank on the content of deep trade agreements (Hofmann et al. 2017). The database maps the provisions of 261 agreements in 189 countries into 52 policy areas and classified according to their legal enforceability.[12] The empirical analysis focuses on legally enforceable (L.E., henceforth) provisions. The number of policy areas with L.E. provisions ranges from 1 to 44, with an average of 16. We measure the depth of an RTA as the count of policy areas containing legally enforceable provisions. The more policy areas an agreement covers, the deeper it is. Figure 3 depicts the surge in RTAs over time.

[12] We exclude all the partial scope agreements from the analysis, which reduced the number of agreements considered from 279 to 261.

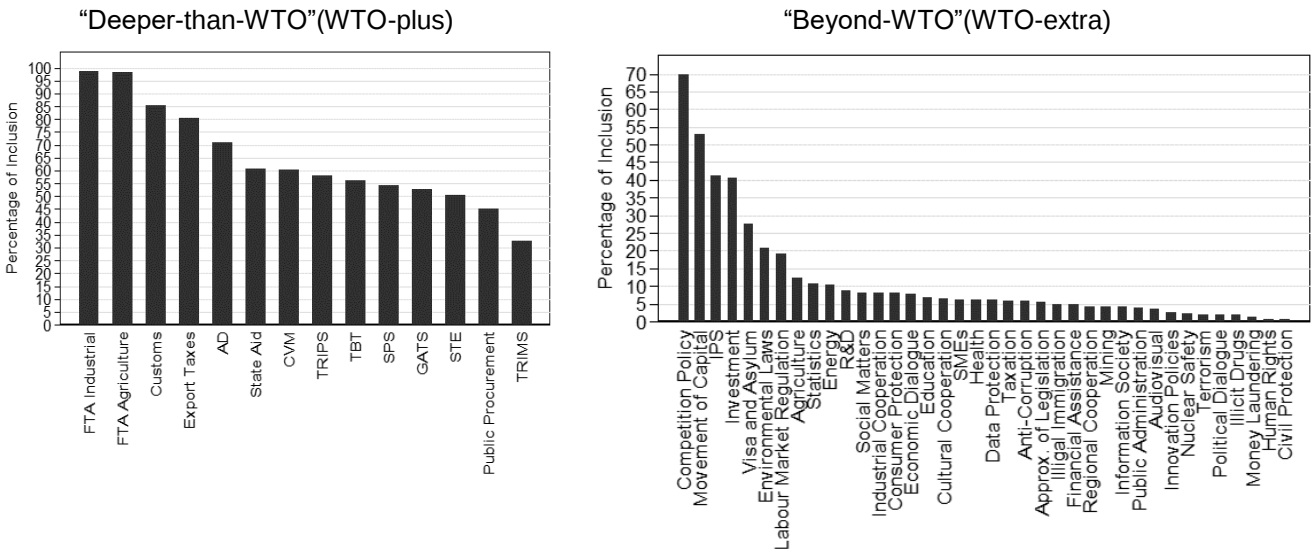
Figure 3 Growing number of RTAs



Source: World Bank's Content of Deep Trade Agreements Database (Hofmann, Osnago and Ruta 2017). In the figure, we include all the agreements in force in 2015.

In Figure 4, we show the type of provisions in the database separated in areas that fall under the WTO mandate (WTO-plus) and areas that go beyond the WTO mandate (WTO-extra). One can notice that WTO-extra provisions are far from common. 40% of the agreements in the sample cover investment issues, and 94% of DRTAs contain investment provisions which justifies looking at RTAs by their composition when comparing them to BITs. We also notice that the on average customs unions and economic integrated unions cover more provisions than most free trade agreements (Figure 4).

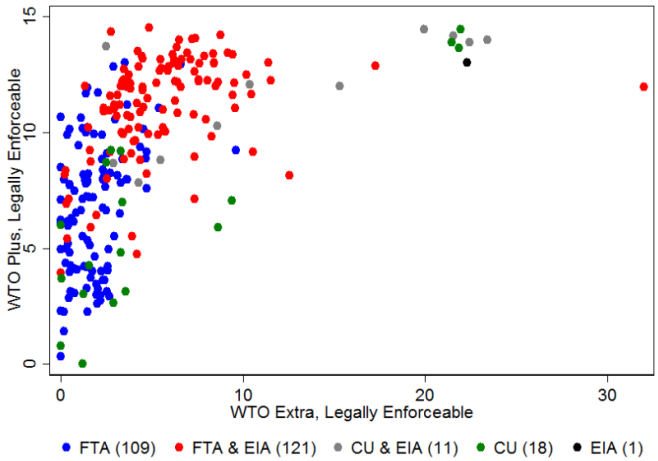
Figure 4 Content of RTAs



Note: Included are all the 261 agreements in force in 2015. Averages are by agreement. Only legally enforceable provisions are plotted.

Source: Authors' calculations based on World Bank's Content of Deep Trade Agreements (Hoffman, Osnago and Ruta 2017).

Figure 5 The relations between the type of agreements and the number of provisions



Note: Included are all the agreements in force in 2015. FTA stands for Free Trade Agreement, EIA for Economic Integrated Area, CU for Customs Union.

Source: Authors' calculations based on World Bank's Content of Deep Trade Agreements (Hoffman, Osnago and Ruta 2017).

The web of trade agreements is also very interesting, as countries and regions with high value-chain activity are also well integrated in terms of the number of policy areas covered (Figure 6). The European Union countries are the most integrated with respect to that. Korea, Peru, Mexico and Chile also have on average agreements that cover more policy areas than the average.

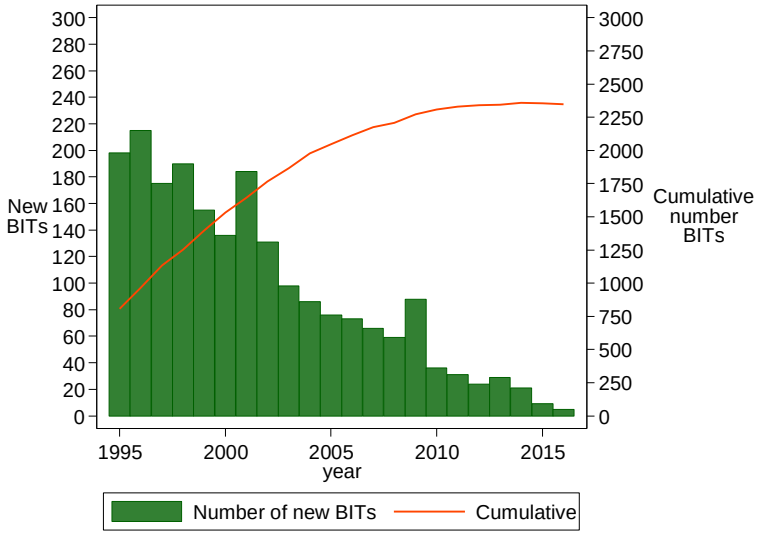
Figure 6 Network of deep trade agreements

Note: Included are all the 261 agreements in force in 2015. Averages are by agreement. Only policy areas with legally enforceable provisions are plotted.

Source: Authors' calculations based on World Bank's Content of Deep Trade Agreements (Hoffman, Osnago and Ruta 2017).

Lastly, we use the UNCTAD database on bilateral investment treaties. The sample covers bilateral trade in value added between 179 countries between 1995 and 2016. We notice that although there are more and more BITs in force, the number of newly signed BITs has been declining through time (Figure 7). We observe this because many country pairs already have a BIT.

Figure 7 Decrease in BIT signatures

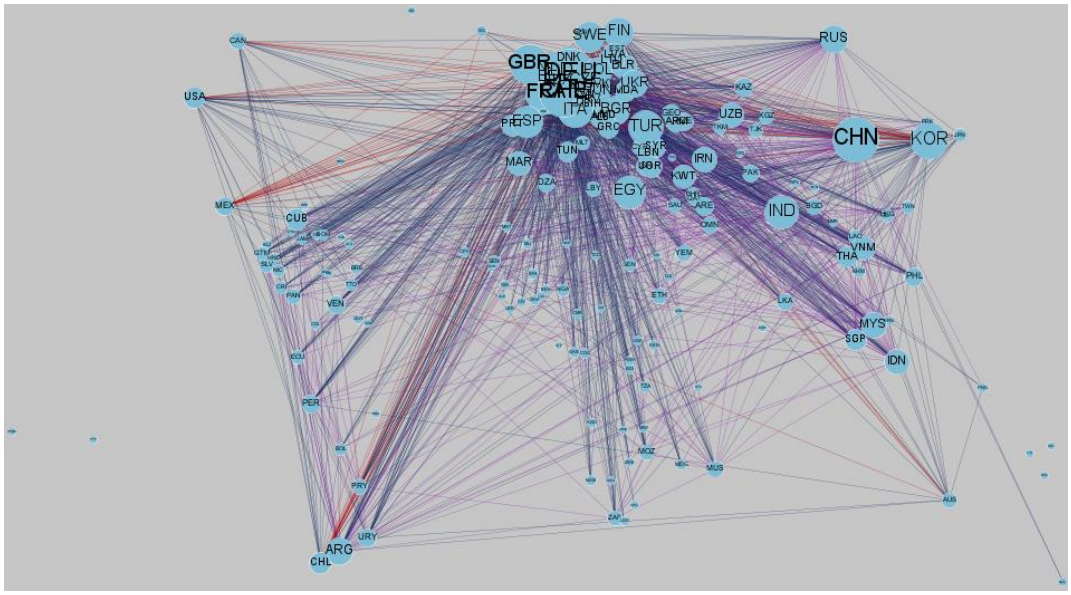


Note: Included are all Bilateral Investment Treaties (BITs) in force in 2015.

Source: Based on UNCTAD's database on Bilateral Investment Treaties.

Figure 8 shows the network of BITs in force, separating between South-South, North-South and North-North agreements. The Figure is a good example of how trade policy for BITs has evolved. Some countries that have relatively shallow trade agreements are champions in the promotion of BITs (China, Russia, and India).

Figure 8 Network of bilateral investment treaties



Note: Included are all Bilateral Investment Treaties (BITs)in force in 2015. In dark blue, we plot all North-South BITs, in red all the North-North BITs and in violet all the South-South BITs.

Source: Authors' calculations based on UNCTAD's database on Bilateral Investment Treaties.

2. Econometric Specification

The goal of the econometric exercise is to assess the effect of trade agreements and bilateral investment treaties on GVC trade. GVC trade is measured through four different dependent variables defined in the previous section denoting integration as a "buyer" or as a "seller" of value added. They all exhibit bilateral and time variability. The starting point of our analysis is the augmented gravity framework used to estimate the impact of deep trade agreements on trade in (Mulabdic, Osnago and Ruta 2017). In their seminal work, they estimate bilateral trade flows in value added terms using the standard gravity model framework. For each of our GVC variables we postulate a gravity model in logarithms.

$$\log(Trade\_in\_VA)_{ijt} = \beta_1 Trade\_policy\_action_{ijt} + \mu_{ij} + \delta_{it} + \rho_{jt} + \epsilon_{ijt} \quad (4)$$

$$\epsilon_{ijt} \sim IID(0, \sigma_{ij}^2) \quad (5)$$

We measure $Trade\_in\_VA_{ijt}$ as trade in value added of country *i* with country *j* at time *t* in millions of US dollars. We consider three different variables as $TradePolicyAction_{ijt}$. First, the existence of an RTA agreement (a dummy variable taking the value 1 if there is an RTA in place between country *i* and country *j* at time *t*). Second, a variable that denotes the count of provisions that an RTA has between country *i* and country *j* has at time *t*.[13] Third, a dummy taking the value 1 if there is a BIT in place between the two countries at time *t*.

Four variables proxy for trade in value added. Two "buyer" related measures and two "seller" related ones. The "buyer" variables are foreign value added form the direct partner and foreign value added in exports form all partners. The "seller" variables are exports of intermediate goods and the domestic value added re-exported to third countries. We estimate the model using ordinary least squares with exporter-time, importer-time and exporter-importer fixed effects. The standard errors are clustered across country pairs.

Since the EORA input-output tables provide a complete picture of the world economy, we observe that less than 1% of value added trade flows at the aggregate country level are zeros. Therefore, in our baseline specification we estimate the model using ordinary least squares with exporter-time, importer-time and exporter-importer fixed effects. As a robustness check, we estimate the models using the Poisson Pseudo Maximum Likelihood (PPML) estimator. Finally, we run the regressions separating countries into "North" and "South" groups by their level of development to infer the impact of asymmetric deals.

3. Results

Table 2 and Table 3 report the results for the two "buyer" related GVC measures. They are both based on the foreign value added concept, which is the use of intermediate foreign goods and services in a country's exports. Table 2 shows the effect of the bilateral trade policy action variables on the foreign value added sourced from the direct trading partner. The coefficient on the RTA dummy implies that, compared to a situation with no agreement, signing an RTA increases the foreign value added content in exports sourced from the direct partner by 2.8% (column 1). The coefficient is similar for the BIT variable which also leads to an increase of about 2.8% (column 3). However, signing an RTA that contains legally enforceable investment provisions rises the effect to 3.2%, while signing the deepest trade agreement appears to increase foreign value added content by 10% (columns 4). Column 5 shows the results of the model that simultaneously includes RTAs with investment provisions and BITs. We observe that an RTA covering investment has a greater impact than a BIT, as the two coefficients are statistically different at the 1% level.

[13] Normalized between 0 and 1. Thus, the interpretation of the coefficient is the effect of signing the deepest trade agreement in the sample which covers 44 policy areas.

Table 2 Effect of RTAs and BITs on foreign value added sourced from direct partner

Explanatory variables	(1) Foreign value added from direct partner (in logs)	(2) Foreign value added from direct partner (in logs)	(3) Foreign value added from direct partner (in logs)	(4) Foreign value added from direct partner (in logs)	(5) Foreign value added from direct partner (in logs)
RTA dummy	0.0280***				
	(0.00572)				
RTA with L.E. investment provisions		0.0316***			0.0308***
		(0.00745)			(0.00744)
BIT dummy			0.0278***		0.0270***
			(0.00709)		(0.00709)
Depth of agreement				0.0999***	
				(0.0115)	
Observations	568,258	568,258	568,258	568,258	568,258
R-squared	0.987	0.987	0.987	0.987	0.987
Country-pair FE	YES	YES	YES	YES	YES
Exporter-year FE	YES	YES	YES	YES	YES
Importer-year FE	YES	YES	YES	YES	YES

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

In Table 3, we estimate the foreign value added from all sources. This is a way to capture spillovers of trade policy into GVC integration. In fact, it could well be that the signature of a DRTA results in many behind-the-border reforms, where there is little room to discriminate between trading partners. The coefficients from Table 3 suggest there are positive effects from a bilateral or regional DRTA on sourcing inputs from all other partners. The impact appears to be much lower than when focusing on the direct partner. Still, there is a small positive spillover effect of trade agreements. Once again, we observe in the first two columns that the effect of signing an RTA of average depth and a BIT have roughly the same effect. Although, in the case of foreign value added from all sources the increase is more modest at 0.8%. Once again, we notice that deep trade agreements with legally enforceable provisions have a strong effect in the foreign value added content of exports (column 2). According to column (4) the effect of signing the deepest agreement is about 7.4%. Column 5 simultaneously includes an RTA with L.E. investment provisions and a BIT and shows that the effect of the RTAs with investment provisions is positive and statistically significant, while the effect of the BIT is not significant in the presence of an RTA covering investment.

Table 3 Effect of RTAs and BITs on foreign value added

Explanatory variables	(1) Foreign value added in exports (in logs)	(2) Foreign value added in exports (in logs)	(3) Foreign value added in exports (in logs)	(4) Foreign value added in exports (in logs)	(5) Foreign value added in exports (in logs)
RTA dummy	0.00847*				
	(0.00441)				
RTA with L.E. investment provisions		0.0233***			0.0230***
		(0.00568)			(0.00569)
BIT dummy			0.00809*		0.00754
			(0.00490)		(0.0049)
Depth of agreement				0.0740***	
				(0.00897)	
Observations	573,352	573,352	573,352	573,352	573,352
R-squared	0.965	0.965	0.965	0.965	0.965
Country-pair FE	YES	YES	YES	YES	YES
Exporter-year FE	YES	YES	YES	YES	YES
Importer-year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses clustered by country pair.

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

In Table 4 and Table 5, we report the two “seller” related GVC measures. As expected, BITs appear to have no effect in value added that is re-exported by the direct partner. In Table 4, we evaluate how the policy action increases domestic value added re-exported to third countries. We find that the impact for an average RTA is to increase the domestic value added re-exported to third countries by 1.3% (column 1). If the agreement contains legally enforceable investment provisions, the effect increases to 2% (column 2). Once again, signing the deepest agreement in the sample has a strong effect, with an increase of 6.8%. The BITs do not have any effect on this type of flows. The model with RTAs with investment provisions and BITs demonstrates that the effect of such RTAs is positive and statistically significant, while the effect of BIT is not significant if the RTA is present.

Table 4 Effect of RTAs and BITs on domestic value added re-exported to third countries

Explanatory variables	(1) Domestic value added re-exported (in logs)	(2) Domestic value added re-exported (in logs)	(3) Domestic value added re-exported (in logs)	(4) Domestic value added re-exported (in logs)	(5) Domestic value added re-exported (in logs)
RTA dummy	0.0132***				
	(0.00410)				
RTA with L.E. investment provisions		0.0195***			0.0195***
		(0.00551)			(0.00551)
BIT dummy			7.65e-05		-0.00038
			(0.00489)		(0.00488)
Depth of agreement				0.0684***	
				(0.00874)	
Observations	567,768	567,768	567,768	567,768	567,768
R-squared	0.965	0.965	0.965	0.965	0.965
Country-pair FE	YES	YES	YES	YES	YES
Exporter-year FE	YES	YES	YES	YES	YES
Importer-year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses clustered by country pair.

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

Table 5 Effect of RTAs and BITs on intermediate goods' exports

Explanatory variables	(1) Exports of intermediate goods (in logs)	(2) Exports of intermediate goods (in logs)	(3) Exports of intermediate goods (in logs)	(4) Exports of intermediate goods (in logs)	(5) Exports of intermediate goods (in logs)
RTA dummy	0.0103***				
	(0.00395)				
RTA with L.E. investment provisions		0.0260***			0.0259***
		(0.00488)			(0.00489)
BIT dummy			0.00559		0.00496
			(0.00426)		(0.00426)
Depth of agreement				0.0755***	
				(0.00784)	
Observations	573,516	573,516	573,516	573,516	573,516
R-squared	0.963	0.963	0.963	0.963	0.963
Country-pair FE	YES	YES	YES	YES	YES
Exporter-year FE	YES	YES	YES	YES	YES
Importer-year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses clustered by country pair.

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

The results pertaining to the depth of the agreement in Tables 2-5 are in line with the finding in Laget et al. (2018), that adding a policy area to a trade agreement increases both forward and backward global value chain linkages. They reason that countries sign DRTAs to promote and facilitate the operation of global value chains. Furthermore, our results are in line – but with a lower order of magnitude – with Orefice and Rocha (201) who show that on average, signing deeper agreements increases production networks trade between member countries by almost 35 percentage points, with the impact of deep integration more significant for industries requiring higher levels of regulation.

A summary of the findings is streamlined in Table 6, showing the effect of policies in original units and in standard deviations. We notice that the strongest effect of trade agreements is to strengthen backward linkages with the direct partner. Deep agreements have an effect that is at least 3 times as large as the effect of an average BIT. Notice that signing an RTA of average depth and a BIT always has a lower effect than signing a deep trade agreement.

Table 6 Summary of findings, RTAs, BITs and GVC trade

Trade policy action	(1) Increase in foreign value added from partner	(2) Increase in foreign value added in exports	(3) Increase in intermediate goods exports to partner	(4) Increase in domestic value added re-exported by partner
RTA ratification, average depth	2.8% (0.008s.d.)	0.8% (0.003s.d.)	1% (0.004s.d.)	1.3% (0.005s.d.)
Deep trade agreement	9.9% (0.027s.d.)	7.4% (0.026s.d.)	7.6% (0.029s.d.)	6.8% (0.025s.d.)
BIT ratification	2.8% (0.007s.d)	0.8% (0.003s.d.)	Not significant	Not significant

Estimates from gravity model. GVC indicators using Wang, Wei and Zhu (2013)decomposition implemented by Quast and Kummritz (2015). Numbers in parenthesis are the regression coefficients with the dependent variables in standard deviations and the independent variables in original units (ratification of an agreement) for ease of interpretation of the magnitude of the results. Fully standardized coefficients (available upon request) show that the effect of one s.d. increase in the BIT variable is always inferior that of an RTA of the average depth.

The standardized coefficients may appear modest in magnitude, yet they are comparable to the findings of existing papers. Most used indicator in the existing literature is trade in intermediate goods. We find that an RTA of average depth increases trade in intermediate goods by 1% or 0.004 standard deviation of the outcome variable (column 3, Table 6). First, the magnitude is close to the findings of Johnson and Noguera (2014), who report 0.39%. Their coefficient is smaller because their sample covers the period 1970-2009, while our sample is from 1996 to 2013. With the share of intermediate goods in total trade increasing over time, we can expect higher coefficients in samples with more recent data. Second, Orefice and Rocha (2014) show that on average, DRTA increases production networks trade between member countries by 18%. Our result is 7.6% but again, the difference may easily stem from difference in the data coverage. Orefice and Rocha (2014) included 66 agreements, mostly from developed countries (that are more integrated into value chain trade), while our data covers 261 agreements, including even the smallest countries such as the Gambia and Vanuatu.

Robustness Check

Our data contains less than 1% of zero observations, but may suffer from heteroscedasticity. To address this potential issue we reproduce our baseline results (presented in Tables 2-6) applying Poisson Pseudo Maximum Likelihood (PPML) estimator to the structural gravity model (Santos Silva and Tenreyro 2006). The results for foreign value added in exports and intermediates goods exports are reconfirmed (Table 12-15 of the Annex).

With regard to the backward linkages, the ratification of an RTA with legally enforceable investment provisions leads to 1.6% increase in foreign value added in exports (column 1), which is also positively related with the depth of the agreement (column 4) (Table 13). BITs and RTAs of an average depth bear no impact (column 1 and 3 respectively). When BITs and RTAs with investment provisions are integrated in the same model, the RTAs effect is re-confirmed while the BITs do not influence foreign value added in exports, measuring integration of a country into value chains as a “buyer” (column 5) (Table 13). When analyzing forward linkages using PPML estimations, we reconfirm that ratification of an RTA increases exports of intermediate goods by 1.7% while BITs do not influence this GVC indicator (Table 15).

North-South RTAs and BITs

In this section, we separate the effect of RTAs and BITs by country groups. The goal is to understand if North-South, North-North and South-South agreements exhibit special features. The intuition would be that since institutions are different in the South, a deep trade agreement may reduce policy uncertainty of firms' in the North willing to develop GVC trade with countries in the South. We compute the effect by interacting the BIT and the deep trade agreements variables with a dummy that distinguishes importer and exporter development groups. We proxy the North by OECD membership. Non-OECD countries are considered as part of the South. Once again, the comparison is only possible thanks to the coverage of the EORA database.

In Table 7, we separate the effects of deep trade agreements and BITs whenever the trading partners belong to different income groups. We find that the effect of deep trade agreements is greater between South-South and North-North partnerships for direct backward linkages in gross exports (column 2). BITs sill appears to play a role but only in North-North and North-South trade relationships (column 1). The effect of deep trade agreements is of 16% for North-North (column 3). BITs still appear to play a role but only in North-North and North-South trade relationships. The finding on BITs corroborates the evidence that the depth of trade agreements is correlated with vertical FDI through the regulatory provisions that improve the contractibility of inputs provided by suppliers (Osnago, Rocha and Ruta, forthcoming).

Table 7 BITs, RTAs and North-South GVCs, effect on value added sourced from direct partner

	(1)	(2)	(3)
Explanatory Variables	Foreign value added from direct partner (in logs)	Foreign value added from direct partner (in logs)	Foreign value added from direct partner (in logs)
BIT North-North	0.0822***		0.0597***
	(0.0184)		(0.0164)
BIT South-South	0.00474		0.00277
	(0.0123)		(0.0123)
BIT North-South	0.0352***		0.0393***
	(0.00920)		(0.00923)
Deep agreement North-North		0.159***	0.160***
		(0.0154)	(0.0154)
Deep agreement South-South		0.0963***	0.0962***
		(0.0339)	(0.0339)
Deep agreement North-South		0.0504***	0.0459***
		(0.0163)	(0.0163)
Observations	568,258	568,258	568,258
R-squared	0.987	0.987	0.987
Country-pair FE	YES	YES	YES

Exporter-year FE	YES	YES	YES
Importer-year FE	YES	YES	YES

Robust standard errors in parentheses clustered by country pair.

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

In Table 8, we notice that the effect is smaller for forward linkages than for backward linkages. We do not find any effect for both deep trade agreements and BITs in South-South domestic value added re-exported to third countries. Once a deep trade agreement is in place, we do not notice any effect from BITs. In column (3) we estimate the effect of North-South trade agreements to increase direct forward linkages of about 3%. North-North deep agreements appear to have a stronger effect at 14%. These findings are in line with Laget et al (2018) showing that trade agreements with provisions outside the current mandate of the WTO drive the effect of trade agreements on North-South trade in parts and components, because GVC trade necessitates a stronger alignment in investment and competition policies, and those policies generally differ greatly between developed and developing countries.

Table 8 BITs, RTAs and North-South GVCs, effect on domestic value added re-exported by the partner

	(1)	(2)	(3)
Explanatory Variables	Domestic value added re-exported (in logs)	Domestic value added re-exported (in logs)	Domestic value added re-exported (in logs)
BIT North-North	0.0331**		0.0140
	(0.0132)		(0.0117)
BIT South-South	-0.00595		-0.00655
	(0.00822)		(0.00823)
BIT North-South	-0.000219		0.00351
	(0.00650)		(0.00650)
Deep agreement North-North		0.135***	0.135***
		(0.0122)	(0.0123)
Deep agreement South-South		-0.00150	-0.000487
		(0.0232)	(0.0232)
Deep agreement North-South		0.0260**	0.0255**
		(0.0122)	(0.0122)
Observations	567,768	567,768	567,768
R-squared	0.965	0.965	0.965
Country-pair FE	YES	YES	YES
Exporter-year FE	YES	YES	YES

Importer-year FE	YES	YES	YES

Robust standard errors in parentheses clustered by country pair.

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

4. Conclusions

TThe proliferation of RTAs is nothing new, but their content is changing. Nowadays, the scope of regional trade agreements goes beyond provisions traditionally regulated by the WTO. A growing percentage of new agreements deals with investment, government procurement and competition policy (Baldwin 2011). In the paper, we find that for GVC, DRTAs have a greater effect than standalone shallow RTAs and BITs. The role of investment provisions seems to be particularly important. The result could help in explaining the slowdown on signatures of BITs in favor of more comprehensive trade deals.

The comparison between BITs and DRTAs reveals different patterns that appear to offer different policy strategies for countries. Both BITs and DRTAs are associated with an increase in GVC trade. However, BITs act only on backward linkages and hence on the use of foreign inputs. Instead, deep trade agreements act along the two dimensions of GVC integration, fostering both backward and forward linkages. This finding is especially relevant for developing countries that aim at fostering forward linkages and diversify from relatively upstream activities such as assembly duties.

The current political landscape suggests a revival of interest in mercantilist policies. In such context, negotiations of deeper regional integration may face temporary setbacks. BITs exhibit a lower political cost in negotiations because of their narrower coverage. In the present paper, we show that this more contained policy can also yield substantial gains, which may fit the bill of the current political landscape. However, the main result is that deep trade agreements have a greater effect on trade than an RTA of an average depth coupled with a BIT.

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Appendix

Table 9 Economies covered by the analysis

Afghanistan	Burundi	French Polynesia	Kuwait	New Zealand	Spain
Albania	Cambodia	Gabon	Kyrgyzstan	Nicaragua	Sri Lanka
Algeria	Cameroon	Gambia	Lao PDR	Niger	Sudan
Andorra	Canada	Georgia	Latvia	Nigeria	Suriname
Angola	Cape Verde	Germany	Lebanon	Norway	Swaziland
Antigua and Barbuda	Cayman Islands	Ghana	Lesotho	Oman	Sweden
Argentina	Central African Republic	Greece	Liberia	Pakistan	Switzerland
Armenia	Chad	Greenland	Libya	Panama	Syrian Arab Republic
Aruba	Chile	Guatemala	Lithuania	Papua New Guinea	Taiwan
Australia	China	Guinea	Luxembourg	Paraguay	Tajikistan
Austria	Colombia	Guyana	Macao	Peru	Tanzania
Azerbaijan	Congo (Brazzaville)	Haiti	Macedonia	Philippines	Thailand
Bahamas	Costa Rica	Honduras	Madagascar	Poland	Togo
Bahrain	Croatia	Hong Kong	Malawi	Portugal	Trinidad and Tobago
Bangladesh	Cuba	Hungary	Malaysia	Qatar	Tunisia
Barbados	Cyprus	Iceland	Maldives	Romania	Turkey
Belarus	Czech Republic	India	Mali	Russian Federation	Turkmenistan
Belgium	Cote d'Ivoire	Indonesia	Malta	Rwanda	Uganda
Belize	Denmark	Iran	Mauritania	Samoa	Ukraine
Benin	Djibouti	Iraq	Mauritius	San Marino	United Arab Emirates
Bermuda	Dominican Republic	Ireland	Mexico	Sao Tome and Principe	United Kingdom
Bhutan	Ecuador	Israel	Moldova	Saudi Arabia	United States of America
Bolivia	Egypt	Italy	Morocco	Senegal	Uruguay
Bosnia and Herzegovina	El Salvador	Jamaica	Mozambique	Seychelles	Uzbekistan
Botswana	Eritrea	Japan	Myanmar	Sierra Leone	Vanuatu
Brazil	Estonia	Jordan	Namibia	Singapore	Venezuela
British Virgin Islands	Ethiopia	Kazakhstan	Nepal	Slovakia	Viet Nam
Brunei Darussalam	Fiji	Kenya	Netherlands	Slovenia	Yemen
Bulgaria	Finland	Korea, DPR	Netherlands Antilles	Somalia	Zambia
Burkina Faso	France	Korea, Republic of	New Caledonia	South Africa	Zimbabwe

Table 10 Summary statistics for value added indicators

Variable name	Obs	Mean	Std. Dev.	Min	Max
MVA, mln USD	573,516	7.59	374.33	0	76242.77
DVA_INTrex, mln USD	573,516	68.54	799.12	0	56817.35
EXP_INT, mln USD	573,516	256.86	3234.09	.038	362260.3
FVA, mln USD	573,516	75.89	1092.03	0	147345.8

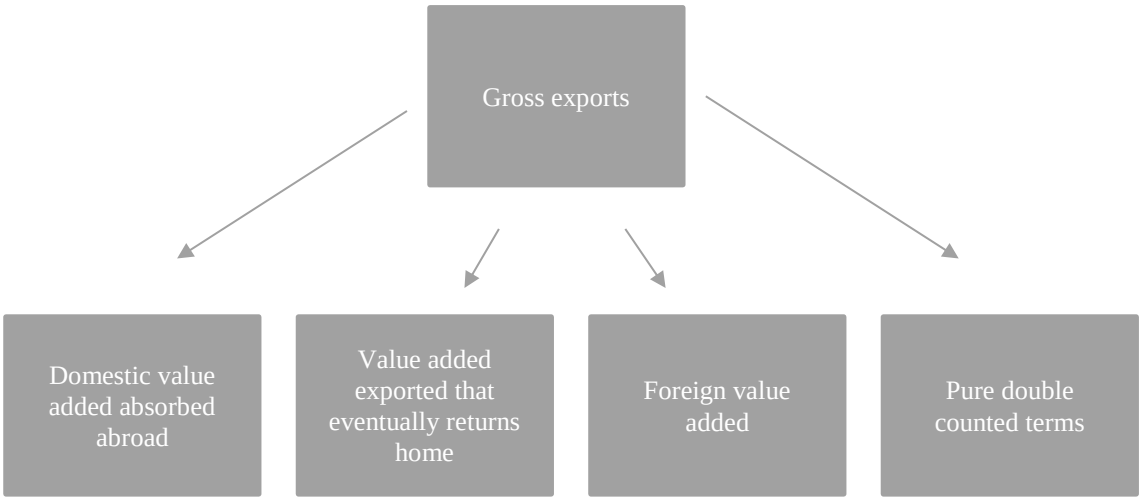
Table 11 Value added trade for selected countries

Origin country	Foreign value added from direct partner		Foreign value added in exports		Exports of intermediate goods		Domestic value added re-exported	
	min	max	min	max	min	max	min	max
Albania	0.00	24.27	0.03	100.46	0.12	470.49	0.01	182.42
Algeria	0.00	108.33	0.02	994.90	0.12	17784.58	0.01	9743.30
Australia	0.00	855.08	0.27	5327.43	1.85	46027.25	0.14	11461.15
Bangladesh	0.00	19.85	0.01	464.54	0.13	758.87	0.01	439.83
Barbados	0.00	14.34	0.02	99.63	0.10	351.84	0.00	16.87
Benin	0.00	0.12	0.02	11.25	0.12	48.16	0.01	9.66
Bolivia	0.00	65.33	0.02	399.78	0.19	5285.15	0.01	870.43
Brazil	0.00	1020.48	0.08	6039.55	0.58	30233.77	0.04	7693.94
China	0.00	5633.34	0.27	63002.84	1.19	159059.03	0.08	44271.41
Germany	0.00	5048.26	0.09	71824.37	0.34	130495.31	0.02	56817.35
India	0.00	769.71	0.16	8582.79	0.81	25395.33	0.05	8331.09
Japan	0.00	6311.46	0.34	37955.65	1.46	194876.67	0.09	35141.49
Korea, Republic of	0.00	13997.30	0.28	72775.33	0.70	206185.88	0.04	29256.15
Nepal	0.00	34.44	0.01	308.57	0.08	1432.61	0.00	391.70
Netherlands	0.00	6981.46	0.08	40694.93	0.23	122527.46	0.01	37869.01
Russian Federation	0.00	259.76	0.03	3968.65	0.26	44939.95	0.02	27513.54
Singapore	0.00	3608.89	0.66	31340.30	0.87	50839.02	0.03	7710.88
South Africa	0.00	155.61	0.09	1705.61	0.44	10586.43	0.03	6286.48
Spain	0.00	2695.59	0.13	17639.74	0.52	42886.99	0.03	17728.67
Turkey	0.00	637.80	0.07	4102.46	0.26	14924.67	0.02	6834.88
Ukraine	0.00	3550.95	0.19	9039.38	0.57	25334.55	0.04	4027.08
United Kingdom	0.00	2527.17	0.55	25153.76	1.82	71468.95	0.10	32843.11
United States of America	0.00	4729.88	0.36	28513.30	1.98	258757.84	0.13	36278.78
Uruguay	0.00	103.05	0.05	437.84	0.33	1323.47	0.02	151.77
Viet Nam	0.00	422.93	0.21	1909.40	0.40	5010.64	0.02	909.02
Zambia	0.00	28.24	0.03	95.00	0.15	780.75	0.01	178.55

Variables are computed at the country-pair level according to the procedure in developed by Wang, Wei and Zhu (2013). Min and max value by partner country is reported for selected origin countries. Variables extracted form EORA multi-regional input-output tables using the R statistical package decompr from Quast and Kummritz (2015).

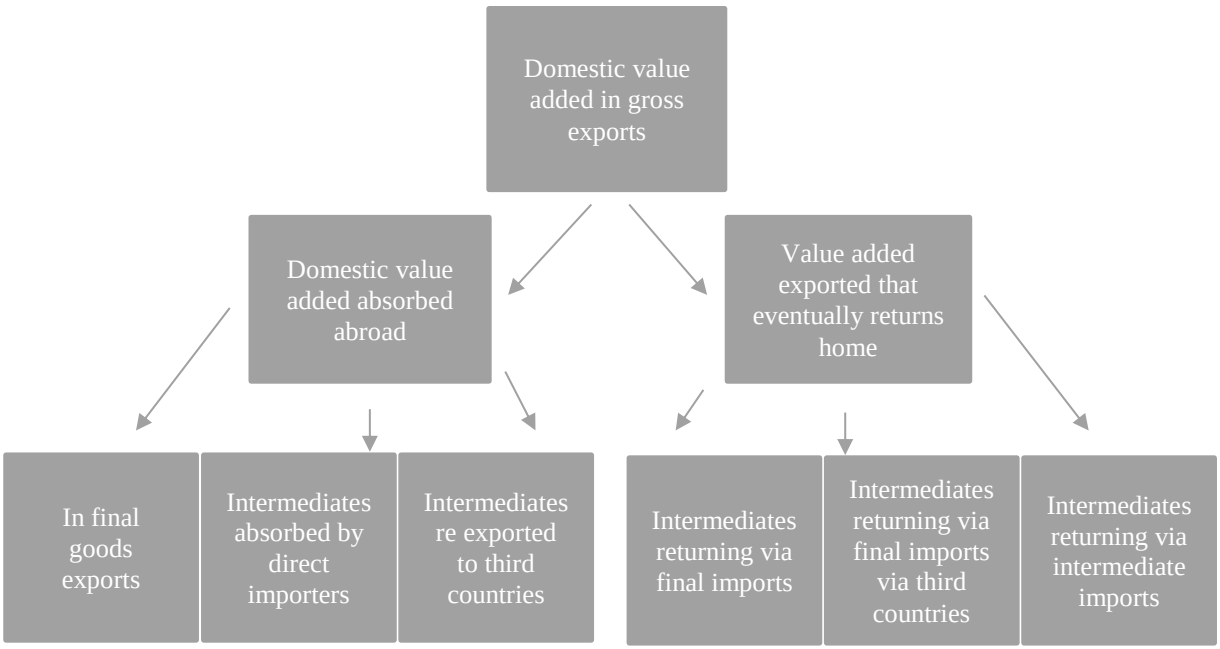
We extract the value added measures using the decomposition of gross exports in 16 terms pioneered by Wang, Wei and Zhu (2013). The technique uses input-output tables to extract the value added components in gross exports. The starting point (Figure 9) is to separate gross exports in four major categories: domestic value added absorbed abroad, domestic value added first exported then returned home via imports, foreign value added and pure double counted items. Then we proceed to the split of domestic and foreign value added according to their final use (Figure 10 and Figure 11). Using the three aforementioned diagrams, we define integration as a seller as the domestic value added in intermediate goods re-exported to third countries. Integration as a buyer is the foreign value added from either the direct partner of third countries.

Figure 9 Decomposition of gross exports



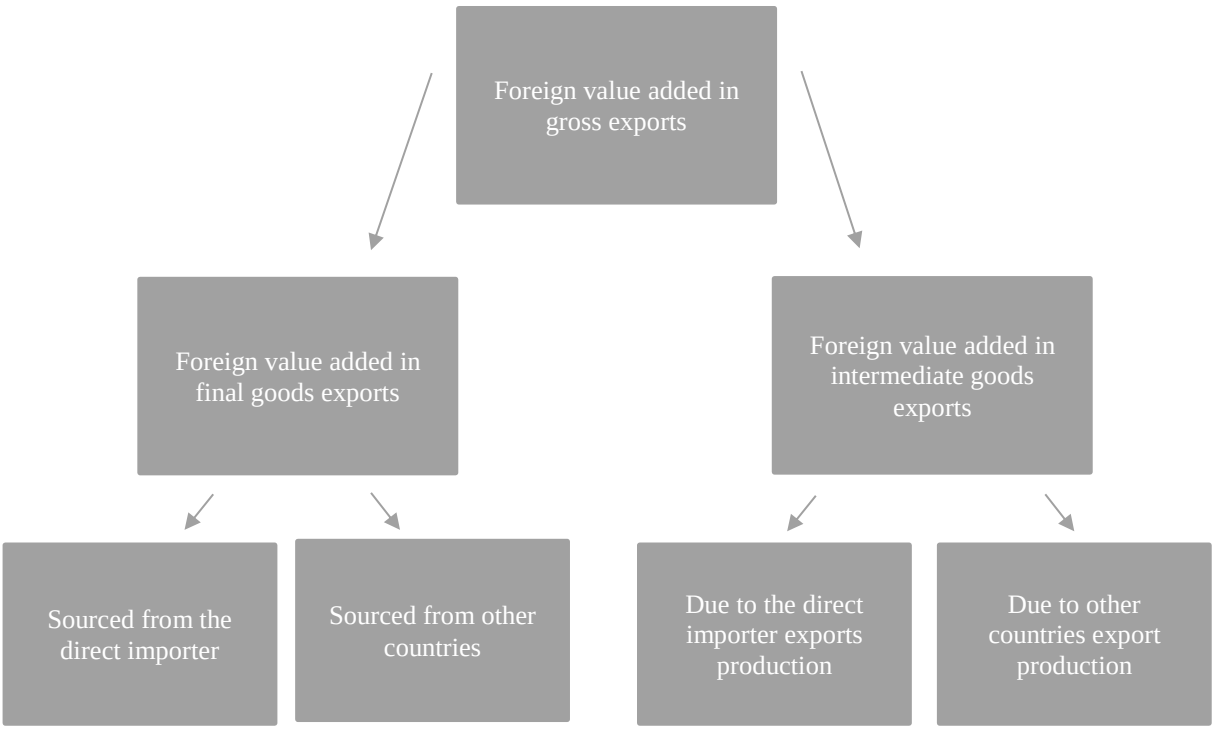
Source: Wang, Wei and Zhu (2013).

Figure 10 Components of domestic value added



Source: Wang, Wei and Zhu (2013).

Figure 11 Components of foreign value added in gross exports



Source: Wang, Wei and Zhu (2013).

Table 12 Effect of RTAs and BITs on foreign value added sourced from direct partner (PPML)

	(1)	(2)	(3)	(4)	(5)
Explanatory variables	Foreign value added from direct partner	Foreign value added from direct partner	Foreign value added from direct partner	Foreign value added from direct partner	Foreign value added from direct partner
RTA dummy	-0.00970				
	(0.0165)				
RTA with L.E. investment provisions		-6.45e-06			0.00359
		(0.0145)			(0.0144)
BIT dummy			0.0382		0.0385
			(0.0293)		(0.0295)

Depth of agreement				-0.0141	
				(0.0273)	
Observations	570,312	570,312	570,312	570,312	570,312
R-squared	1.000	1.000	1.000	1.000	1.000
Country-pair FE	YES	YES	YES	YES	YES
Exporter-year FE	YES	YES	YES	YES	YES
Importer-year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses clustered by country pair.

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

Table 13 Effect of RTAs and BITs on foreign value added (PPML)

	(1)	(2)	(3)	(4)	(5)
Explanatory variables	Foreign value added in exports	Foreign value added in exports	Foreign value added in exports	Foreign value added in exports	Foreign value added in exports
RTA dummy	0.0104				
	(0.00836)				
RTA with L.E. investment provisions		0.0160**			0.0160**
		(0.00729)			(0.00735)
BIT dummy			-0.00970		-0.00969
			(0.00668)		(0.00677)
Depth of agreement				0.0362***	
				(0.0128)	
Observations	573,516	573,516	573,516	573,516	573,516
R-squared	1.000	1.000	1.000	1.000	1.000
Country-pair FE	YES	YES	YES	YES	YES
Exporter-year FE	YES	YES	YES	YES	YES
Importer-year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses clustered by country pair.

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

Table 14 Effect of RTAs and BITs on domestic value added re-exported to third countries (PPML)

	(1)	(2)	(3)	(4)	(5)
Explanatory variables	Domestic value added re-exported	Domestic value added re-exported	Domestic value added re-exported	Domestic value added re-exported	Domestic value added re-exported
RTA dummy	0.0135				
	(0.0119)				
RTA with L.E. investment provisions		0.0159			0.0160
		(0.0145)			(0.0144)
BIT dummy			0.0133		0.0135
			(0.0101)		(0.0102)
Depth of agreement				0.0348	
				(0.0250)	
Observations	570,632	570,632	570,632	570,632	570,632
R-squared	0.999	0.999	0.999	0.999	0.999
Country-pair FE	YES	YES	YES	YES	YES
Exporter-year FE	YES	YES	YES	YES	YES
Importer-year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses clustered by country pair.

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

Table 15 Effect of RTAs and BITs on intermediate goods' exports (PPML)

	(1)	(2)	(3)	(4)	(5)
Explanatory variables	Exports of intermediate goods	Exports of intermediate goods	Exports of intermediate goods	Exports of intermediate goods	Exports of intermediate goods
RTA dummy	0.0171*				
	(0.00950)				
RTA with L.E. investment provisions		0.0169			0.0169
		(0.0115)			(0.0114)
BIT dummy			0.00903		0.00902

			(0.00851)		(0.00848)
Depth of agreement				0.0334*	
				(0.0192)	
Observations	573,516	573,516	573,516	573,516	573,516
R-squared	1.000	1.000	1.000	1.000	1.000
Country-pair FE	YES	YES	YES	YES	YES
Exporter-year FE	YES	YES	YES	YES	YES
Importer-year FE	YES	YES	YES	YES	YES

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