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Trade agreements and participation in global value chains: Empirical evidence from Latin America

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Abstract

The rise of global sourcing implies a heterogeneous relationship between buyers and suppliers regarding the liberalisation scenarios in emerging countries. This paper analyses the effect of regional trade agreements (RTAs) on participation in the Global Value Chains of Latin American countries between 1995 and 2015. We combine the framework of gravity equations with the trade in value-added, applying a Pseudo Poisson Maximum Likelihood (PPML) estimator with panel data and fixed effects to deal with endogeneity and heteroscedasticity. Heterogeneous estimations show that the deepest RTAs reinforce the position of lower technology-industry suppliers, driven by an extra-regional strategy of Latin American trade policy. The geography of value chains has little effect on industrial upgrading in the region, reducing the development potential. The study concludes that the region's trade policy could reduce the dependent relationship between distant partners and pay more attention to creating shorter value chains as a strategy to generate local capacities to gain competitiveness in value chains.

KEYWORDS
geography of trade, global value chains, Latin America, Pseudo Poisson Maximum Likelihood, trade agreements

1 | INTRODUCTION

Regional Trade Agreements (RTAs) can promote technological transfers between developing countries and large nodes of global value chains (GVC), increasing the industrial upgrading potential (Baldwin, 2011; Gereffi, 2019; Miroudot et al., 2013). Evidence on the positive relationship between trade policy and GVC gains has been gained relevance in international economy studies (Antràs & Staiger, 2012; Bickwit et al., 2018). Although in regional blocks such as Asia, the European Union and North America, this relationship is more straightforward, while in Latin America (LA), this pattern is fuzzier. The trade policy strategy associated with extra-regional partners has not improved opportunities in LA (Boffa et al., 2019; Cadestin et al., 2016; Suder et al., 2015). Moreover, the uneven geography of GVC gains generates controversies regarding the benefits of GVCs (Werner et al., 2014). Since the 1960s, LA regional integration efforts have consolidated a complex network of RTAs, both bilateral and multilateral (Choi, 2020). Nevertheless, the continent is stuck with low research and development (R&D) technological industries, negligible diversification and is a global supplier of raw materials on production networks worldwide.

This article analyses the role of RTAs on LA integration in GVCs from 1995 to 2015. To better understand the gains and losses related to value-added upgrading opportunities, we consider three analytical dimensions of trade policy effects. The first relates to the depth of RTAs, providing evidence on the relationship between provisions and the effects on trade in value-added flows. The second addresses the effect of the geography of the GVCs, allowing the evaluation of trade gains according to location patterns of trade partners. Furthermore, we study GVC trade based on the countries' position in the network, distinguishing between integrating as a 'buyer'—importer value-added as a backward linkage's indicator—or as a value-added 'seller'—value-added exporters also referred to as a forward linkage (Johnson & Noguera, 2012; Koopman et al., 2014). Finally, the last dimension details the role of trade policy on the industrial position in GVCs, assessing the technological intensity embedded across production networks.

Trade in intermediate inputs accounts for about two-thirds of international trade and reflects the growing fragmentation and interdependence of production processes across borders. Conventional gross trade flows statistics do not compute the net value-added along supply chains across borders, thus overestimating the domestic value-added content of exports. As a result, there is a 'double counting' problem, which does not allow for the identification of real trade costs, nor does it portray the direct and indirect effects of intermediate goods used throughout the productive stages (Hummels et al., 2001; Johnson & Noguera, 2012; Koopman et al., 2014). In this regard, the growing literature on GVC claims to include value-added trade measures to understand how countries are linked to each other through the global production structure (Choi, 2020; Francois et al., 2015; Gereffi, 2019). Motivated by these concerns, this study focuses on identifying the relationships between the trade policy based on RTAs and the value-added content of bilateral world trade. Estimating the model with trade in value-added (TiVA) measures makes it possible to assess the impact of trading costs, as pointed out by (Aichele & Heiland, 2018; Johnson & Noguera, 2017; Njike, 2021). Although recent evidence has incorporated value-added exports into the classic gravity models as a dependent variable, many do not consider heteroscedasticity in log-linear models, further comprising the potential bias in the estimated parameters (Amendolagine et al., 2019; Boffa et al., 2019; Johnson & Noguera, 2017).

In this regard, incorporating the augmented structure of gravitational models *a la* (Anderson & van Wincoop, 2003) (and further derivations, such as those by Eaton & Kortum (2002) or Chaney (2008)), we follow the structural derivation presented by (Aichele & Heiland, 2018) to consider the value-added exports in a nonlinear framework to deal with heteroscedasticity, as proposed by (Santos Silva & Tenreyro, 2006, 2021). Moreover, by incorporating the global input-output structure to measure the value-added exported as a dependent variable, we better deal with the direct and indirect effects of the linkages of value chain networks on the intermediary purchases required for cross-border production. Furthermore, Njike (2021) found that the standard errors regarding the trade costs parameters are lower for value-added measures than gross trade statistics, further being a feasible estimator for our empirical objectives. Conversely, we applied the nonlinear estimator Pseudo Poisson Maximum Likelihood (PPML) with country origin-destination-time and country-pair fixed effects to deal with the endogeneity between RTAs and cross-border flows (Egger & Staub, 2016; Santos Silva & Tenreyro, 2011a). Furthermore, the GVC trade data are from the multiregional EORA input-output tables, including 20 Latin countries. Finally, the bilateral trade agreement database is from the World Bank (Hoffman et al., 2017), and the gravitational data were obtained from CEPII Gravity Database.

Empirical evidence suggests that RTAs increase the predictability of the trade and political-institutional environment by reducing costs and trade barriers (Miroudot et al., 2013). Models by Antràs and Staiger (2012) and Ornelas et al. (2012) show that in the presence of offshoring's intermediate inputs, deep agreements can mitigate the global sourcing decisions under incomplete contracts and endogenous correspondence. Thus, an endogenous buyer-supplier match is created (Bickwit et al., 2018), where the role played by each country in GVCs is driven by geographical patterns (Baldwin & Lopez-gonzalez, 2015; Johnson & Noguera, 2012). In this context, GVC trade in nearby countries with a high level of technological and innovative development is strongly induced, contributing to creating global high-tech hubs. At the other extreme are resource-rich countries, held hostage by price competition that keeps wages low and keeps them dependent on the vagaries of commodity prices (resource curse), as a conditional trade policy result (Gereffi, 2019; Ponte et al., 2019).

Our results provide useful policy contributions based on the analysis of a controversial approach to the relationship of RTAs and potential gains on trade in LA countries. In non-LA countries, there is evidence that value chains are mostly shorter and regional, and RTAs bring national clusters together in a fragmented context (Miroudot et al., 2013). Unlike other regions, intraregional integration and trade policy are adding to foreign dependence as a development barrier (Blyde & Juan, 2014; Hernández et al., 2014). In part, this may reflect weak barriers that increase trade costs at the continent level, especially across non-literal borders, as well as a 'spaghetti bowl' of RTAs. Despite the representative case of LA, our empirical application advances on considering the trade in value-added in an augmented gravity model, as recently approached by (Njike, 2021), to understand the penalty faced by African countries in the coefficients of trade costs. Moreover, heterogeneous analysis allows us to verify the patterns of geographic shifts based on the position of LA on value chains, be it exporter or importer of value-added according to technological bases on trade. This could be a representative case of some emerging economies.

The article is structured as follows: The next section presents a brief background on LA trade agreements and their position in GVCs. Next, we describe the data and our empirical strategy. Later, we present the results considering the influence of RTAs on LA participation in GVCs. Finally, we conclude with a discussion on the role of trade policy in the upgrading process of Latin America in GVC.

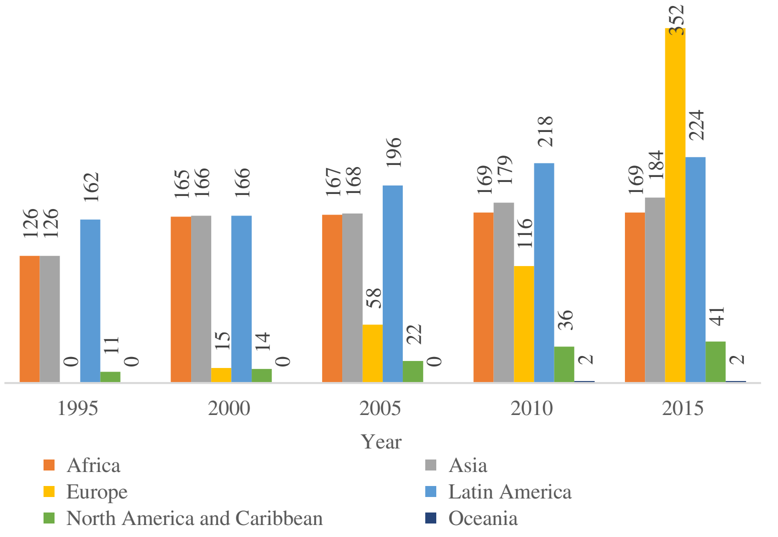

FIGURE 1 Bilateral Trade Agreements in force by LA countries (1995–2015). At least one country is from Latin America. We considered the sum of all bilateral agreements in each year (five years intervals considered)
Source: Mario Larch Database (Hoffman et al., 2017) [Colour figure can be viewed at wileyonlinelibrary.com]

2 | RTA AND GVC PATHS IN LATIN AMERICA

Since the 1960s, the geographical composition of RTAs has expanded in LA. As a result of these prolific integrations, predominantly through bilateral agreements, the RTA's *spaghetti bowl* is now more complex. Figure 1 represents the total bilateral trade agreements between one LA country and countries on other continents. The increase in the number of agreements is accompanied by greater provisions, potentially forming a complex network of deep agreements. Free trade agreements (FTAs) and economic integration agreement (EIA)[1] have increased since the 2000s, mainly in European and Asian countries. It is to be expected that this type of agreement will generate greater security for transactions in the context of global sourcing and encourage an increase in value-added flows. As shown by (Bickwit et al., 2018; Jinji et al., 2019), deeper agreements include aspects that go beyond tariff changes and serve as a lever for broader structural and regulatory changes for signatories.

In the light of a 'new regionalism', the sub-regional trade agreements have been increased since the 1990s, inspired by the European Union integration model. All efforts aimed at customs unions or even common markets, with the free circulation of goods, services and labour, in addition to an extensive list of supranational institutions (Mesquita Moreira, 2018). The complex network of agreements has made significant advances, particularly in trade liberalisation within the intraregional LA. Still, they have failed to implement full customs unions or even free trade zones, implying a significant presence of partial scope agreements in LA as includes among themselves (Estevadeordal et al., 2009; Vaca-Eyzaguirre, 2015). Although the increase of sub-regional RTAs, Mexico and Chile followed a different path, avoiding ambitious regional projects favouring standard-free trade agreements, mostly in bilateral terms. Accordingly, Mexico,

[1]A free trade agreement (FTA) as defined in Paragraph 8(b) of GATT (1994) Article XXIV, whereas an economic integration agreement (EIA) as defined in Article V of General Agreement on Tariffs and Trade (GATT, 1994).

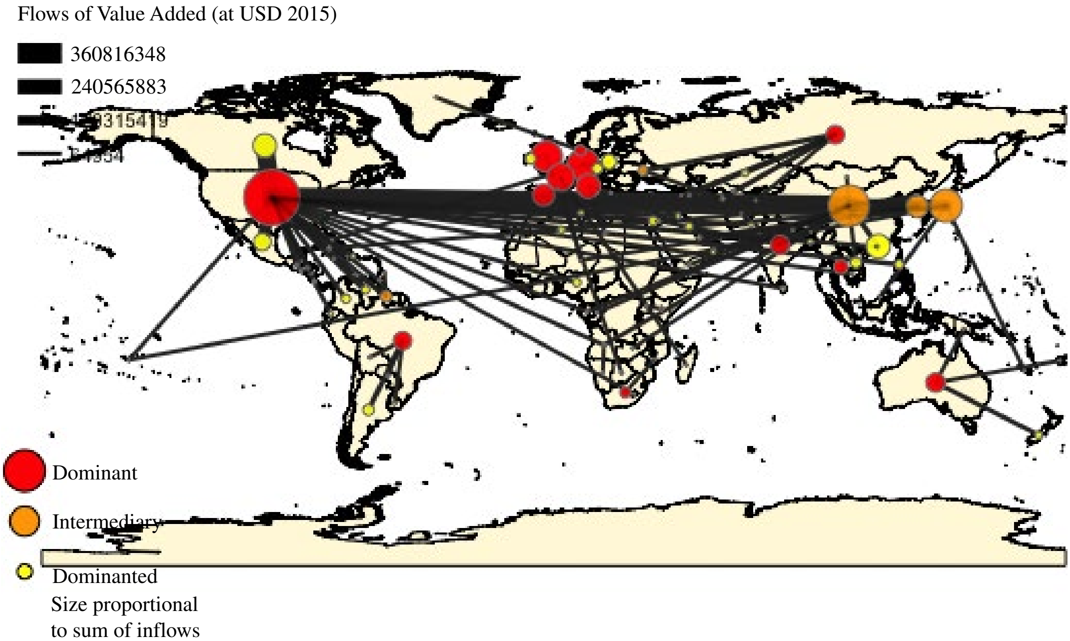

FIGURE 2 Global flows of trade in value-added (TiVA) in 2015. *Note*: This map shows the flows of value-added between countries using the R package ‘flows’. Three hierarchical relations are considered based on the concept of nodal regions by Dacey (1960): dominant, dominated, and intermediate. We define that a region r is dominated by s if the most important flow of r originates in s; (2) the sum of the flows received per s is at least 15% of the total trade in value-added (TiVA) from r. *Source*: Authors based on EORA-UNCTAD-GVC (2019) [Colour figure can be viewed at wileyonlinelibrary.com]

and the NAFTA signed in 1994, focussed on establishing an extra-regional orientation. Indeed, consolidated trade agreements, such as Mercosur, have the characteristic of strengthening close trade ties, especially in manufactured goods. Moreover, Mesquita Moreira (2018) pointed out that trade agreements within the LA were motivated by gains in scale and specialisation to expand opportunities abroad, especially outside the traditional areas of natural resources—further for extra-regional trade partners. However, the RTAs did not have sufficient effects of increasing participation on the world market for industrialised goods, except for Mexico (McLean & Singh, 2018) based on NAFTA-induced effects.

Figure 2 portrays the composition of global networks in 2015, based on the trade in value-added (TiVA) concept as proposed by Johnson and Noguera (2012, 2017). The measure accounts for the value-added exported by the source country and absorbed by the destination. An uneven profile of the international division of production highlights asymmetries in the institutional and technological environment between different countries (Blyde & Juan, 2014; Cadestin et al., 2016)[2]. Despite the deepening of RTAs, participation in global and regional chains has been weaker over the past decades in LA compared to global northern countries (Blyde & Juan, 2014; Hernández et al., 2014). Indeed, LA countries are relatively disconnected by global drivers on GVCs in advanced stages of production networks. A clear exception is Venezuela, Chile and

[2]These results are consistent with Taglioni and Winkler (2016) who worked with TiVA OECD and Aslam et al. (2017) who used data from EORA.

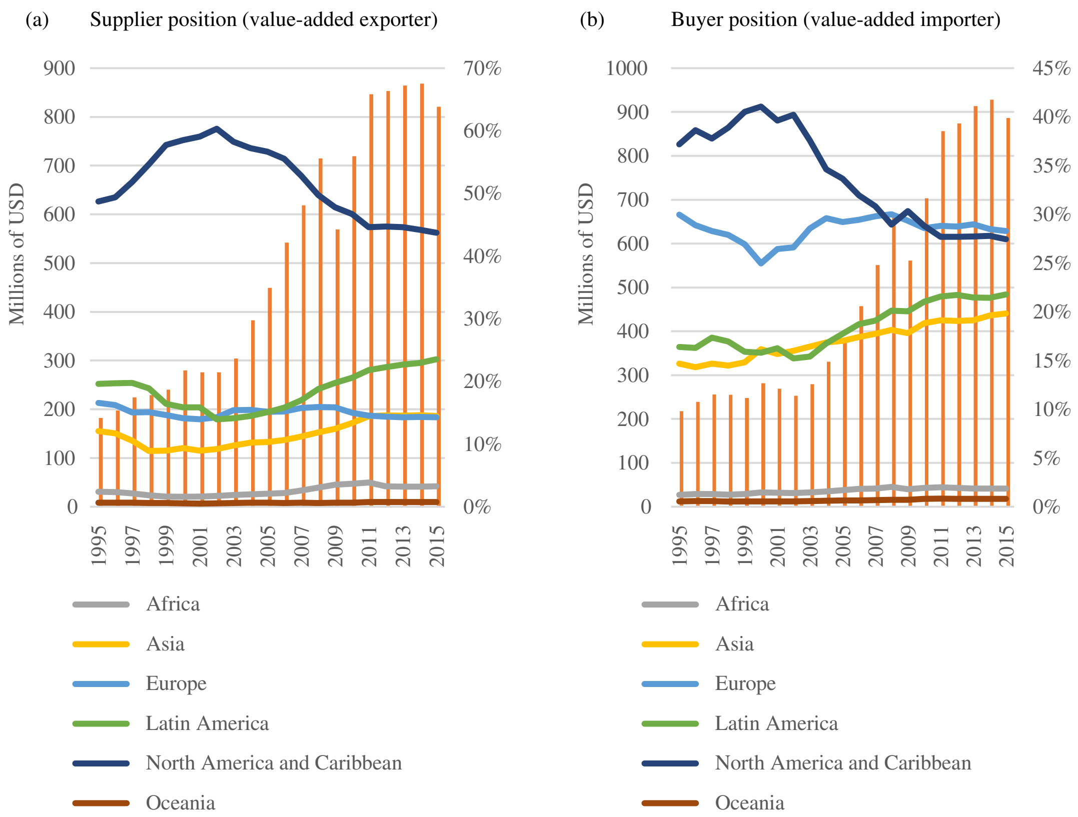

FIGURE 3 Geography based on TiVA in LA (1995–2015). *Note*: In part a, Latin American countries are source of value-added exporters. In part b are importers (buyers). *Source*: Authors based on EORA-UNCTAD-GVC (2019) [Colour figure can be viewed at wileyonlinelibrary.com]

Mexico, which are oriented to provide extra-regional value chains. In this regard, developed countries have stronger advanced linkages at the worldwide level, while emerging economies have weaker connectivity (Boffa et al., 2019) in terms of value-added trade.

Figure 3 describes the participation of LA in GVCs between 1995 and 2015. Part (a) represents the value-added sourced by LA countries, with details of the absorbed amount by each continental aggregate (share in lines). Part (b) shows the participation of foreign content in LA imports. There is an apparent increase in value-added flows originating in different regions of the world in recent years. Between 1995 and 2015, Mexico, Brazil and Venezuela consolidated themselves as the main sources of value-added exported by LA, representing, on average, about 60% of total trade. Despite this increase, the geography of integration had little change. European and North American countries were still the leading destinations for value-added sourcing from LA. However, LA's position as an importer has changed markedly since 2004. There is an increase in European and Asian content absorbed by the LA region. This increase is accompanied by lower North American participation, indicating a reorientation of the downstream position of LA. Thus, evidence from LA suggests that the region's involvement is lower compared to other developing areas. Meanwhile, the intraregional ties are weaker in internalising a robust value chain vertically—that is including advanced processing states—and further, the regional role is heterogeneous as little countries have a higher level of industrialisation (Blyde & Juan, 2014; Cadestin et al., 2016; Cecchini et al., 2014; Rodrik, 2016; Rosales et al., 2013).

GVC integration based on industries of low technological level, knowledge and innovation embedded in trade delegates LA countries to have a uniform and little diversified role in global sourcing (Cadestin et al., 2016; Gómez-Mera, 2015). The contribution to GVCs occurs in the initial stages, with few exceptions in terms of the technological intensity content in trade (OCDE, 2015). Mexico and Costa Rica, for example, specialise in processing and exporting inputs and are well integrated with the North American supply chains. At the same time, Chile and Peru are specialised in agricultural and mining inputs increasingly oriented towards Asian markets. Brazil has a high level of domestic content incorporated into exports, encouraged by Chinese and European demand (Perobelli et al., 2019). Import for processing and re-export is less prevalent in Chile, Argentina, Brazil, and Colombia. These countries specialise in the supply of global inputs based on commodities, which are subsequently processed or consumed abroad, mainly in Europe and Asia. In LA, the main links with GVC are found in Mexico and Chile (with North America) and Brazil (Asia and Europe). Mexico and Brazil have a major manufacturing structure, but the scale of diversification in GVCs is lower. On the other hand, those countries have been intensified the intraregional trade in manufactured goods internally finished, such as Brazil, Argentina and Mexico—which embedded the highest levels of value-added in total trade (Mesquita Moreira, 2018).

3 | DATA AND ESTIMATION

In this section, we first outline our measure of trade in value-added. Next, we discuss our empirical strategy to analyse the role of regional trade agreements on GVC integration. Finally, we describe the data used and variables considered on estimations.

3.1 | Measuring value chains integration

The literature has used various measures to capture the rise of fragmentation of production worldwide. Hummels et al. (2001) initially presented a critical argument, in which the authors point out the relevance of considering trade flows in value-added to evidence integration in value chains networks. Value-added measures account for the domestic content incorporated into exports, offering further empirical evidence of flows in final goods. Furthermore, the value chain idea claims incorporating the interregional input-output linkages to include the direct and indirect effects of production chaining in terms of intermediates inputs used for the production systems worldwide (Gereffi, 2019; Johnson & Noguera, 2012; Suder et al., 2015).

Several studies state that the trade of intermediate inputs accounts for a considerable portion of international trade (Johnson, 2014; Johnson & Noguera, 2017; Koopman et al., 2014; Los et al., 2016), reflecting the growing fragmentation of production processes across borders and reinforcing the multiregional interdependence of the production and trade structure. According to those authors, the conventional trade statistics calculate the gross value of goods at each border crossing, rather than the net value-added between border crossings, generating a ‘double counting’ problem—it means that conventional data overestimates the internal (domestic) value-added content of exports (Miroudot & Ye, 2021). Furthermore, in a GVC context, transnational production networks imply that intermediate inputs can be implicitly incorporated into interregional trade flows, generating a hidden value-added structure in exports (Pahl & Timmer, 2019). In this way, accurate measurement of this value-added trade is key to understanding how countries are linked to each other through the representative global production structure of GVC. This aspect is especially relevant when analysing the relevance of trade agreements.

The leading indicators consider the trade in value-added embedded in the production of exports, based on multiregional input-output (MRIO) tables. Therefore, in order to identify the value-added traded between two countries, we rely on the linkages through input-output global production structure. We focussed on the measure of trade in value-added, as proposed by Johnson and Noguera (2017), accounting for the GVC integration as the bilateral domestic value-added in exports absorbed abroad by destination. Formally, let us consider a world with G countries and N sectors, in which X is the gross output matrix that can be used as intermediate goods or for intermediate use. Each country and sector produce output using domestic capital, labour primary inputs and intermediates inputs that could be sourced from the home country or abroad. Production and trade satisfy the multiregional final demand, Y, and A is the input-output technical coefficients. Furthermore, the basic input-output relations can be expressed as follows:

$$X = AX + Y = (I - A)^{-1}\, Y = BY \tag{1}$$

where B is the Leontief inverse matrix computing the direct and indirect requirements to produce a monetary unit of goods to meet the final demand. This structure provides a means to trace the flow of gross activity and value-added across G countries and N sectors through income transfers along with the production value chain. Some share of gross output involves value-added from industries, which we call v, the diagonal matrix of the ratio between value-added and gross output. Furthermore, we refer to $TiVA_{\mathrm{ij}}$ as value-added exports from country i embedded in final goods absorbed in j, as (Johnson & Noguera, 2017). Within the MRIO structure, TiVA can be accounted as follows:

$$TiVA_{ij} = \hat{v}\,(I - A)^{-1}\, e = \hat{v}Be \tag{2}$$

where e is a vector of gross exports from multiregional final demand. This measure tracks the amount of value-added in a country i that is absorbed by destination j (Johnson, 2014; Johnson & Noguera, 2017; Koopman et al., 2014; Los et al., 2016). The metric further captures how much value-added is generated from i and embedded in exports for j, as an indicator forwards linkages along with input-output value chain network linkages (Bems et al., 2011; Pahl & Timmer, 2019). This metric[3] is of particular interest because it accounts for the domestic content of exports absorbed by the destination trade partners, being a plausible indicator to understand how bilateral trade agreements affect integration in value chain networks.

3.2 | Empirical strategy

The main foundation of the theoretical model relies on the literature focussed on understanding the role of intermediates, which is a feasible representative measure in the GVC context. As mentioned in earlier section, we considered the TiVA measure in an augmented gravity model structure. The value-added content traded is measured by multiplying the value-added coefficient by

[3]The measurement of such metric was made using the International Monetary Fund (IMF) algorithm, available by (Aslam et al., 2017) (the document detailed the derivation), which also adopts the multi-regional base EORA.

the Leontief matrix B—incorporating both direct and indirect effects associated with intermediate intercountry relations (Equation 4)—and the export vector, as suggested by (Johnson & Noguera, 2017) and (Pahl & Timmer, 2019).

Estimating the model with value-added exports makes it possible to assess the impact of trading costs, as pointed out by (Aichele & Heiland, 2018; Johnson & Noguera, 2017; Njike, 2021). In this regard, our benchmark considers an augmented structure of gravity models *a la* (Amendolagine et al., 2019; Anderson & van Wincoop, 2003; Chaney, 2008). In order to assess the effect of RTAs on TiVA, the postulated model can be expressed as follows:

$$\ln TiVA_{ijt} = \beta_1 RTA_{ijt} + \Pi_{it} + P_{jt} + \rho_{ij} + \varepsilon_{ij} \quad (3)$$

where $TiVA_{ijt}$ accounts for the trade in value-added from a country i to country j at time (year) t in millions of US dollars; RTA_{ijt} is a dummy variable taking the value 1 if country i and j shared at least one trade agreement in the year t, and the remaining parameters are fixed effects (multilateral resistance terms) and the error term. However, in the linear form, the model (3) has two potential misspecification issues: (i) the presence of zero flows[4] between i and j that can generate selection bias[5] (Anderson et al., 2018; Baier & Bergstrand, 2009; Egger et al., 2008; Egger et al., 2011; Fontagné & Santoni, 2018), and (ii) the consistency of the linear estimator in the presence of heteroscedasticity (like OLS). This is because $E\left[\ln\varepsilon_{ij}|X\right]$ depends on the average of superior orders so that if the error's conditional variance is not constant, there is a correlation with regressors (Santos Silva & Tenreyro, 2006).

In this regard, our benchmark considers the exponentiation of the terms of equation (3), following an augmented gravity equation structured as suggested by Mulabdic et al. (2017) and Boffa et al. (2019). Furthermore, we have considered the TiVA in a nonlinearity framework based on Pseudo Poisson Maximum Likelihood (PPML) estimator in order to deal with heteroscedasticity, as claimed by (Santos Silva & Tenreyro, 2006, 2011b, 2021). The first-order condition of PPML is $i1 = \widehat{\sum}\left[T_{ij} - \exp\left(x_{ij}\widehat{\beta}\right)|x_{ij} = 0\right.$, and the consistency of the estimator is required $E\left[T_{ij}|x\right] = \exp\left(x_{ij}\beta\right)$, although the data did not need to have a Poisson distribution, as the estimator gives equal weight to observations and is more efficient than linear estimators.

The reduced equation is given by:

$$TiVA_{ijt} = \exp\left(\beta RTA_{ijt} + \tau_{ij} + \mu_{it} + \delta_{jt}\right)\varepsilon_{ij,t} \quad (4)$$

where $\boldsymbol{\beta}$ is our interested parameter of RTA, μ_{it} and δ_{jt} are the exporter and importer country fixed effects as multilateral resistance terms, τ_{it} is a country-pair fixed effect, and ε_{ij} is the disturbance (*stochastic*) error term. We consider different types of RTA to identify the depth of trade agreements: first, independents agreements such as custom unions (cu), free trade agreements (fta), and economic

[4]Some studies adopt the negative binomial model in place of Poisson if the data present greater dispersion in relation to the mean. However, such an approach presents theoretical problems: (i) PPML is a consistent probability estimator, regardless of distribution, (ii) the negative binomial estimator is not invariable in scale, so when applied to trade data, it may be inconsistent and inefficient.

[5]According to Laget et al. (2018), omitted variables bias arises when the error term is correlated with some unobservable country-specific policy variables (like restrictive domestic policy regulation), which at the same time affects both GVC-related trade and the probability of forming a deep RTA. Reverse causality may arise because firms in country pairs involved in GVC may lobby for deeper trade agreements to secure the supply of intermediates in partner countries.

integration agreements (eia). Moreover, we consider the combination of two types in order to point out deeper agreements: custom unions and economic integration agreement (cuandeia), and free trade agreements and economic integration agreement (ftaandeia).

The main challenge in estimating trade effects of RTAs is the potential endogeneity between RTAs and cross-borders trade flows. In this regard, our empirical strategy intends to mitigate this concern focussed on two main aspects. First, applying the nonlinear PPML with three dimensions of fixed effects in all estimations—country importer and exporter in time (multilateral resistance terms), and country-pair fixed, reducing the bias from parameters as supported by several empirical studies in international trade literature (Egger & Staub, 2016; Santos Silva & Tenreyro, 2011a). Second, by incorporating trade in value-added measures on the augmented gravity equation, we further follow Njike (2021), which shown lower standard errors in the estimated parameters compared to gross trade[6].

Moreover, for our analytical purposes, the model of Equation 4 allows analysing if a change in trade policy could affect the GVC relations in terms of the domestic content embodied in each country's trade, according to firm behaviour.[7] The dependent variable was measured incorporating a global input-output structure, better dealing with the direct and indirect effects of the linkages of value chain networks on the intermediary purchases required for cross-border production. In this regard, the implications of RTAs directly affect TiVA as they depend on the cost unit acting to reduce trade barriers. Conversely, in a world with intermediates, it is expected that RTAs can reinforce the buyer-supplier relations in GVCs (Baldwin & Taglioni, 2011). The reduction of trade barriers decreases trade costs and expands bilateral flows (Jinji et al., 2019).

As mentioned earlier, we compute estimations for three analytical dimensions: depth of RTAs, countries' positions in GVC and technological intensity. In this regard, the role of the depth of RTAs remains the models of Lawrence (1996) and Baldwin (2011), formalised by Antràs and Staiger (2012) and Ornelas et al. (2012). Global sourcing decisions associated with incomplete contracts and buyer-supplier matching tend to be mitigated by more profound agreements as the institutional environment for transactions in GVCs improves. Moreover, there is a direct relationship between country pairs along the value chain, with specific functions geographically governed. Cross-border policies influence trade when production is internationally fragmented (Antràs et al., 2013). In addition, the sectoral content of value-added trade can differ considerably according to the degree of development of the countries, in which input globally sourced by emerging countries has a competitive price level paid by demanding producers. Accordingly, deeper RTAs explicitly include provisions that encourage technological dissemination (Amendolagine et al., 2019; Laget et al., 2018), increasing the potential technological spread throughout GVCs.

3.3 | Data sources

We built a panel from 1995 to 2015, with data from a multiregional input-output model EORA (Lenzen, 2013) data, which incorporates the input-output country and industry-level

[6]In Annex, we provide results considering gross bilateral exports as a dependent variable, which have also had higher standard errors compared to value-added measures.

[7]There is a discussion in the theoretical literature about the effects of relocation on the use of domestic and foreign labor (see Grossman & Rossi-Hansberg, 2012). An important point in this discussion is the substitution between local or foreign production in some sectors, in which the different price of labor induces the dispersion of production at an international level.

relations. The computation of trade in value-added measures was obtained according to the procedures of Aslam et al. (2017), which intuitively rely on the value-added trade from EORA. The panel includes 161 countries, of which 20 are from LA (the country list is available in Appendix 1). Gravity variables were obtained from CEPR (2015). Bilateral trade agreement data are provided by Hoffman et al. (2017). Table 1 shows the description of the variables used in our estimation.

4 | EMPIRICAL RESULTS

As shown in the first section, we consider three dimensions to analyse the relationship between RTAs and GVC integration in LA: (1) the depth of the agreements, (2) LA position (seller or buyer) and (3) the technological content in value-added.

4.1 | Depth of trade agreements

Table 2 shows the results of the effects by types of trade agreements for all countries in the sample (model 1) and for interregional trade within Latin America (models 2–8). At a global level, the estimated parameter has a positive and significant relationship of the present of at least one RTA on TiVA. This result is similar to those found by Boffa et al. (2019) considering other value-added measures in OLS estimations. We build on this literature to show the importance of considering the design of trade agreements when estimating trade effects for LA on GVC. Therefore, the models 2–8 shows the estimated results for considering LA' intraregional trade. This selected clipping shows the essential differences regarding the provisions of RTAs in terms of TiVA. The type of RTA affects trade heterogeneously among LA countries, as they could differ in the extent to which they reduce tariffs or consider specific sectoral groups. Partial scope agreements (focus on a sector or a few products or require only limited tariff cuts) have a positive and significant estimated elasticity potentially increasing the TiVA by 30%[8]. Deeper agreements such as the free trade agreement (*fta*) and economic integration agreement (*eia*), despite covering areas that go beyond tariff reduction, did not significantly affect.

Deeper agreements are generally signed in developed regions, like North American and European countries (Bickwit et al., 2018; Jinji et al., 2019). There is a large presence of *partial scope* agreements in LA, including among themselves (Cirera et al., 2016). In this light, the geographical proximity would influence the formation of regional value chains, as shown by Los et al. (2016).[9] As the RTAs reduce trade costs, the relative stability of trade flows within LA has been facilitated by direct bilateral or multilateral agreements. Although the Mercosur agreement could be seen as an essential *custom union* between Brazil, Argentina, Uruguay and Paraguay, the results presented in Table 2 do not evidence an extent contribution in terms of TiVA. Similar results were pointed out by Mesquita Moreira (2018), considering gross trade

[8]It computes the effect as $\left(e^{\beta}-1\right)\times 100\%$, where β is the estimated coefficient

[9]The authors discuss the existence of global or regional value chains. Their study extends Feenstra and Hanson's (1999) fragmentation measure to a multi-country scenario. It concludes that the trend of 'global inputs' was halted after the 2008 financial crisis and that countries with similar levels of development tend to share regionally delimited production networks.

TABLE 1 Variables details

Variable		Description	Source
TiVA	Trade in value-added	Bilateral flow of value-added exports, accounting for the total value-added produced (in a sector *s*) in source country *i* and absorbed in destination country *j* (Johnson & Noguera, 2017)	EORA MRIO tables
rta	Any regional trade agreement	It assumes the value of 1 if *i* and *j* have at least one trade agreement in year *t* in effect, and 0 if the opposite	Mario Larch Database (Hoffman et al., 2017).
cu	Custom Union	It assumes the value of 1 if *i* and *j* have at least one custom union trade agreement in year *t* in effect, and 0 if the opposite	Mario Larch Database (Hoffman et al., 2017).
fta	Free Trade Agreement	It assumes the value of 1 if *i* and *j* have at least one free trade agreement in year *t* in effect, and 0 if the opposite	Mario Larch Database (Hoffman et al., 2017).
eia	Economic Integration Agreement	It assumes the value of 1 if *i* and *j* have at least one economic integration agreement in year *t* in effect, and 0 if the opposite	Mario Larch Database (Hoffman et al., 2017).
ps	Partial Scope Agreement	It assumes the value of 1 if *i* and *j* have at least one partial scope agreement in year *t* in effect, and 0 if the opposite	Mario Larch Database (Hoffman et al., 2017).
cuandeia	Customs Union and Economic Integration Agreement	It assumes the value of 1 if *i* and *j* simultaneously have at least one Custom Union and an Economic Integration Agreement, and 0 if the opposite	Mario Larch Database (Hoffman et al., 2017).
ftaandeia	Free Trade Agreement and Economic Integration Agreement	It assumes the value of 1 if *i* and *j* simultaneously have at least one Free Trade Agreement and an Economic Integration Agreement, and 0 if the opposite	Mario Larch Database (Hoffman et al., 2017).
Gravitational variables			
lndist	Log of distance	Distance between the centroids of each country *i* and *j* (log of values in kilometres)	CEPR Gravity Database
contig	Contiguity	It assumes the value of 1 if *i* and *j* are contiguous, and 0 if the opposite	CEPR Gravity Database

(Continues)

TABLE 1 (Continued)

Variable		Description	Source
comlang_off	Common official of primary language	It assumes a value of 1 if *i* and *j* have the same official language, and 0 if the opposite	CEPR Gravity Database
colony	Historical colonial relationship	Assumes the value of 1 if *i* and *j* already had a colonisation relationship, and 0 if the opposite	CEPR Gravity Database

Note: The dependent variable was re-scaled using the algorithm of the 'ppmlhdfe' for Stata (Correia et al., 2020).

within the LA region. The author has pointed out that a significant impact on intraregional trade based on RTAs compared to extra-regional flows. One possible explanation is that exports are shifting to more protected and profitable intraLA markets. However, this would require evidence of a large trade diversion being consistent with a situation where exports change to the regional market (which implies the substitution of foreign suppliers by regional) coexist with the expansion of extra-regional imports (which benefit from unilateral liberalisation).

The estimations suggest that trade policy within the region can encourage intraregional TiVA to a considerable extent, regardless of the role played in GVCs, whether buying or selling position in production networks. Conversely, we notice that these policy-based results have been suggested by empirical evidence applied to both final goods (Guilhoto et al., 2015; Rubínová, 2017; Yotov et al., 2016) and intermediate goods (Aichele & Heiland, 2018; Egger et al., 2017; Guilhoto et al., 2015; Laget et al., 2018).

4.2 | GVC's position and geography-based integration

In Table 3, Models 1–7 show the estimates for different degrees of depth of agreements on the value-added trade from both LA seller's (exporter) and buyer's (importers) in models 8–14. This is a way to capture the differentiated effects associated with the value-added domestically incorporated by LA focussed on the direction of trade flows despite the RTAs, which stresses that the role of LA on GVC can be emphasised.

The elasticities are higher and more significant when LA countries are exporters in GVC, highlighting the role of LA as a global supplier in production networks. The effect of at least one RTA between two countries increased the TiVA by 2.17% on average. From the FTA and EIA coefficients, the deep agreements also favour the increase of LA participation as a supplier in GVC with elasticities of 0.0175 and 0.1763, respectively. In contrast, the less deep agreements contribute to strengthening the value-added importer's role in GVC relations, as shown in the results of models 8–14. Only the presence of partial scope agreements could improve the importer's position of LA in GVC, further following Laget et al. (2018). In this regard, internal costs resulting from more complex trade agreements help explain this phenomenon (Cadestin et al.,2016). These internal costs are obstacles to increasing participation in value chains since the way trade agreements can reduce trade costs is less compensated when compared to other regions of the world.

TABLE 2 Effects of RTA on value-added flows at global and intraregional level

	Global level	**Interregional trade**						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Variables	**All countries-rta**	**LA-rta**	**LA-cu**	**LA-fta**	**LA-eia**	**LA-ps**	**LA-cuandeia**	**LA-ftaandeia**
rta	0.0191**	−0.0013						
	(0.0086)	(0.0177)						
cu			−0.0042					
			(0.0189)					
fta				0.0088				
				(0.0151)				
eia					0.0062			
					(0.0103)			
ps						0.2643***		
						(0.1020)		
cuandeia							0.0044	
							(0.0134)	
ftaandeia								0.0093
								(0.0140)
Observations	540,958	7980	7980	7980	7980	7980	7980	7980
Exporter-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses clustered by country-pair estimated using the ppmlhdfe for Stata (Correia et al., 2020). Column 1 includes all countries-level data and considers the existence of at least some type of RTA, whereas Columns (2–8) consider intraregional trade in LA. In Appendix 1, we provide the estimated coefficients considering the phase-in strategy with five-year intervals to allow us to capture the effects related to new agreements over time (Baier & Bergstrand, 2009; Baier et al., 2008; Kohl, Brakman, & Garretsen, 2016).

Robust standard errors in parentheses.

***$p < .01$, **$p < .05$, *$p < .1$.

Furthermore, Bickwit et al. (2018) show that countries' development and trade openness levels are relevant to consolidating more efficient value chains. Therefore, it is reasonable to consider that a policy area associated with a RTA can increase productive linkages along the input-output network value chain for both exporter and importer positions (Boffa et al., 2019). These mentioned studies argued that the RTA subscription promotes and facilitates the functionality of value chains by reinforcing the comparative advantages implied in the value-added content in trade.

Table 4 included dummy variables for the direction of value-added flows (Africa, Asia, Europe, North America, Oceania, and Latin America), which allows us to analyse the heterogeneous response of value-added traded according to trading partners' location trade policy.

The results indicate that the intensity and significance of the relationship between RTAs and TiVA are different when considering the GVC's geography. From the exporter's perspective, models 1–5 indicate that RTAs provide higher trade gains to African and Asian trading partners—the remaining aggregated trading partners showed a non-significant effect from the trade policy perspective. Although the trade agreements between Southern and Northern countries could be pointed as a relevant mechanism to integrate LA into GVC, our estimations revealed another path. On the other hand, the analysis of models 6–10 shows that RTA can increase the TiVA from Europe destined to LA. Furthermore, we found a significant but negative effect of RTAs from value-added sourced by Asian countries and absorbed in LA. These findings are similar to those shown by Boffa et al. (2019), in which the authors focussed on understanding the role of bilateral investment treaties on trade relations among North-North and North-South countries. Furthermore, our results suggest that RTAs further promote GVC's integration gains in a forward perspective, the highest estimated parameters when LA countries are exporters of value-added. This conclusion is also corroborated by Osnago et al. (2019) as the North-South patterns are related to vertical integration among inputs providers in a GVC context. Such results are further corroborated by the empirical evidence applied to African, Asian, and some global southern countries (Del Prete et al., 2018; Kowalski et al., 2015; Lund-Thomsen & Wad, 2014; Tinta, 2017), indicating the global role of the southern world as raw materials suppliers to international hubs of processing and manufacturing, such as Asian and European factories.

The results suggest three relevant aspects regarding the position of LA in GVC. First, they confirm the idea that LA countries have an important provider' role in GVC—in which the goods exported may be processed abroad along with value chain networks. Therefore, it is plausible to appreciate that the presence of RTAs potentially influences trade flows in value-added to these productive hubs. Second, the network of RTAs between LA and the extra-regional partners could restrict opportunities for a change in the composition (diversification) of value-added embedded content flows. This idea is implicit in the results that consider LA as value-added' importers, with considerably lower elasticities for income generated in Asian countries and without significance for European and Oceanic partners. The exception occurs with partners in North America, whose results are influenced by the intense trade flow with Mexico. Third, pointing to the need to reconcile partial scope approaches within the LA' region, including mainly productive diversification aimed at sustainable upgrading in GVC. In this regard, Mesquita Moreira (2018) points out that trade agreements within the LA were motivated by gains in scale and specialisation to expand growth opportunities abroad, especially outside the traditional areas of natural resources. Furthermore, the author argues that the agreements did not have sufficient effects of increasing participation in the world market for industrialised goods, except for Mexico (McLean & Singh, 2018).

TABLE 3 Effects of RTAs according to GVC's position

Variables	LA is value-added' exporter (1) LA as i rta	(2) LA as i cu	(3) LA as i fta	(4) LA as i eia	(5) LA as i ps	(6) LA as i cuandeia	(7) LA as i ftaandeia
rta	0.0215**						
	(0.0096)						
cu		0.0259					
		(0.0441)					
fta			0.0175**				
			(0.0088)				
eia				0.0161*			
				(0.0083)			
ps					0.1763**		
					(0.0772)		
cuandeia						0.0230	
						(0.0208)	
ftaandeia							0.0166*
							(0.0086)
Observations	67,200	67,200	67,200	67,200	67,200	67,200	67,200
Exporter-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Variables	**LA is value-added' importer (8) LA as j rta**	**(9) LA as j cu**	**(10) LA as j fta**	**(11) LA as j eia**	**(12) LA as j ps**	**(13) LA as j cuandeia**	**(14) LA as j ftaandeia**
rta	−0.0073						
	(0.0071)						
cu		−0.0069					
		(0.0262)					
fta			−0.0057				
			(0.0071)				
eia				−0.0061			
				(0.0058)			
ps					−0.0468*		
					(0.0249)		

(Continues)

TABLE 3 (Continued)

Variables	LA is value-added' importer						
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	LA as j rta	LA as j cu	LA as j fta	LA as j eia	LA as j ps	LA as j cuandeia	LA as j ftaandeia
cuandeia						−0.0133	
						(0.0116)	
ftaandeia							−0.0052
							(0.0070)
Observations	67,200	67,200	67,200	67,200	67,200	67,200	67,200
Exporter-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Models 1–7 consider a sub-sample in which Latin American countries are exporters (country *i*) and all other importing countries (Latin and non-Latin) are computed; while models 8–14 were estimated as the importers (country *j*) the Latin American, and all other exporters in the sample.

Robust standard errors in parentheses.

*** $p < .01$, ** $p < .05$, * $p < .1$

4.3 | Technology-intensity embedded in GVCs

Many RTAs seek deeper integration, including provisions that encourage technological spread throughout the GVC. Table 5 shows the estimates for the positions (buyer and supplier) across Latin American countries, according to five levels of R&D intensity. Compatibilisation based on the typology of sectors made by Galindo-Rueda and Verger (2016) was made. For our purposes, we adapted the ISIC—Rev-3 structure of the EORA MRIO data with the original proposal based on ISIC—Rev-4 (the detailed industry level can be found in Appendix 1). Models 1–6 consider the value-added flows generated in LA and absorbed abroad, grouped by sum-up of the trade from the set of industries related to each of six R&D groups. The regressions 7–12 computes the estimations when LA are importers of those industries.

The estimated elasticities among R&D groups are, on average, different between the main RTAs established between LA and the rest of the world. As expected, at least one RTA shows higher effects for the lower R&D intensity industries sourced by LA, followed by the low-med R&D. The differences between R&D groups can be related to the income generated and domestically added to bilateral trade flows. Notably, the effects revealed for low R&D industries—generally based on natural resources—would reinforce LA's position as a worldwide supplier of raw materials. A similar argument was pointed by (Cirera et al., 2016), Cipollina et al. (2013) and (Lubinga et al., 2017), which revealed that the industry-based preferences in the leading trade agreements signed by LA countries (Cirera et al., 2016), with an extra-regional orientation of the leading trade partners.

Models 7–12 track the relationship between RTAs and the amount of value-added generated abroad and absorbed by LA countries. Several studies consider this measure an indicator of

TABLE 4 Effects of RTAs according to geography-based trading partners

	Part (a) LA is value-added' exporter				
	(1)	(2)	(3)	(4)	(5)
Variables	**LA → AFR**	**LA → ASI**	**LA → EUR**	**LA → NAC**	**LA → OCE**
rta	0.3499***	0.0376*	0.0189	0.0046	0.0116
	(0.0773)	(0.0224)	(0.0137)	(0.0234)	(0.0142)
Observations	16,800	19,740	15,960	4620	2100
Exporter-time FE	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes
	Part (b) LA is value-added' importer				
	(6)	**(7)**	**(8)**	**(9)**	**(10)**
Variables	**AFR → LA**	**ASI → LA**	**EUR → LA**	**NAC → LA**	**OCE → LA**
rta	0.0421	−0.0290**	0.0155**	0.0085	−0.0139
	(0.0837)	(0.0131)	(0.0076)	(0.0124)	(0.0182)
Observations	16,800	19,740	15,960	4620	2100
Exporter-time FE	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses.

***$p < .01$, **$p < .05$, *$p < .1$.

spillover effect and backward linkage in production networks (Pahl & Timmer, 2019; Los and Timmer, 2018; Bems et al., 2011). It is interesting to note that the results change considerably in terms of R&D industrial composition. The RTA's coefficient related to exports of med-high intensity R&D is statistically significant but negative. This pattern shows the potential of trade policy to encourage the export of inputs with less technological content and with a lower level of value-added. Low-complexity industries incorporate little knowledge and technology to GVC, and the estimated elasticities indicate that RTAs can reduce up to 2.25% in value-added trade when LA countries are importers. The buyer's role is important in GVC (Baldwin & Lopez-gonzalez, 2015). Taglioni and Winkler (2016) argue that a country cannot become a major exporter in GVC without first becoming a successful importer of intermediate imports because imported intermediate inputs contain foreign technology. Several studies have identified that technological transmission is enhanced by trade (Acharya & Keller, 2009; Coe & Helpman, 1995). Imports of foreign intermediate goods that incorporate foreign advanced technology allow the implicit use of this technology to produce final goods in each country (Keller, 2004). Although EORA' s routine-export and re-import industry represent outsourcing (R&D group 6), it does not represent the incorporation of value by each country region.

The results suggest an industrial and technological pattern for hub-and-spoke networks based on developed regions governing the functions performed by LA. This productive dynamic of the global supply of inputs with little processing by the Latin region is reinforced by RTAs. In this

TABLE 5 Effects of RTAs according to the intensity of R&D and GVC' position

Variables	Part (a) LA is value-added' exporter					
	(1)	(2)	(3)	(4)	(5)	(6)
	R&D intensity group 1	**R&D intensity group 2**	**R&D intensity group 3**	**R&D intensity group 4**	**R&D intensity group 5**	**R&D intensity group 6**
rta	0.0464***	0.0283***	0.0110	0.0217*	−0.0076	−0.0177
	(0.0175)	(0.0101)	(0.0113)	(0.0131)	(0.0150)	(0.0270)
Observations	65,142	67,179	67,200	67,200	66,880	67,200
Exporter-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Variables	**Part (b) LA is value-added' importer**					
	(7)	(8)	(9)	(10)	(11)	(12)
	R&D intensity group 1	**R&D intensity group 2**	**R&D intensity group 3**	**R&D intensity group 4**	**R&D intensity group 5**	**R&D intensity group 6**
rta	−0.0022	−0.0064	−0.0003	−0.0222**	0.0201	0.0120
	(0.0093)	(0.0095)	(0.0066)	(0.0106)	(0.0126)	(0.0078)
Observations	66,659	67,200	66,960	67,160	67,122	66,080
Exporter-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: The difference in the number of observations for different directions of TiVA is due to the handling of singleton and nested groups from ppmlhdfe for Stata (Correia et al., 2020). Details of the economic sectors in each group are in the Appendix 1.

Group 1—Low R&D intensity; Group 2—Medium-low R&D intensity; Group 3—Medium R&D intensity; Group 4—Medium-high R&D intensity; and Group 5—High R&D intensity. Group 6 refers to 're-export' and 're-import' sector included in MRIO-EORA.

Robust standard errors in parentheses.

***$p < .01$, ** $p < .05$, * $p < .1$.

context, the evidence found in the literature applied to developed regions (such as the US and EU) reveals results opposite to ours. In these cases, activities with a higher level of knowledge and technology are more sensitive to trade agreements. This is because a productive and regional structure is often already established between countries, besides lower internal costs for adapting to rules established by RTAs. This increases the effect of trade policy on reducing trade barriers.

The most direct relationship between RTAs and the flows of intermediaries in Latin America largely depends on the past and the role performed by the countries of the region in the process of international fragmentation of production. As many RTAs seek deeper integration, there is evidence that these positive effects for upgrading are seen in regions already in advanced positions in the value chain and are located, in most cases, in developed regions of the global North. In LA, policy actions are still required to reduce internal costs and international competitiveness and increase the development potential around GVC.

The results presented in this section indicate that RTAs can enhance intraregional value-added flows associated with the effects of distance and institutional similarity, which act as cost reducers. However, the market-size effect associated with less integration in regional value chains is driven for estimations, revealing a lower potential to improve upgrades across close-geography value chains. When we incorporate the deep agreements in the analysis, the results show less effect on the formation of LA value chains. The profile of extra-regional integration becomes a determinant of this pattern. The deepest RTAs influence the exports of basic inputs on GVCs. The coefficients are higher when considering the exporter side of value-added and lower when increasing the 'import to export' position, which is associated with the indirect gains of the upgrading strategy (Ponte et al., 2019).

The geography of GVCs implies that RTAs contribute to LA countries' dominance over international demand, coordinated by global hubs. The supply of global inputs is reinforced by the distance, showing that large distances do not reduce the potential to provide lower technology industries across value chains. Exports of higher value-added sectors are weakly enhanced by RTAs, while positive coefficients increase as we move to low-technology industries.

5 | CONCLUSIONS

LA countries have consolidated a dense network of RTAs, as suggested by GVC's studies and international institutions. At the same time, in the last two decades, the region does not show a consistent structural change in favour of upgrading, development and convergence to higher income levels. The paradigm of fragmented global production across borders aimed to exploit the lower costs associated with the intensification of knowledge and technology flows does not prove entirely true in LA. As international buyers, some countries may exercise power over subcontractors, reducing the spread of gains from globalisation. Our results revealed the RTA's role in potentially reinforce the regional position as a global source of less R&D industries based on a heterogeneous estimation strategy. Latin countries have chosen a trade policy strategy based on increasing trade relations with international drivers in GVCs—mainly extra-regional in terms of trade—despite the promotion of an approximation with intraregional partners.

In summary, our findings show that in the exporter's position, the elasticities of RTAs show a higher significance for less intense R&D trade sourced in LA. This pattern suggests the potential of trade policy to encourage the export of inputs with less technological content and with a lower level of value-added. Low-complexity industries incorporate little knowledge and technology to GVC, reducing opportunities for upgrading and development for LA countries. Although the position of the importer is important in GVC (Baldwin & Lopez-gonzalez, 2015)—in which a given country cannot become a major exporter in GVC without first becoming a successful importer of intermediate imports because imported intermediate inputs contain foreign technology (Taglioni and Winkler, 2016)—our results predicts that the presence of bilateral RTAs increases the foreign content that is incorporated by Latin American exports without representing a virtuous process of upgrading and incorporation and local content of trade.

Our results support the argument in favour of intraregional articulation; however, other complementary actions are needed to bring countries closer together in more complete ways. The structural path of location and trade patterns at the international level deals with the idea that reduced trade costs affected by RTAs favour the maintenance of the uneven structure of GVCs, whose global hubs specialise in certain stages of the fragmented process of production. Without a policy mix, the historically consolidated export-based profile tends to persist or even grow because of trade cost reductions by RTAs. In this regard, it is also essential to rescue the idea of intraregional integration. Regional value chains tend to generate greater competitiveness than isolated countries do. Moreover, in the face of exogenous shocks, the strengthening of nearby production networks increases the stability of structural production systems. Therefore, industrial and trade policies must promote integration at the regional level. With this, the benefits of productive fragmentation allow the Latin American region to gain competitiveness in a diversified way.

Evidence on GVC shows that integration internalises bilateral externalities and affects the size effect of RTAs on reducing barriers such as trade costs and facilities (Bickwit et al., 2018; Cadestin et al., 2016). Indeed, our strategy does not explicitly explain the role of third countries along the chains or how this linkage affects LA. We have adopted a bilateral approach assuming that it represents the entire shock on trade flows, including the dependence on demand from high-income countries. The concern about the size effect of deeper RTAs on internal costs and the ability to upgrade or diversify is an open question for future studies. The productive potential of each country underlines the capacity for more robust integration, which is noted by the greater participation of the region in more complex trade agreements in recent years and presence in global foreign trade. The increase in the domestic value-added embedded by Latin American countries in response to the RTA policies is evident, while it is accompanied by export prioritisation.

An important question that arises when taking the model specified in this study is how to link with the (potential) endogeneity of policy variables, such as participation in preferential trade agreements. The literature presents arguments associated with the resulting reverse causality that would invalidate the estimates of all model parameters and the consequent policy experiments and welfare calculations. Although the literature has recognised this problem for a long time (Rose, 2004), reaching a satisfactory solution has proved difficult. Therefore, the use of fixed effects and nonlinear models, such as was our methodological choice, allow us to better deal with endogeneity issues. Some empirical studies address this potential endogeneity using an approach that explores time-series variation in the form of panel data (Baier & Bergstrand, 2007; Glick, 2017; Head & Mayer, 2014; Santos Silva & Tenreyro, 2011b). However, recent evidence indicates that such a strategy may not be satisfactory either (Jochmans & Verardi, 2020). An alternative to panel data would be to resort to instrumental variable (IV) approaches that can predict trade policy variables, which is still an open path to follow in future studies. Computationally, it is also necessary to advance in techniques that allow IV in large trade data panels. In any case, working with IV requires strong parametric assumptions, some of which are irrefutable and seem to conflict with some stylised facts, such as the (conditional) heteroskedasticity of trade flows (Santos Silva & Tenreyro, 2006).

Finally, our study sheds light on questions regarding regional and subnational assets incorporated in GVCs. Likewise, the potential of joint intranational or multilateral policies to favour productive diversification requires specific analyses and mailing in terms of subnational effects. It is to be expected that external demand from large global drivers will induce local adaptations, be it the production structure, the labour market qualification or the productive chains. For emerging regions, these channels of effects are little explored in the economic literature, and future evidence is needed. Another important aspect of our discussion is the dependence on international prices of commodities and natural resources. Economies become fragile to externalities. As a result, global connectivity was impacted by the 2008 financial crisis and by the COVID-19 outbreak, where regional value chains began to dominate and became necessary.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available at request.

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APPENDIX 1

TABLE A1 Descriptive statistics of dataset

Variable	Obs	Mean	SD	Min	Max
year	540,958	2005	6.055	1995	2015
rta	540,958	0.178	0.383	0	1
cu	540,958	0.0406	0.197	0	1
fta	540,958	0.0828	0.276	0	1
eia	540,958	0.0525	0.223	0	1
ps	540,958	0.0635	0.244	0	1
cuandeia	540,958	0.0221	0.147	0	1
ftaandeia	540,958	0.0309	0.173	0	1
contig	540,958	0.0182	0.134	0	1
comlang off	540,958	0.128	0.334	0	1
comlang et~o	540,958	0.133	0.339	0	1
colony	540,958	0.0121	0.109	0	1
comcol	540,958	0.0855	0.28	0	1
curcol	540,958	0.000621	0.0249	0	1
col45	540,958	0.00714	0.0842	0	1
smctry	540,958	0.00893	0.0941	0	1
dist	540,958	7838	4455	59.62	19951
distcap	540,958	7820	4454	59.62	19951
distw	534,238	7816	4439	114.6	19781
distwces	534,238	7794	4449	105.8	19780
EXGR c i	540,958	7.92E+07	2.28E+08	35745	2.52E+09
EXGR c j	540,958	7.92E+07	2.28E+08	35745	2.52E+09

(Continues)

TABLE A1 (Continued)

Variable	Obs	Mean	SD	Min	Max
afr i	540,958	0.248	0.432	0	1
asi i	540,958	0.292	0.455	0	1
eur i	540,958	0.236	0.425	0	1
nac i	540,958	0.0683	0.252	0	1
oce i	540,958	0.0311	0.173	0	1
al i	540,958	0.124	0.33	0	1
afr j	540,958	0.248	0.432	0	1
asi j	540,958	0.292	0.455	0	1
eur j	540,958	0.236	0.425	0	1
nac j	540,958	0.0683	0.252	0	1
oce j	540,958	0.0311	0.173	0	1
al j	540,958	0.124	0.33	0	1
lndist	540,958	8.737	0.784	4.088	9.901
cum fva	540,958	0.543	0.284	1.48E−06	1
reg i	540,958	2.845	1.372	1	6
reg j	540,958	2.845	1.372	1	6
lnvax i	540,958	15.37	2.384	10.24	21.22
lngross	540,958	35.78	3.087	26.53	48.16
pair id	540,958	16069	9367	1	32039
exp time	540,958	1886	1099	1	3759
imp time	540,958	1886	1099	1	3759
EXGR ij	540,958	492593	5.60E+06	57.49	5.40E+08
VAX ij	540,958	340536	3.85E+06	0.819	3.61E+08
lnexgr	540,958	7.901	2.856	4.052	20.11
lnvax	540,958	8.071	2.819	0.598	19.7
al afr	540,958	0.0311	0.173	0	1
al asi	540,958	0.0365	0.188	0	1
al eur	540,958	0.0295	0.169	0	1
al nac	540,958	0.00854	0.092	0	1
ali alj	540,958	0.0148	0.121	0	1
afr al	540,958	0.0311	0.173	0	1
asi al	540,958	0.0365	0.188	0	1
eur al	540,958	0.0295	0.169	0	1
nac al	540,958	0.00854	0.092	0	1
oce al	540,958	0.00388	0.0622	0	1
al oce	540,958	0.00388	0.0622	0	1
alj ali	540,958	0.0148	0.121	0	1
rta tot	540,958	0.239	0.557	0	3
rtaowni	540,958	40.45	33.22	0	158

(Continues)

TABLE A1 (Continued)

Variable	Obs	Mean	SD	Min	Max
rtaownj	540,958	40.45	33.22	0	158
g1	540,958	83248	1.04E+06	0	1.32E+08
g2	540,958	142296	1.68E+06	0	1.59E+08
g3	540,958	56266	649315	0	6.81E+07
g4	540,958	34885	352770	0	3.42E+07
g5	540,958	14173	188580	0	2.77E+07
g6	540,958	10481	157002	0	2.66E+07
max rta	540,958	57.47	33.56	0	158

TABLE A2 List of countries

n.	Country name	*ISO_3dig*	*iso_a3*		Region	id_region
1	Afghanistan	111	AFG	Afghanistan	Asia	asi
2	Albania	113	ALB	Albania	Europe	eur
3	Algeria	114	DZA	Algeria	Africa	afr
4	Andorra	116	AND	Andorra	Europe	eur
5	Angola	117	AGO	Angola	Africa	afr
6	Antigua	119	ATG	Antigua	North America and Caribbean	nac
7	Argentina	120	ARG	Argentina	**Latin America**	al
8	Armenia	121	ARM	Armenia	Europe	eur
9	Aruba	122	ABW	Aruba	North America and Caribbean	nac
10	Australia	123	AUS	Australia	Oceania	oce
11	Austria	124	AUT	Austria	Europe	eur
12	Azerbaijan	125	AZE	Azerbaijan	Asia	asi
13	Bahamas	126	BHS	Bahamas	North America and Caribbean	nac
14	Bahrain	127	BHR	Bahrain	Asia	asi
15	Bangladesh	128	BGD	Bangladesh	Asia	asi
16	Barbados	129	BRB	Barbados	North America and Caribbean	nac
17	Belgium	131	BEL	Belgium	Europe	eur
18	Belize	132	BLZ	Belize	North America and Caribbean	nac

(Continues)

TABLE A2 (Continued)

n.	Country name	*ISO_3dig*	*iso_a3*		Region	id_region
19	Benin	133	BEN	Benin	Africa	afr
20	Bermuda	134	BMU	Bermuda	North America and Caribbean	nac
21	Bhutan	135	BTN	Bhutan	Asia	asi
22	Bolivia	136	BOL	Bolivia	**Latin America**	al
23	Bosnia and Herzegovina	137	BIH	Bosnia and Herzegovina	Europe	eur
24	Botswana	138	BWA	Botswana	Africa	afr
25	Brazil	139	BRA	Brazil	**Latin America**	al
26	Brunei	141	BRN	Brunei	Asia	asi
27	Bulgaria	142	BGR	Bulgaria	Europe	eur
28	Burkina Faso	143	BFA	Burkina Faso	Africa	afr
29	Cambodia	145	KHM	Cambodia	Asia	asi
30	Cameroon	146	CMR	Cameroon	Africa	afr
31	Canada	147	CAN	Canada	North America and Caribbean	nac
32	Cape Verde	148	CPV	Cape Verde	Africa	afr
33	Central African Republic	150	CAF	Central African Republic	Africa	afr
34	Chad	151	TCD	Chad	Africa	afr
35	Chile	152	CHL	Chile	**Latin America**	al
36	China	153	CHN	China	Asia	asi
37	Colombia	156	COL	Colombia	**Latin America**	al
38	Congo	158	COG	Congo	Africa	afr
39	Costa Rica	160	CRI	Costa Rica	**Latin America**	al
40	Ivory Coast	161	CIV	Ivory Coast	Africa	afr
41	Croatia	162	HRV	Croatia	Europe	eur
42	Cuba	163	CUB	Cuba	**Latin America**	al
43	Cyprus	164	CYP	Cyprus	Europe	eur
44	Czech Republic	165	CZE	Czech Republic	Europe	eur
45	Denmark	168	DNK	Denmark	Europe	eur
46	Dominican Republic	171	DOM	Dominican Republic	**Latin America**	al
47	Ecuador	172	ECU	Ecuador	**Latin America**	al
48	Egypt	173	EGY	Egypt	Africa	afr
49	El Salvador	174	SLV	El Salvador	**Latin America**	al
50	Estonia	177	EST	Estonia	Europe	eur
51	Fiji	181	FJI	Fiji	Oceania	oce

(Continues)

TABLE A2 (Continued)

n.	Country name	ISO_3dig	iso_a3		Region	id_region
52	Finland	182	FIN	Finland	Europe	eur
53	France	183	FRA	France	Europe	eur
54	French Polynesia	185	PYF	French Polynesia	Asia	asi
55	Gabon	186	GAB	Gabon	Africa	afr
56	Georgia	188	GEO	Georgia	Asia	asi
57	Germany	189	DEU	Germany	Europe	eur
58	Ghana	190	GHA	Ghana	Africa	afr
59	Greece	192	GRC	Greece	Europe	eur
60	Greenland	193	GRL	Greenland	Europe	eur
61	Guatemala	197	GTM	Guatemala	**Latin America**	al
62	Guinea	199	GIN	Guinea	Africa	afr
63	Guyana	201	GUY	Guyana	Africa	afr
64	Haiti	202	HTI	Haiti	**Latin America**	al
65	Honduras	204	HND	Honduras	**Latin America**	al
66	Hong Kong	154	HKG	Hong Kong	Asia	asi
67	Hungary	205	HUN	Hungary	Europe	eur
68	Iceland	206	ISL	Iceland	Europe	eur
69	India	207	IND	India	Asia	asi
70	Indonesia	208	IDN	Indonesia	Asia	asi
71	Iran	209	IRN	Iran	Asia	asi
72	Iraq	210	IRQ	Iraq	Asia	asi
73	Ireland	211	IRL	Ireland	Europe	eur
74	Israel	213	ISR	Israel	Asia	asi
75	Italy	214	ITA	Italy	Europe	eur
76	Jamaica	215	JAM	Jamaica	North America and Caribbean	nac
77	Japan	216	JPN	Japan	Asia	asi
78	Jordan	218	JOR	Jordan	Asia	asi
79	Kazakhstan	219	KAZ	Kazakhstan	Asia	asi
80	Kenya	220	KEN	Kenya	Africa	afr
81	Kuwait	222	KWT	Kuwait	Asia	asi
82	Laos	224	LAO	Laos	Asia	asi
83	Latvia	225	LVA	Latvia	Europe	eur
84	Lebanon	226	LBN	Lebanon	Asia	asi
85	Lesotho	227	LSO	Lesotho	Africa	afr
86	Libya	229	LBY	Libya	Africa	afr
87	Lithuania	231	LTU	Lithuania	Europe	eur

(Continues)

TABLE A2 (Continued)

n.	Country name	*ISO_3dig*	*iso_a3*		Region	id_region
88	Luxembourg	232	LUX	Luxembourg	Europe	eur
89	Macao SAR	155	MAC	Macao SAR	Asia	asi
90	Madagascar	233	MDG	Madagascar	Africa	afr
91	Malawi	234	MWI	Malawi	Africa	afr
92	Malaysia	235	MYS	Malaysia	Asia	asi
93	Mali	237	MLI	Mali	Africa	afr
94	Malta	238	MLT	Malta	Europe	eur
95	Mauritania	241	MRT	Mauritania	Africa	afr
96	Mexico	244	MEX	Mexico	**Latin America**	al
97	Mongolia	248	MNG	Mongolia	Asia	asi
98	Morocco	251	MAR	Morocco	Africa	afr
99	Mozambique	252	MOZ	Mozambique	Africa	afr
100	Namibia	254	NAM	Namibia	Africa	afr
101	Nepal	256	NPL	Nepal	Asia	asi
102	Netherlands	257	NLD	Netherlands	Europe	eur
103	Netherlands Antilles	258	ANT	Netherlands Antilles	North America and Caribbean	nac
104	New Caledonia	259	NCL	New Caledonia	Oceania	oce
105	New Zealand	260	NZL	New Zealand	Oceania	oce
106	Nicaragua	261	NIC	Nicaragua	**Latin America**	al
107	Niger	262	NER	Niger	Africa	afr
108	Nigeria	263	NGA	Nigeria	Africa	afr
109	North Korea	166	PRK	North Korea	Asia	asi
110	Norway	267	NOR	Norway	Europe	eur
111	Oman	269	OMN	Oman	Asia	asi
112	Pakistan	270	PAK	Pakistan	Asia	asi
113	Panama	272	PAN	Panama	**Latin America**	al
114	Papua New Guinea	273	PNG	Papua New Guinea	Asia	asi
115	Paraguay	274	PRY	Paraguay	**Latin America**	al
116	Peru	275	PER	Peru	**Latin America**	al
117	Philippines	276	PHL	Philippines	Asia	asi
118	Poland	278	POL	Poland	Europe	eur
119	Portugal	279	PRT	Portugal	Europe	eur
120	Qatar	281	QAT	Qatar	Asia	asi
121	Russia	285	RUS	Russia	Europe	eur
122	Rwanda	286	RWA	Rwanda	Africa	afr
123	San Marino	295	SMR	San Marino	Europe	eur

(Continues)

TABLE A2 (Continued)

n.	Country name	*ISO_3dig*	*iso_a3*		Region	id_region
124	Saudi Arabia	297	SAU	Saudi Arabia	Asia	asi
125	Senegal	298	SEN	Senegal	Africa	afr
126	Seychelles	300	SYC	Seychelles	Africa	afr
127	Sierra Leone	301	SLE	Sierra Leone	Africa	afr
128	Singapore	302	SGP	Singapore	Asia	asi
129	Slovakia	303	SVK	Slovakia	Europe	eur
130	Slovenia	304	SVN	Slovenia	Europe	eur
131	South Africa	307	ZAF	South Africa	Africa	afr
132	South Korea	282	KOR	South Korea	Asia	asi
133	Spain	308	ESP	Spain	Europe	eur
134	Sri Lanka	309	LKA	Sri Lanka	Asia	asi
135	Suriname	311	SUR	Suriname	Africa	afr
136	Swaziland	313	SWZ	Swaziland	Africa	afr
137	Sweden	314	SWE	Sweden	Europe	eur
138	Switzerland	315	CHE	Switzerland	Europe	eur
139	Syria	316	SYR	Syria	Asia	asi
140	Taiwan	348	TWN	Taiwan	Asia	asi
141	Tajikistan	317	TJK	Tajikistan	Asia	asi
142	Tanzania	334	TZA	Tanzania	Africa	afr
143	TFYR Macedonia	319	MKD	TFYR Macedonia	Europe	eur
144	Thailand	318	THA	Thailand	Asia	asi
145	Togo	321	TGO	Togo	Africa	afr
146	Trinidad and Tobago	324	TTO	Trinidad and Tobago	North America and Caribbean	nac
147	Tunisia	325	TUN	Tunisia	Africa	afr
148	Turkey	326	TUR	Turkey	Asia	asi
149	Turkmenistan	327	TKM	Turkmenistan	Asia	asi
150	UAE	332	ARE	UAE	Asia	asi
151	Uganda	330	UGA	Uganda	Africa	afr
152	UK	333	GBR	UK	Europe	eur
153	Ukraine	331	UKR	Ukraine	Asia	asi
154	Uruguay	337	URY	Uruguay	**Latin America**	al
155	USA	335	USA	USA	North America and Caribbean	nac
156	Uzbekistan	338	UZB	Uzbekistan	Asia	asi
157	Vanuatu	339	VUT	Vanuatu	Oceania	oce
158	Venezuela	340	VEN	Venezuela	**Latin America**	al

(Continues)

TABLE A2 (Continued)

n.	Country name	*ISO_3dig*	*iso_a3*		Region	id_region
159	Viet Nam	341	VNM	Viet Nam	Asia	asi
160	Yemen	344	YEM	Yemen	Asia	asi
161	Zambia	345	ZMB	Zambia	Africa	afr

Note: In the EORA countries classification, Cuba, Dominican Republic, Haiti and Mexico are part of North America and Caribbean. The following countries were excluded from the panel because too small values of TiVA and to avoid feedbacks issues from the Leontief inverse multiplications: Belarus, British Virgin Islands, Burundi, Cayman Islands, Djibouti, DR Congo, Eritrea, Ethiopia, Former USSR, Gambia, Gaza Strip, Kyrgyzstan, Liberia, Liechtenstein, Maldives, Mauritius, Moldova, Monaco, Montenegro, Myanmar, Romania, Samoa, Sao Tome and Principe, Serbia, Somalia, South Sudan, Sudan, and Zimbabwe.

TABLE A3 Economic industries and R&D groups

Sector EORA (name)	ISIC Rev. 3 Correspondence	R&D Intensity Level (manufacturing)	R&D Intensity Level (non-manufacturing)	R&D intensity	Group R&D intensity
Agriculture	1, 2		Low R&D intensity	Low R&D intensity	1
Fishing	5		Low R&D intensity	Low R&D intensity	1
Mining and Quarrying	10, 11, 12, 13, 14		Medium-low R&D intensity	Medium-low R&D intensity	2
Food & Beverages	15, 16	Medium-low R&D intensity		Medium-low R&D intensity	2
Textiles and Wearing Apparel	17, 18, 19	Medium-low R&D intensity		Medium-low R&D intensity	2
Wood and Paper	20, 21, 22	Medium-low R&D intensity		Medium-low R&D intensity	2
Petroleum, Chemical and Non-Metallic	23, 24, 25, 26	Medium-high R&D intensity		Medium-high R&D intensity	4
Metal Products	27, 28	Medium-high R&D intensity		Medium-high R&D intensity	4
Electrical and Machinery	29, 30, 31, 32, 33	High R&D intensity		High R&D intensity	5
Transport Equipment	34, 35	Medium-high R&D intensity		Medium-high R&D intensity	4
Other Manufacturing	36	Medium R&D intensity		Medium R&D intensity	3
Recycling	37		Low R&D intensity	Low R&D intensity	1
Electricity, Gas and Water	40, 41		Low R&D intensity	Low R&D intensity	1
Construction	45		Low R&D intensity	Low R&D intensity	1
Maintenance and Repair	50	Medium R&D intensity		Medium R&D intensity	3
Wholesale Trade	51		Low R&D intensity	Low R&D intensity	1
Retail Trade	52		Low R&D intensity	Low R&D intensity	1

(Continues)

TABLE A3 (Continued)

Sector EORA (name)	ISIC Rev. 3 Correspondence	R&D Intensity Level (manufacturing)	R&D Intensity Level (non-manufacturing)	R&D intensity	Group R&D intensity
Hotels and Restaurants	55		Low R&D intensity	Low R&D intensity	1
Transport	60, 61, 62, 63		Low R&D intensity	Low R&D intensity	1
Post and Telecommunications	64		Medium-low R&D intensity	Medium-low R&D intensity	2
Financial Intermediation and Business Activities	65, 66, 67, 70, 71, 72, 73		High R&D intensity	High R&D intensity	5
Public Administration	75		Medium-low R&D intensity	Medium-low R&D intensity	2
Education, Health and Other Services	80, 85, 90, 91, 92, 93		Medium-high R&D intensity	Medium-high R&D intensity	4
Private Households	95		Low R&D intensity	Low R&D intensity	1
Others	99		Low R&D intensity	Low R&D intensity	1
Re-export & Re-import	X				6

Note: Observations: The classification is based on Galindo-Rueda and Verger (2016). OECD taxonomy of economic activities based on R&D intensity.

The EORA industries classification is based on ISIC Rev. 3, whereas Galindo-Rueda and Verger (2016) working with ISIC Rev. 4. In this sense, following concordances between ISIC Rev.3 (i3) and ISIC Rev.4 (i4) were used in order to compare both classifications: the allocation of i4 303 was compared to the allocation of i3 353 in the previous classification; i4 21 to i3 2423; i4 26 to i3 30, 32 and 33; i4 252 to i3 29; i4 29 to i3 34; i4 325 to i3 33, 29 and 2423; i4 28 to i3 29; i4 20 to i3 24 except 2423; i4 27 to i3 31; i4 30X to i3 352+359; i4 22 to i3 25; i4 301 to i3 351; i4 32X to i3 36; i4 23 to i3 26; i4 24 to i3 27; i4 13 to i3 17; i4 15 to i3 19; i4 17 to i3 21; i4 10–12 to i3 15–16; i4 14 to i3 18; i4 25X to i3 28; i4 19 to i3 23; i4 31 to i3 36; i4 16 to i3 20; i4 18 to i3 23. ISIC Rev.4 33 has no rough equivalent in ISIC Rev.3.

Pharmaceutical products are classified as high technology by Galindo-Rueda and Verger (2016). However, in the sectorial organisation of EORA, this sector is together with others so that we will consider this one of medium-high intensity.

In the ISIC Rev. 3 classification, scientific development activities are in the ISIC-related group 65, 66, 67, 70, 71, 72, 73. Because of this, we consider this group of high technological level in R&D.

TABLE A4 Effects of RTAs on global and intraregional LA value-added trade (phase-in)

Variables	(1) All countries -	(2) LA - rta	(3) LA - cu	(4) LA - fta	(5) LA - eia	(6) LA - ps	(7) LA - cuandeia	(8) LA - ftaandeia
1.rta	0.019							
	−0.0117							
rta		−0.0055						
		−0.0234						
cu			−0.0076					
			−0.018					
fta				0.0128				
				−0.0203				
eia					0.0152			
					−0.0116			
ps						0.2368**		
						−0.1125		
cuandeia							0.0166	
							−0.0138	
ftaandeia								0.0157
								−0.0184
Observations	128798	1900	1900	1900	1900	1900	1900	1900
Exporter-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Considering the following years: 1995, 2000, 2005, 2010, and 2015. The pattern of results is the same, except the size of clustered standard errors in parenthesis.

Robust standard errors in parentheses.

***$p < .01$, ** $p < .05$, * $p < .1$.

TABLE A5 Effects of RTAs on global and intraregional LA gross exports trade (phase-in strategy)

Variables	(1) All countries	(2) LA - rta	(3) LA - cu	(4) LA - fta	(5) LA - eia	(6) LA - ps	(7) LA - cuandeia	(8) LA - ftaandeia
1.rta	0.0229*							
	(0.0127)							
rta		0.0001						
		(0.0262)						
cu			−0.0274					
			(0.0181)					
fta				0.0211				
				(0.0208)				
eia					0.0288**			
					(0.0122)			
ps						0.3176**		
						(0.1285)		
cuandeia							0.0385**	
							(0.0163)	
ftaandeia								0.0240
								(0.0187)
Observations	128,798	1900	1900	1900	1900	1900	1900	1900
Exporter-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The results considering the gross exports present more significant standard errors. We observed that the economic integration agreements, partial scope and both custom unions and economic integration agreements show positive and significant results for gross exports between Latin American countries, the difference in the results found for trade in value-added. These differences emphasize the differences between considering local content embedded in commerce versus computing final goods trade (ignoring technical requirements' direct and indirect effects from Leontief matrix).

Robust standard errors in parentheses.

***$p < .01$, ** $p < .05$, *$p < .1$.