

Evolution of trade and productive integration in Latin America, 1995–2015: an input-output analysis

Latin American productive integration

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Abstract

Purpose – The main goal of this paper is to examine the evolution of Latin American productive integration in terms of the regional value added incorporated in intra-regional exports of Argentina, Brazil, Chile, Colombia, Mexico and Peru. In addition, the study traces the trade and productive integration trajectories for each of these countries from 1995 to 2015.

Design/methodology/approach – Based on the use of OECD's global ICIO input-output tables, this paper applies the methodological framework by Wang *et al.* (2018) for the analysis of trade flows at the bilateral level, which allows breaking down the value of gross exports of each sector-country, depending on the origin of the value added contained in exports, as well as their use.

Findings – The estimates show very low shares of value added from regional partners in the intra-regional exports of the countries studied. Conversely, the weight of the value added incorporated in these exports by countries outside the region has increased in tandem with China's expanding involvement in Latin America. This development, along with the downward trend in domestic value added incorporated in exports, indicates a lack of a regional integration process of any depth.

Originality/value – This article addresses an economic problem of conventional importance from a global value chain perspective using a novel methodology based on the use of global input-output tables.

Keywords Latin America, Value chains, Input-output, Regional integration, Exports

Paper type Research paper

1. Introduction

In Latin America, the new global context—led by international organizations—gave rise to a new “open” integration paradigm, with the primary goal of increasing regional trade to foster greater global integration, based on each country's static comparative advantages (Bértola and Ocampo, 2013). The establishment of open trade and regional preference zones was proposed, but unlike the previous “closed” model, there were no instruments to promote productive transformation with equity (Briceño, 2013). These public policy guidelines motivated the formation of NAFTA and MERCOSUR, as well as the region's leading economies' active participation in these agreements (Brazil, Mexico and Argentina) (Botto, 2019).

JEL Classification — C67, F15, F63, O54, N76

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With the arrival of progressive governments at the beginning of the twenty-first century, there was a return—in terms of ideological orientation—to postulates based on productive integration, as a means of progressing in industrialization processes towards more sophisticated modalities and with greater technological content (CEPAL, 2014). While the Bolivarian Alliance promoted an integration model based on solidarity, complementarity and cooperation, MERCOSUR's agenda was temporarily expanded to include issues related to coordination and productive integration. In 2012, the creation of the Pacific Alliance, with an “open” integration perspective, revealed a process influenced by national political fluctuations consisting of free trade agreements, regional and subregional agreements with opposing approaches and marked by the simultaneous participation of one or more countries in incompatible integration initiatives (Lámbarry, 2016).

In this regard, Latin American governments have shared the goal of forming and developing international production linkages that allow progress towards complete accumulation of origin. For that purpose, a consensus has emerged to embrace a more modern perspective of the integration process, focusing on the issues of integration in the production base and developing regional or subregional value chains (CEPAL, 2014). At the global level, different national experiences indicate that a more significant share of exports as a percentage of GDP may not reflect long-term progress in terms of income, employment or development if it is not accompanied by increases in domestic value-added content in exports (Banga, 2013). In this context, the benefits of productive and trade integration must be evaluated based on the value added generated in each location.

Various authors (Wang *et al.*, 2018; Johnson, 2014) have argued that trade statistics measured in gross terms entail a misinterpretation of the nature of trade integration phenomena, particularly the role of different countries, sectors and productive factors in global dynamics. Recently, the development of global input-output matrices and various methodologies based on these new instruments has made it possible to trace the value of goods and services through the set of participating countries and industries using bilateral trade flow analysis, and thus quantify the contributions of different stages of production to the value of the final product, as well as the distribution between countries of the benefits resulting from the fragmentation of the manufacturing process (Johnson, 2014).

In light of this, the main goal of this article is to examine the evolution of Latin American productive integration in terms of the regional value added (RVA) incorporated in intra-regional exports of countries for which complete and consistent data is available in the OECD's global input-output matrices (ICIO) (OECD, 2021) (Argentina, Brazil, Chile, Colombia, Mexico and Peru). In a second instance, the study uses two axes of analysis to trace the trade and productive integration trajectories for each of the countries from 1995 to 2015. The first, based on typical trade statistics, analyses the weight of intra-regional exports in the total exported; the second, based on a Global Value Chain approach, assesses the RVA's participation in intra-regional exports, in order to highlight the involution recorded in the degrees of complexity of these regional exchanges.

The outline of the paper is as follows: Following this introduction, the second section discusses the main aspects of economic integration theories about developing countries and Latin America in particular, as well as the concerns exposed on the issue of economic integration in Latin America within the context of the formation of Regional Value Chains (RVCs). Then, a third section details the calculations made from the methodology developed by Wang *et al.* (2018) (hereinafter referred to as WWZ), as well as the statistical sources used. The fourth section conducts a descriptive analysis of traditional trade statistics, which functions as a prelude to the presentation of the integration trajectories for the studied countries, in the fifth section. The fifth section holds also a discussion on the breakdown of intra-regional exports based on the origin of the incorporated value added and presents some theoretical and policy implications, followed by the research's key conclusions in the sixth section.

2. Theoretical framework and literature review

The framework of the theory of economic integration as laid out by Jacob Viner (1950) stems from the classical perspective of searching for the most efficient use of resources, emphasizing the static effects of the creation and deviation of trade caused by the liberalization of commerce (Asche, 2021). As the theory develops, particularly with the emergence of the so-called “New Trade Theory” (Krugman, 1980), the potential for different dynamic effects of integration have been considered (increase of investment expenditure, sustainable increase of demand, consolidation of production and increase of its specialization, improvement of the organization and management of production and production technology, rationalization of territorial distribution and utilization of resources, increase of production efficiency, creation of economic growth, etc.) (Marinov, 2014).

In this regard, several authors argue that these theories are inadequate for analyzing the specific case of economic agreements between developing countries (DCs) (Draper, 2010). Marinov (2014) regroups the main elements of integration for these cases into four main categories (general economic, market-related and trade-related factors, and effects). Among the general economic aspects, we can highlight the need for partners to coordinate macroeconomic policies, noting that the reduction of potential gains is due to the lack of coordination, particularly in terms of increasing intra-regional trade (Malamud, 2013). The market determinants include, among others, the need to achieve significant levels of complementarity between economies in order to increase the share of intra-regional trade and achieve greater benefits in terms of welfare (Butorina and Borko, 2022). Hosny (2013) mentions that most DCs consider integration as an instrument to increase their competitiveness in the global economy and thus place an increasing number of products in international markets.

Starting in the 1950s, specifically in Latin America, the structuralist economic perspective developed by ECLAC brought together some of the aforementioned theoretical elements, attributing a strategic role to regional integration in diversifying exports towards manufactured products, thus strengthening industrialization and expanding the capacity to import (CEPAL, 1959). Regional integration is contingent on the industrialization process and, in particular, on the need to move towards the manufacture of products with a higher value added, based on the concepts of specialization, industrial reciprocity and structural complementarity (CEPAL, 2014). These objectives might be attainable when the participating countries gain access to a much larger market, which at the level of the national productive structure may involve the realization of economies of scale and thus promoting technological development (Vázquez-López, 2011).

The rise of global value chains (GVCs) and the current relevance of geographical proximity for the organization and operation of fragmented manufacturing processes between countries have revalued regional space as a platform for the construction of productive complementarities and showed the need to readapt the integrationist theory and its quantitative instruments of analysis. In terms of potentialities, this new context means that, in addition to the benefits traditionally associated with regional integration (access to larger markets, learning advantages, generation of economies of scale, etc.), increased manufacturing productivity and competitiveness can be added as a result of supply chain formation and regional productive articulation (Milberg *et al.*, 2014). As Amar and Torchinsky (2019) point out, increasing the proportion of regional content in exports makes it possible to strengthen the productive “spillovers” generated by foreign sales.

Although final goods are sold on a worldwide scale, the majority of the productive activities, particularly in the manufacturing core, are commonly distributed among countries in the same region (Johnson and Noguera, 2012). The regional bias, according to Estevadeordal *et al.* (2013), stems from the high costs of transportation and logistics when traveling to long distances, including the existence of preferential trade agreements between neighboring countries. The need for a fast and secure supply of parts and components is yet

another aspect that recently reaffirmed the potential of regional integration and, as a result, the nearshoring of a whole series of productive activities to locations close to the main markets (Piatanesi and Arauzo-Carod, 2019). In the context of the current development of GVCs, the benefits of regional economic integration are not only an increase in the share of intra-regional exports in the total exports, but also and a very important asset is a greater accumulation of the regional value included in the trade between partners, synonymous with the realization of activities with higher degrees of sophistication and higher demand of high-skilled workers (Amar and Torchinsky, 2019).

Recent studies of the issues raised by economic integration in Latin America point to a scarce development of RVCs and a limited and shallow insertion of countries into extra-regional GVCs (Blyde and Trachtenberg, 2020; Banco Mundial, 2019; Zaclicever, 2017). Among the determinants of these deficiencies, some authors highlight heterogeneous and conflicting rules of origin in the different existing treaties in the region (Romero, 2021; BID, 2017; Cadestin *et al.*, 2016). Cadestin *et al.* (2016), for example, estimate that differences in rules of origin between existing agreements reduce the positive effects of regional trade exchanges by 15%, and are especially discouraging in the case of intermediate goods exports, where the positive effects are reduced by 30%.

For most countries, intra-regional competitiveness in intermediate goods is concentrated in primary sectors and industries with low technological content, while comparative advantages are limited to the regional level in industries with higher technological content, highlighting the potentialities in terms of the construction of production linkages in Latin America (Kreimerman, 2020; Amar and Torchinsky, 2019; Zaclicever, 2017). A particularly prominent aspect in the literature is the growing participation of China both as a provider of intermediate inputs in technology-intensive industries, and as an importer of commodities from the region, with regressive effects on the productive structure of Latin American countries in terms of their degrees of diversification and sophistication (Botto, 2019; CEPAL, 2018; Chun and Guo, 2017).

With an abundance of literature as background, the hypotheses put forward in this paper are twofold: Regional productive integration in Latin America has not progressed in terms of the regional value added incorporated in its exports, and the trajectories of productive and trade integration of the selected countries of the region have moved backwards into a more traditional trade based on the exchange of natural resource-intensive inputs with low value added.

3. Method

3.1 Research design/model

In Latin America, intra-regional exports have followed the growth pattern of total exports, averaging a solid growth rate of 8% per year between 1995 and 2015. However, with similar economic structures in the countries, trade tied to GVCs expanded by only 0.1% over that time, compared to 19% globally (Banco Mundial, 2019). The absence of a more complex trade in the region occurs in a context in which value chains structured by the industrial and/or service manufacturing sectors are primarily directed to destinations in the region, as are those connected to the primary sector and natural resource manufacturing. In fact, exclusively regional chains occur more frequently in highly technological industries such as the automotive industry and the manufacture of electrical machinery or electronics (Amar and Torchinsky, 2019).

Using the WWZ methodological framework (2018) as a starting point, a regrouping of the components described is proposed in this article, in order to distinguish the share of value added (domestic, regional or extra-regional) as well as the use given to these exports (final or intermediate) for intra-regional exports of Latin American countries for which information is available. The WWZ methodological framework for the analysis of trade flows at the bilateral level, based on the use of global input-output matrices, allows breaking down the value of gross exports of each sector-country, depending on the origin of

the value added contained in exports, as well as their use. The following seven components are obtained:

Component 1: Domestic value added, generated by exporting country (s), incorporated in its exports of final goods to the region (r) = DVA_{FIN}^s .

Component 2: Domestic value added incorporated in exports of intermediate goods that will be used by the rest of the region's countries, either for the production of final goods or intermediate goods for re-export = DVA_{INTER}^s .

Component 3: Foreign value added of regional origin, which is incorporated in the exports of final goods from s to the region = FVA_{FIN}^r .

Component 4: Value added generated in the region, but contained in the intermediate goods that are exported from the exporting country to the region = FVA_{INTER}^r .

Component 5: Foreign value added generated in third countries, outside the region, incorporated in exports of final goods from the exporting country to the region = FVA_{FIN}^t .

Component 6: Extra-regional foreign value added, incorporated in the exports of intermediate goods from the exporting country to the region = FVA_{INTER}^t .

Component 7: Double counting of domestic and foreign origins that, when eliminated, facilitates a better assessment of the trade flows analyzed.

Using these components, the regional value added (RVA) incorporated in a country's exports can be calculated as the sum of the domestic value added (DVA) and the foreign value added from the region (FVA^r). Namely:

$$RVA = DVA + FVA^r$$

Consequently, it is possible to distinguish the regional value added incorporated in the exports of final goods from that contained in the exports of intermediate goods.

3.2 Data/variables

The source of the data is the OECD's Global Input-Output Matrices (ICIO) (OECD, 2021), which covers the years 1995–2015. However, the project has published two editions of tables (2016 and 2018) covering overlapping time periods (1995–2011 and 2005–2015), with some changes in the number of sectors (34 in the 2016 edition and 36 in the 2018 edition) and their content. Therefore, it was decided to divide the sectors into three broad groups (extractive, industry and service) and, starting in 2005, use the values provided by the second updated series (2018 edition). Due to the availability of information, the computations were carried out for Argentina, Brazil, Chile, Colombia, Mexico and Peru, which together accounted for 79.6% of Latin American exports in 2015 [1]. Consequently, the group of regional trading partners (r) was, in each case, made up of the remaining 5 countries in the sample.

3.3 Analytical procedure

Below, the gross exports of a country (s) to the group of regional partners examined (r), where (t) is the group of third countries, is decomposed into the seven essential components using matrix calculation:

$$X^{sr} = \underbrace{(V^s B^{ss})^T}_{(1)} \# Y^{sr} +$$

$$\begin{aligned}
 & \underbrace{(V^s L^{ss})^T \# \left(A^{sr} B^{rs} Y^{ss} + A^{sr} B^{rr} \sum_t^G Y^{rt} + A^{sr} \sum_{t \neq s,r}^G B^{rt} \sum_u^G Y^{tu} \right)}_{(2)} + \\
 & \underbrace{(V^r B^{rs})^T \# Y^{sr}}_{(3)} + \underbrace{(V^r B^{rs})^T \# (A^{sr} L^{rr} Y^{rr})}_{(4)} + \\
 & \underbrace{\left(\sum_{t \neq s,r}^G V^t B^{ts} \right)^T \# Y^{sr}}_{(5)} + \underbrace{\left(\sum_{t \neq s,r}^G V^t B^{ts} \right)^T \# (A^{sr} L^{rr} Y^{rr})}_{(6)} + \\
 & \underbrace{\left[(V^s L^{ss})^T \# \left(A^{sr} B^{rs} \sum_{t \neq s}^G Y^{st} \right) + (V^s B^{ss} - V^s L^{ss})^T \# A^{sr} P^r + \left(\sum_{t \neq s}^G V^t B^{ts} \right)^T \# (A^{sr} L^{rr} X^r) \right]}_{(7)}
 \end{aligned}$$

Where V^s is the vector of sectoral coefficients of value added per unit of output that originate in country s (value added that originates in the region (V^r) or incorporated from third countries (V^t) is recognized in a similar way). B^{ss} , B^{rs} y B^{ts} are submatrices of the Leontief global inverse, which represent the input requirements of country s , depending on their origin (s , r or t). L^{ss} is the local Leontief inverse, or the input requirements obtained solely from domestic factors per unit of final demand. Throughout the equation, by multiplying the value added coefficients (V^s , V^r , V^t) by Leontief submatrices (B^{ss} , B^{rs} , B^{ts} , L^{ss}) the value added multipliers are obtained. By multiplying these coefficients by exports from s to r (X^{sr}), distinguishing between those produced in the form of final goods (Y^{sr}) and those produced in the form of intermediate goods ($A^{sr} P^r$), the seven components are obtained. A^{sr} is the matrix of intermediate inputs exported from s to r per unit of output of country r , and P^r is the vector of gross output of r .

4. Results

4.1 Descriptive analysis

An initial look at the evolution of trade integration in Latin America, both in terms of the weight of intra-regional trade in total exports of the countries studied and—in a qualitative manner—considering the nature of intra-regional exports, reveals two distinct trends. In terms of the first trend, despite the significant increase in global trade between 1995 and 2015, the weight of intra-regional exports in total exports has remained relatively constant as a result of the establishment of economic openness policies under “open” trade integration schemes beginning in the 1990s. In fact, the slight increases in intra-regional exports (X^{sr}) as a percentage of total exports (X^t) in Brazil, Chile, Colombia, Mexico and Peru were more than offset by Argentina’s drop from 30.6% in 1995 to 22.2% in 2015. (See [Table 1](#)).

Significantly, the reduction in Argentine intra-regional trade seems to be due to a reorientation of raw material exports towards China as a result of China’s emergence as the region’s leading buyer of primary commodities, which resulted in a shift in Latin American countries’ productive structures in favor of a development model based on static competitive advantages ([Botto, 2019](#)). In fact, Latin American exports to its three main extra-regional markets (USA, China and the EU) increased their concentration of products, reflecting a marked trend towards a reprimarization induced by high raw material prices (see [Figure 1](#)). In the case of Argentina, the weight of the X^{sr} in total exports of extractive products declined

from 33.1% in 1995 to 12.1% in 2015, resulting in a reduction in this percentage from 23.9% to 14.4% in the service category over the same period.

Starting in 2012, the beginning of a new negative phase in commodity prices, the stagnation of two of the largest economies in the region (Argentina and Brazil) and the slowdown in global demand as a result of the 2008–2009 crisis severely affected trade flows, especially intra-regional exchanges (Amar and Torchinsky, 2019). In the case of South American countries, the growing importance of exporting natural resources and derivatives as inputs to extra-regional destinations has limited the degrees and types of participation in modern industrial processes fragmented into value chains (Blyde, 2014). Various authors point to the main economies of Latin America (Brazil, Mexico and Argentina) having a greater productive linkage with countries outside the region, a low coefficient of cohesion and a limited degree of interconnection with other regional partners as key explanatory elements for RVC's limited development (Lámbarry, 2016; Bekerman and Rikap, 2010).

In support of the foregoing, and as the second noteworthy trend of this first descriptive analysis, the weight of intermediate goods in the X^{sr} of the sampled countries was reduced, going

	1995			2015		
	Intra-regional exports (X^{sr})	X^{sr}/X^t	Exports of intermediate goods in X^{sr}	Intra-regional exports (X^{sr})	X^{sr}/X^t	Exports of intermediate goods in X^{sr}
Argentina	7,606	30.6	52.4	13,822	22.2	48.4
Brazil	5,849	10.6	55.2	25,477	12.2	53.7
Chile	2,501	12.4	68.6	8,948	13.3	62.5
Colombia	903	7.7	65.6	5,086	12.4	61.4
Mexico	3,010	3.5	49.9	12,927	3.5	42.6
Peru	537	8.4	89.0	4,005	10.8	67.0
Total	20,405	10.0	56.4	70,264	9.0	53.1

Table 1. Intra-regional export data of selected countries*, 1995 and 2015 (Millions of dollars and percentages)

Note(s): *Intra-regional exports are made up of trade between the countries in the table
Source(s): Own elaboration with data from OECD (2021)



Figure 1. Evolution of commodity prices, 1995–2015* (Index base 100 in 2000)

Note(s): *Monthly frequency excludes gold

Source(s): Own elaboration with data from the International Monetary Fund (2021)

from 56.4% in 1995 to 53.1% in 2015 (see [Table 1](#)). When comparing 1995 to 2015, the indicator shows a decrease in all situations, demonstrating a shift towards classic Ricardian-type trade at the expense of more complex intra-industry exchanges associated with the establishment of industrial RVCs. As the GVC approach shows, “open” integration based on commodity exports limits the possibilities of upgrading [\[2\]](#) in the direction of carrying out industrial tasks or services with greater intensity in value added. This is partly because since raw material markets are dominated by purchasing countries, the supplying countries compete on price, blocking processes of learning and building of technological capabilities in these locations.

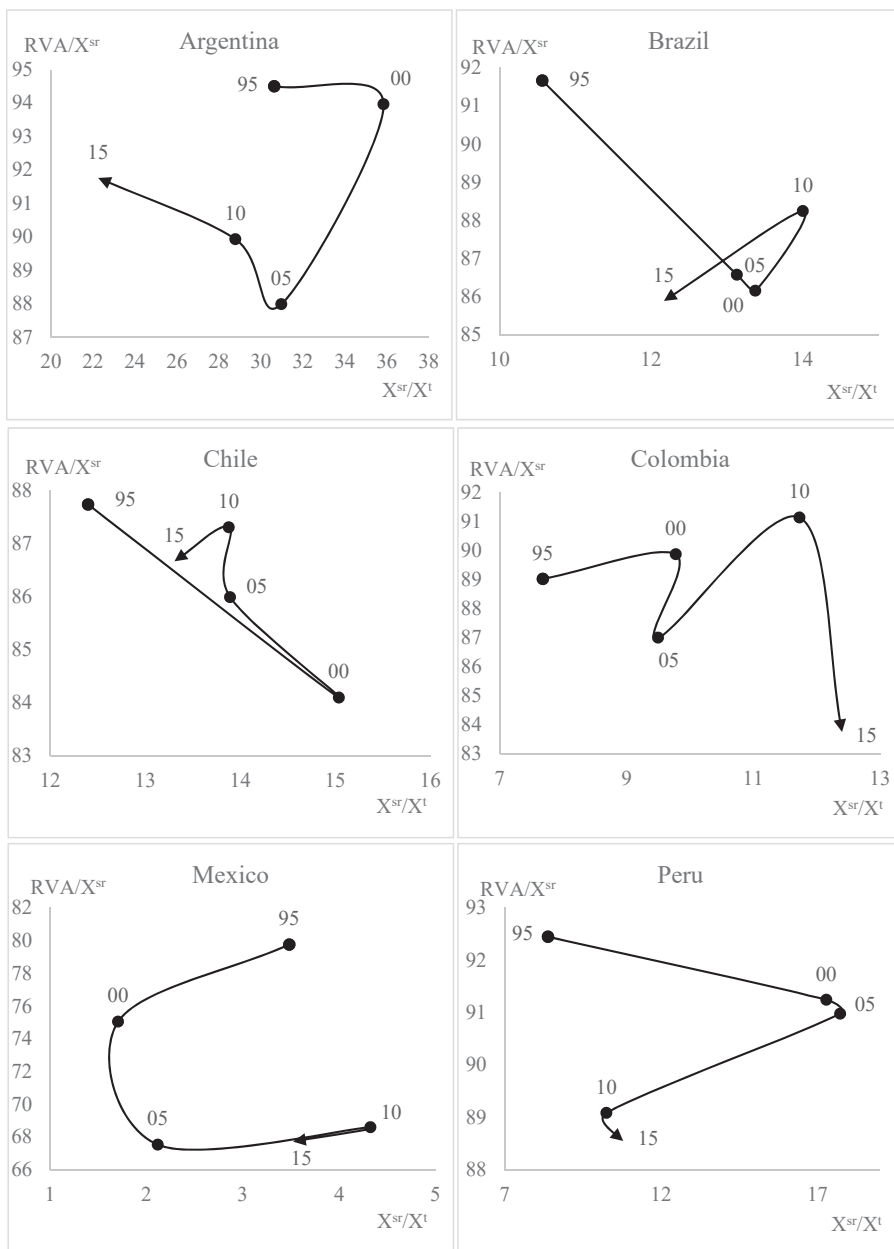
4.2 Trajectories of trade and productive integration

In order to corroborate and illustrate an evolution of the region’s process of productive integration in the direction of a shallower trend, trajectories of trade and productive integration were developed for each country in the sample from 1995 to 2015 (see [Figure 2](#)). These trajectories are depicted in a graph with two dimensions of analysis. The first one represents the evolution of trade relations between the sampled countries in gross terms, based on the share of intra-regional exports (X^{sr}) in total exports (X^t). Using the results of the applied input-output methodology and the weight of the RVA in the X^{sr} , the second dimension assesses the intensity of these relations in terms of value added. In these graphs, a country’s degree of trade integration grows as it travels to the right in time, whereas an upward trend suggests a larger degree of productive integration.

The graphs for each of the countries studied reveal that the trajectories’ starting points in 1995 are positioned above the points belonging to 2015. This means that the RVA included in intra-regional exports decreased from 1995 to 2015, indicating a lower degree of productive integration between Latin American economies over the study period. The situations of Brazil and Mexico, the region’s largest industrialized economies, are particularly noteworthy. Due to the rising integration of these countries into extra-regional GVCs, the weight of the RVA in the X^{sr} was reduced by 6 and 12%, respectively. This phenomenon can be explained by these nations’ limited use of the regional market to establish economies of scale and learning processes in order to grow their exports to countries outside the bloc, which has prevented the consolidation of reciprocal regional trade.

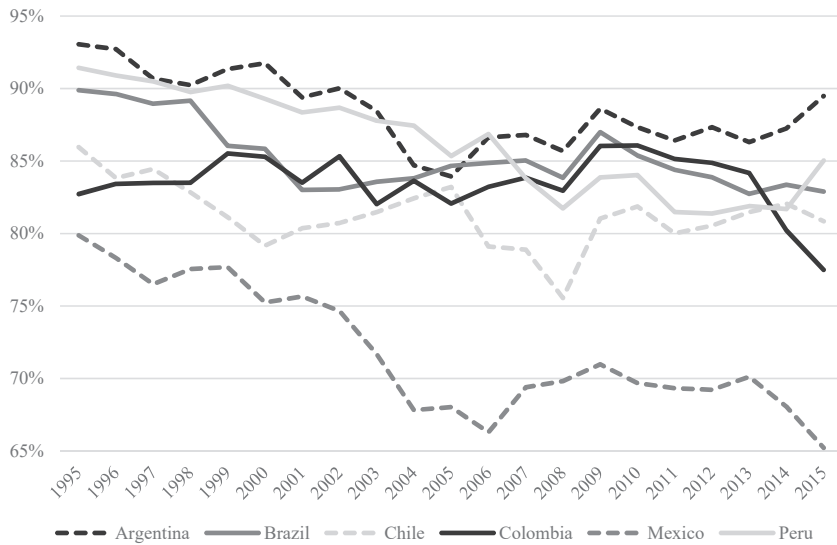
For example, as [Bekerman and Rikap \(2010\)](#) point out, in the bilateral relationship between Brazil and Argentina, the larger economy continues to supply goods to the smaller one, while the latter’s exports are losing ground in their partner’s market. As for Mexico, despite the fact that the X^{sr} portion of X^t increased since the first decade of this century, the weight of RVA in X^{sr} remained steady at roughly 68%, the lowest of the sample, indicating a pattern of regional exchange growth, without an increase in productive integration. In Colombia, the weight of the X^{sr} in the X^t increased from 7.7% in 1995 to 12.4% in 2015, coinciding with a significant increase within the industrial sectors in the structure of sales to the region, from 51.5% to 66.9% in the same years. However, the RVA’s share of industrial intra-regional exports declined since 2000, from 87% in 2000 to 83.7% in 2015, indicating a scarce productive integration with its regional partners.

Moreover, when examining the evolution of the RVA included in intermediate industrial goods traded within the region, all countries show a declining trend as a result of the impoverishment of the tasks carried out with regard to these exports in terms of their sophistication grades (see [Figure 3](#)). In Colombia, this decline, from 86.1% in 2010 to 77.5% in 2015, largely explains the observed reduction in RVA in the X^{sr} , despite rises recorded in the weights of both the X^{sr} in the X^t , as well as in industrial exports in sales to the region. In general, an involutionary trend in terms of productive integration is confirmed in all cases, but with two variants: countries that recorded an increase in the relative weight of their X^{sr} (Brazil, Chile, Colombia, Peru and Mexico) and Argentina, which experienced a reduction in the proportion of its X^{sr} within its X^t as a result of the aforementioned reprimarization and reorientation of its exports to China.



Source(s): Own elaboration with OECD data (2021)

Figure 2. Trajectories of trade and productive integration in selected Latin American countries, 1995–2015 (Percentages)



Source(s): Own elaboration with OECD data (2021)

Figure 3. Share of regional value added in intra-regional exports of intermediate industrial goods, 1995–2015 (Percentages)

5. Discussion

5.1 Decomposition of intra-regional exports based on the origin of the value added incorporated

When breaking down intra-regional exports by the origin of the value added, the input-output methodology finds significant RVA shares in all situations (83.8% for the sample as a whole in 2015) (see Table 2). However, distinct results are revealed when the RVA is broken down into its two components: domestic value added (DVA) and value added generated by regional trade partners (FVA^t). In 2015, the FVA^t recorded inconsequential values of 1.7 and 2.1% for the economy as a whole and the industrial sectors, respectively.

According to Blyde and Trachtenberg's (2020) estimations, the FVA^t in overall Latin American exports was 5% in 2015, compared to 18% in Asia and 24% in Europe. As part of the explanation for this, the substantial participation of inputs based on natural resources with a low degree of processing in the composition of this FVA^t must be recognized. One case that illustrates the type of trade relations that exist behind these figures is that of Chile and other nations with an extractivist profile, where energy and—notably—gas utilized in the extraction of copper for export account for a significant portion of regional imports. Overall, the findings of the analyses demonstrate the absence of the development of complex RVCs, based on the presence of complementarities between Latin American partners that could lead to the establishment of regional production linkages.

Furthermore, the extra-regional value added in X^{sr} (FVA^t) in the total of the countries in the sample went from representing 8.5% for the economy as a whole, and 11.1% for the industrial sectors in 1995, to levels of 13.9 and 17.9%, respectively, in 2015 (see Table 2). The increased participation of FVA^t was associated with the commercial dynamics induced by China's increased presence in the region (reprimarization and concentration by products). South American exports to China are limited to a narrow range of primary products, necessitating the positioning of South American countries in the lower, less profitable segments of GVCs. For example, in Argentina, exports of soybean meal and other processed products of this raw material have dropped substantially in favour of sales of unprocessed

Sector	Country	Exports	1995			2015			
			DVA	FVA'	FVA'	Exports	DVA	FVA'	FVA'
Total	Argentina	7,606	93.2	1.3	4.9	13,822	89.1	2.7	6.6
	Brazil	5,849	90.8	0.9	7.0	25,477	84.6	1.3	11.3
	Chile	2,501	85.1	2.7	10.2	8,948	84.2	2.5	10.8
	Colombia	903	87.9	1.1	9.6	5,086	81.7	2.1	13.4
	Mexico	3,010	79.5	0.3	19.3	12,927	67.0	0.7	30.5
	Peru	537	89.8	2.7	5.7	4,005	86.8	1.8	9.3
	<i>Total</i>		20,405	89.2	1.2	8.5	70,264	82.1	1.7
Industry	Argentina	4,128	90.7	1.8	6.8	9,723	86.5	3.5	8.0
	Brazil	4,462	89.0	1.1	8.3	17,716	81.3	1.6	13.7
	Chile	1,653	82.9	3.1	11.5	3,842	78.3	3.6	15.3
	Colombia	465	82.2	1.6	14.4	3,404	76.0	2.8	17.6
	Mexico	2,298	74.7	0.4	23.8	10,280	60.5	0.8	36.6
	Peru	294	87.2	3.8	6.6	2,197	82.4	2.5	12.7
	<i>Total</i>		13,300	86.0	1.5	11.1	47,163	77.2	2.1
Extractives	Argentina	1,428	95.3	0.7	3.1	1,359	95.4	0.6	3.4
	Brazil	269	93.9	0.6	4.7	2,721	88.4	0.5	8.5
	Chile	462	86.9	2.3	9.0	2,029	87.5	1.6	6.6
	Colombia	235	94.1	0.4	4.2	843	93.5	0.6	4.3
	Mexico	35	95.5	0.1	3.8	68	91.4	0.2	6.9
	Peru	168	92.9	1.3	4.4	970	92.7	0.7	4.0
	<i>Total</i>		2,597	93.4	1.0	4.5	7,990	90.4	0.8
Services	Argentina	2,051	96.9	0.5	2.2	2,740	95.3	0.7	3.5
	Brazil	1,118	96.9	0.3	2.5	5,039	94.5	0.3	4.5
	Chile	385	92.1	1.2	6.0	3,076	89.5	1.6	7.9
	Colombia	203	93.8	0.6	5.1	838	92.6	0.8	5.8
	Mexico	678	94.9	0.1	4.8	2,579	92.6	0.2	6.7
	Peru	74	93.1	1.3	5.1	839	91.5	1.0	6.4
	<i>Total</i>		4,509	96.0	0.5	3.2	15,111	93.0	0.7

Source(s): Own elaboration with OECD data (2021)

Table 2.
Breakdown of intra-
regional exports based
on the origin of the
value added
incorporated by
activity sector, 1995
and 2015 (Millions of
dollars and
percentages)

soybeans, relegating the South American country to the chain's first stages of lower value added. This resulted from China's upgrading industrial policy, which—starting in 1990—encouraged investment in modern soybean crushing plants in coastal provinces, essentially relocating the production facilities of large transnational businesses (ADM, Bunge and Cargill) from South America to China (Chun and Guo, 2017).

As pointed out by ECLAC (CEPAL, 2018, p. 41): “The basket of exports from Latin America and the Caribbean to China is substantially less sophisticated than its shipments to the rest of the globe. Indeed, in 2016 primary products accounted for 72% of the value of the region's exports to China, compared to only 27% for its shipments to the rest of the world. By contrast, low-, medium- and high-tech manufacturing accounted for just 8% of regional exports to China, compared to 57% of shipments to the rest of the world. In the case of imports, the opposite occurs while low-, medium- and high-tech manufacturing accounted for 91% of the value of regional purchases from China in 2016, their share of imports from the rest of the world, while still considerably high, was substantially lower (68%).”

As UNCTAD (2018) points out, nations can be trapped in low-end export positions with little value added, with poorer gains in terms of domestic value generation and productive diversification, depending on their type of GVC insertion. As a final example, in Colombia, recent governments' strengthening of the mining-export strategy, as well as high productivity in mining exploitation as a result of large transnational companies' use of mature high-performance technologies, resulted in a currency revaluation with a

discouraging effect on exports with higher value-added (Torres, 2013). It should be noted that, despite the high levels of innovation and technological efficiency of these large corporations, spillovers to the rest of the economy are low (Garavito and Rueda, 2021). In this context, the decline in intermediate industrial goods shares and low FVA^r levels in intra-regional exports observed here, reflect not only the reprimarization and/or impoverishment of productive structures, but also a shallower process of productive integration in the region.

5.2 Theoretical implications

In this regard, given the poor technological and economic viability of fragmentation in a specialization pattern based on natural resources, the link to GVCs through the export of raw materials does not usually result in major structural transformations in economies (Veiga and Rios, 2007). The development of regional productive links based on the exploitation of natural resources should therefore be seen as the beginning of a long-range planned process of productive upgrading (Cigna *et al.*, 2022). On the other hand, maintaining a regional trade pattern based on the simple exchange of products and inputs of primary origin, with little value-added, will result in a dependent, shallow and short-range integration process. Similarly, insertion into these global networks based on the performance of low-skilled labor-intensive tasks has little impact on the rest of the productive structure, especially when local inputs are substituted by imports.

Theoretically speaking, we can draw a valuable lesson: that regional integration based exclusively on exporting natural resources or low-skilled labor-intensive tasks, that is, based on the exploitation of static comparative advantages—as is the case in Latin America—, will not likely generate a structural change that may foster the development of activities with a higher degree of sophistication (CEPAL, 2018). With the objective of increasing global competitiveness and as a platform for an insertion in GVCs of greater depth and length, this type of regional integration narrows the positioning of DCs to the less profitable initial links of the chain, making it incompatible to generate learning opportunities that would increase the degrees of productivity and efficiency in the economy (Tian *et al.*, 2019). In theory, a series of systemic advances, such as the development of an efficient infrastructure, diversification of productive structure, the adoption of appropriate regulatory frameworks and indigenous technological developments, etc., must be set in motion to achieve the expected positive dynamic effects of regional integration (CAF, 2021).

5.3 Policy implications

Following this train of thought, in order to take advantage of the regional space to generate a structural change that would lead to a productive upgrade within the international value systems, it will be necessary to implement a consecutive series of specific measures. At the national level, long-term planning by the State is necessary, aimed at developing the capacities and skills needed to conduct the most knowledge-intensive tasks. As the process advances, all activities and strategic sectors to be encouraged will indeed change; therefore, the degree of flexibility of the capacities and skills developed will be of particular importance. As shown by complexity theory (Hidalgo *et al.*, 2007), there are industries and sectors with greater degrees of closeness and similarity, which allows upgrading by following a preset route based on the needs—in terms of capabilities and skills—of the different sectors.

At the regional level, the paper's findings confirm the policy recommendations made by the literature on the integrationist phenomenon in Latin America. First, coordination of macroeconomic policies and tariff frameworks among partners aimed at increasing intra-regional trade, is indispensable to increase the gains from integration (Malamud, 2013). The second, economic integration between countries at similar levels of development, requires achieving significant degrees of productive complementarity (Butorina and Borko, 2022).

This is particularly difficult in the case of Latin America because most trading partners are characterized by comparative advantages based on the exploitation of natural resources. In order to advance at unison, a series of challenges must be met, such as the homogenization of regulatory frameworks and the elimination of trade barriers, but—most of all—the establishment of joint productive development policies to greatly improve the processing of these goods in a coordinated manner.

5.4 Future research agenda

In order to refine and make theoretical and public policy proposals more concrete and specific, a particularly interesting approach to be developed in future research is to reconcile the analysis conducted at the level of large sectors using input-output tables with a microeconomic analysis at the level of companies. In Latin America, there is a high concentration of productive activity in a small number of large companies that account for a high percentage of trade and the type of exchanges conducted. Detecting the main companies responsible for exports, knowing the transfer prices between their subsidiaries and explaining the logic behind their exchanges would make it possible to delineate and focus on the public measures to be implemented.

Another aspect to consider is the analysis of the two larger economies of the region, Brazil and Mexico. Several authors have pointed out that a determinant factor of the failure of integration attempts in the region is the lack of real interest in the project on the part of the leading Latin American countries (Lámbarry, 2016; Bekerman and Rikap, 2010). In this regard, the calculations performed corroborate that those cases show an increase in GVCs and a lowering of RVCs. In the case of Mexico, its linkage to GVCs, through assembly operations in the electronic and automotive sectors for the export of final goods to the US market, has resulted in an expansion of its exports but also in the breakdown of domestic value chains and reduced diversity of the productive structure (Vázquez-López, 2020). In the case of Brazil, the majority of commodities are exported to be processed and consumed in Europe and Asia, in the context of a continuous process of reprimarization of the economic structure that has limited the possibilities of closing technological and production gaps with respect to its extra-regional trading partners (Phillips, 2013; Rodrigues *et al.*, 2022).

6. Conclusions

The estimates based on the WWZ methodology (2018) and statistical data from the OECD's global ICIO input-output tables (OECD, 2021) for the period of 1995–2015, show very low shares of value added from regional partners in the intra-regional exports of the countries studied (Argentina, Brazil, Chile, Colombia, Mexico and Peru). Conversely, the weight of the value added incorporated in these exports by countries outside the region has increased in tandem with China's expanding involvement in Latin America. This development, along with the downward trend in domestic value added incorporated in exports, indicates a scarce development of productive complementarities, as well as a lack of a regional integration process of any depth.

On that account, the tracing of the trajectories of trade and productive integration for the cases studied confirms a setback in terms of degrees of productive integration, which reflects an involutory process towards traditional intra-regional trade of the Ricardian type at the expense of more complex intermediate goods exchanges associated with the conformation of industrial RVCs. In South America, the reorientation of trade towards China, along with an increase in commodity prices beginning in 2002, resulted in a reprimarization and concentration of exports by products. The tendency to adopt specialization patterns based

on the exploitation of static competitive advantages has definitively stifled the processes of learning and building of technological skills, restricting upgrading possibilities within GVCs.

Thus, despite the revaluation of the regional space for the development of productive complementarities and the existence of a plethora of agreements aimed at facilitating free trade, it appears that the evolution of trade and productive integration in Latin America has followed the guidelines set by the logic of large transnational corporations' operations and organization. In most cases, transnational corporations, leaders of GVCs, decide the location of each stage of the production process according to the level of labor costs, tax exemptions or the preferential geographical location of the territory (Leachman and Leachman, 2004). In this regard, and following the example set by China, deeper economic integration in the region, which allows the development of RVCs based on the construction of productive linkages, requires the establishment of a wide range of specific Latin American sectoral measures that encourage said corporations to conduct tasks of a higher degree of sophistication in the region. To this end, two lines of action could be of particular interest: joint ownership of affiliated companies and the dissemination of the parent company's know-how to its subsidiaries located in the region.

Notes

1. Percentage calculated based on UN figures (UN, 2021). In the case of Venezuela, data from 2013 were used, as there was no information for 2015 in the sources consulted.
2. Gereffi (1995) defines economic upgrading as the transition from less sophisticated export roles to more sophisticated ones, or from activities or tasks that generate less value added to activities or tasks that generate relatively more of it.

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