Latin America integration and regional production networks.

This paper quantifies the effects of two regional integration agreements in Latin America, namely the Latin American Integration Association and the Southern Common Market, on the development of production networks in the region. Two main hypotheses are tested using disaggregated data for trade in goods between eleven LAIA members over the period 1991-2008. First, with trade liberalisation LA countries have become more integrated into regional production networks and second, the implementation of LA agreements has had production relocation consequences. The main results indicate some evidence of production networks mainly in the 1990s and for Mercosur members, but no significant evidence is found from 2000 onwards.

Keywords: production networks; intermediate goods; trade integration; Latin America; panel data; gravity model

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1. Introduction

This paper focuses on the effects of two regional integration agreements (RIAs) in Latin America (LA), namely the Latin American Integration Association (LAIA) and the Southern Common Market (Mercosur) on the development of production integration networks. LAIA includes 12 LA countries, whereas Mercosur only includes 4 bordering countries, which represent 65% of LA surface area, almost 9% of the world surface area and about 50% of the population of LA. Additionally, more than 90% of GDP is generated in the two largest countries (Blanchard and Pérez-Enrri, 2000) and trade policies in Mercosur partially reflect interests in Argentina and Brazil (de Paiva Abreu, 2004).

Previous research has mainly focused on other integration agreements, such as the European Union or the North American Free Trade Area. According to the existing literature, European integration has been a fundamental driving force behind the increase observed in intermediate goods trade, fostering integrating countries' participation in European production networks (Blázquez, Diaz-Mora and Gandoy, 2009 and 2010; Martínez-Zarzoso, Voicu, and Vidovic, 2010). In the same vein, this is the first paper that tests whether increasing imports of intermediate goods in the region have led to higher exports of final and intermediate goods to LA trading partners.

The main aim of this paper is to estimate the determinants of intra-LAIA and intra-Mercosur trade in intermediate and final goods separately[1] and test two main hypotheses. First, with trade liberalisation LA countries have become more integrated into regional production networks. Second, the implementation of LA agreements has had production relocation consequences, as manufacturing companies prefer to locate an activity or process of their production in countries with a more favourable trade policy or nearer to potential markets.

The main findings show evidence of the first hypothesis in capital goods, suggesting that higher level of imports of capital goods from Mercosur are associated with higher level of exports of capital goods to LAIA countries. Evidence is also found of the second hypothesis, results being in line with the existence of a "substitution" effect in the sector of food and beverages and a "complementary" effect in capital goods. Overall, the effect of integration on regional production networks is found to be positive for Mercosur in the 1990s, and non-significant from 2000 onwards.

The rest of the paper is organised as follows. Section 2 presents stylised facts about regional integration in LA. The main hypotheses are outlined in Section 3. Section 4 describes the data and the empirical strategy and Section 5 presents the main results. Finally, Section 6 concludes.

2. Regional Integration in Latin America

2.1. LAIA and Mercosur integration processes

The first of the two agreements considered in this paper, LAIA (Montevideo Treaty, 1980), aims to establish a preferential economic system within the LA region. LAIA employs three mechanisms to do so: 1) Preferential regional tariffs applied to products which come from member countries, 2) Regional trade agreements, common to all member countries and 3) Trade agreements, in which only two or more countries in the region participate. Member countries are Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela.[2]

As regards the second agreement, the Asuncion Treaty was signed in 1991 and established Mercosur, a free trade area including Argentina, Brazil, Paraguay and Uruguay. The main objective was to achieve a common market by 1995 based on the free movement of goods, services and production factors. This Treaty entailed an initial

40% reduction in tariffs among member countries, with progressive reductions until they were totally eliminated in 1995. That same year, a common external tariff (CET) came into force in the region. The main foundations of Mercosur included coordination in macroeconomic, external trade, agriculture, industry, fiscal, monetary and exchange rate policies, among others.

Unlike other RIAs that involve developed countries, such as the European Union, LAIA and Mercosur seem to have accepted the arguments put forward by Prebisch (1959) and Cooper and Massell (1965). Prebisch (1959) distinguished between the effect of trade protection in developed and developing countries. According to this author, protection of primary production in developed countries tends to depress developing countries and decreases growth in world trade, whereas in developing countries trade protection can correct the effects of existing disparities without hampering growth in world trade. This author recommends enlarging domestic markets in developing countries by establishing a common market to foster and diversify trade within the area. In fact, LA regional integration could have helped Brazil to achieve its industrialisation objectives, as Brazil exports more sophisticated goods, in which it does not have a comparative advantage, to Mercosur members (Moncarz, Olarreaga and Vaillant, 2010).

Cooper and Massell (1965), by assuming that economic planners in a developing country may be willing to accept a reduction in national income to achieve an increase in industrial production, state that industrialisation objectives might be achieved at a lower cost by establishing RIAs and point out that when "two countries are complementary, different industries are likely to be protected in each country, and a customs union will tend on balance to be trade-diverting, with the loss in efficiency (and hence in welfare) that Vinerian theory associates with this result".[3] These authors

support not only explicit compensation agreements between the integrated members, but also a detailed agreement on intra-union division of industry. One example of intra-Mercosur division of industry could be observed in the leather footwear industry, as Argentina specialised in the supply of tanned leather and Brazil specialised in the production of leather shoes, consolidating a South American production network as a result of the dramatic growth in consumer demand in the United States during the 1980s (Korzeniewicz, 1992).

2.2. Intermediate goods trade in LA

As trade in intermediate goods and its role in global production networks are the main interest of this research, a more detailed description of intermediate trade data is presented in this section. After the CET was established in Mercosur, import duties on intermediate goods were reduced drastically. Giving easier access to foreign equipment and intermediate products than to consumer goods, a trade policy strategy which increases the effective degree of protection, was widespread among the 11 LAIA members. Nevertheless, some differences could be observed from one country to another. Brazil protects consumer goods and other final goods[4] to a greater extent than intermediate goods, whereas the group of other goods, which includes primary fuels and capital goods, is a more liberalised sector in Argentina, Bolivia, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela, followed by the sector of intermediate goods. In contrast, Chile has undergone the most far-reaching liberalisation process over the period 1994-2008. Mexico has experienced greater liberalisation with other RIAs that involve developed countries after becoming a member of the North American Free Trade Area (NAFTA) and signing a free trade agreement with the EU in 2000. Meanwhile, the rest of countries (excluding Chile) have liberalised trade with LAIA and Mercosur to a greater extent.

The global relative importance of intermediate imports, that is, world imports of intermediate goods over total world imports, increased in all members of Mercosur over the period 1994-2008. In particular, the import share of intermediate goods from the NAFTA and the EU has increased over time in most of the countries considered (excluding Bolivia, Ecuador and Venezuela), whereas the share of intermediate goods imported from the two South-South RIAs considered (LAIA and Mercosur) only increased for Bolivia, Brazil, Ecuador and Paraguay. The increase in the importance of intermediate goods trade appears to point towards greater production integration among the members of the RIAs. Nonetheless, when considering the change in imports of intermediate goods that originated in different RIAs, different patterns are observed in LA countries. While a number of countries in the region seem to be more integrated in LA regional production networks, such as Brazil (increase in relative imports from LA regional agreements), others seem to be more integrated in production networks within other integration agreements, such as the NAFTA and the EU (as is the case of Chile and Mexico) or global production networks with other countries in the world (as could be the case of the increase in imports of intermediate goods from China). Figures 1 and 2 summarise the change in the relative importance of imports of intermediate goods in the four most representative countries in the region in terms of trade (Argentina, Brazil, Chile and Mexico).

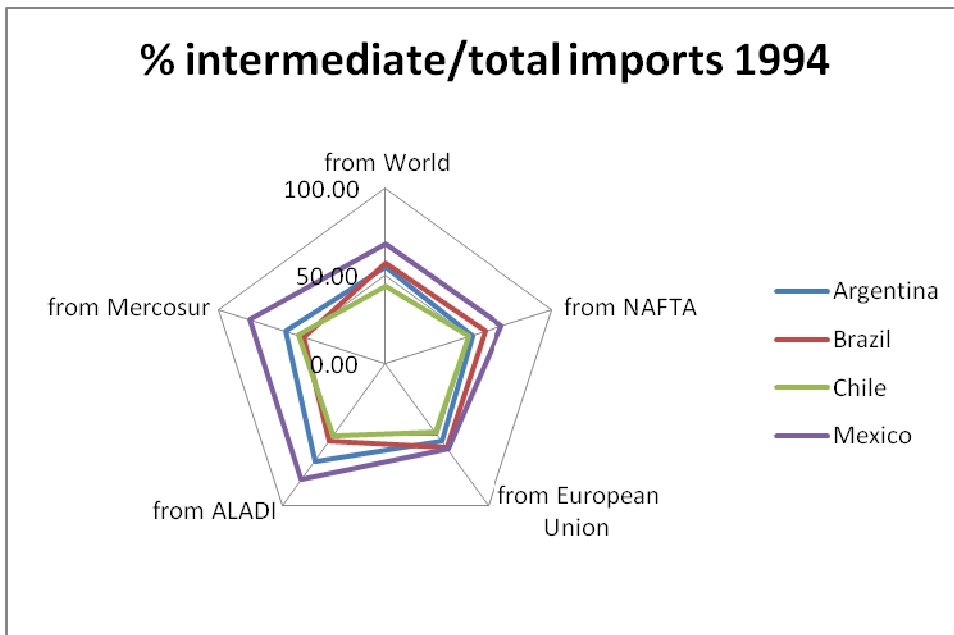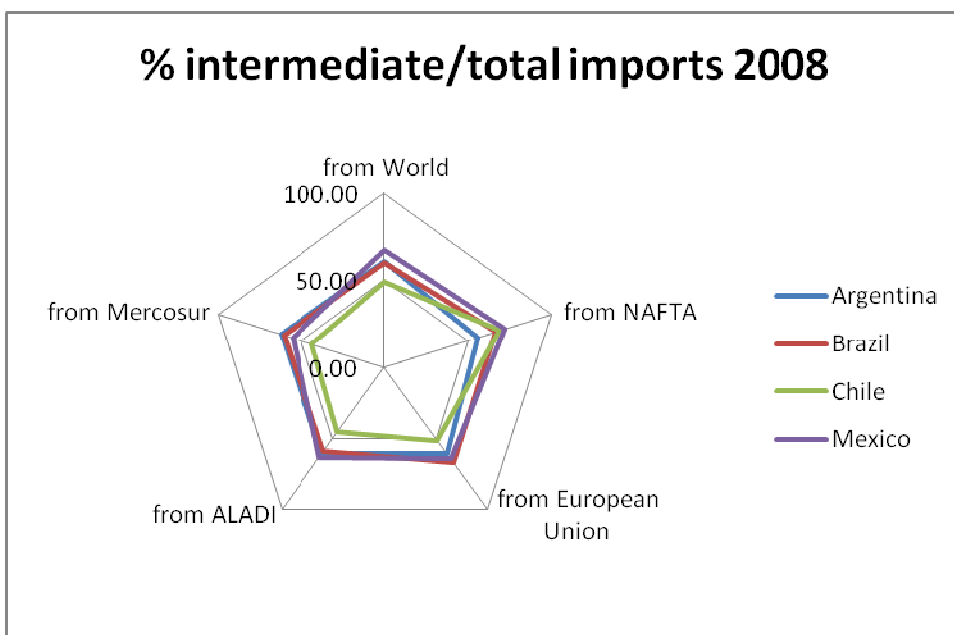**Figure 1. Relative imports of intermediate goods in 1994**

% intermediate/total imports 1994

Figure 2. Relative imports of intermediate goods in 2008

% intermediate/total imports 2008

The specific characteristics of certain intermediate goods might be behind the different patterns observed in LA imports, such as the relative intensity of production factors or the abundance of natural resources. In order to illustrate the change in the composition of intermediate goods in Mercosur, the most advanced and recent LA integration agreement, the two largest partners (Argentina and Brazil) are considered. Argentina

has maintained a more similar import structure over time than Brazil, but that both countries have experienced a larger increase in relative imports of intermediate goods from Mercosur in sectors 111 (Primary food and beverages, mainly for industry) and 32 (Processed fuels and lubricants). In contrast, both Argentina and Brazil now import less Parts and accessories of transport equipment (sector 53) than in the past. This is the opposite to what has occurred in the European Union automotive sector, where the adhesion of Eastern and Central European countries has led to greater integration of production networks (Blázquez, Diaz-Mora and Gandoy, 2010). The reason for this difference could be that the automotive sector in Mercosur still has a number of artificial trade barriers.[6] Additionally, Brazil also imports less intermediate goods from Mercosur in sectors 121 (Processed food and beverages, mainly for industry), 21 (Primary industrial supplies) and 22 (Processed industrial supplies).

With regard to exports, Argentina has recorded an increase in exports of intermediate goods belonging to sectors 111 and 32 to Mercosur, whereas Brazil now exports more intermediate goods from sectors 22 and 32 to Mercosur. The decrease in exports from sector 53 in both countries falls in line with the previous argument and indicates the existence of protectionist industrial policy in the automotive sector in Mercosur.[7] Finally, Argentina also registers a decrease in exports in sector 21 (Primary industrial supplies). This sector includes raw hides, skins, leather and furs and was a key variable in the division of labour between Argentina and Brazil in the 1980s, as Argentina exported leather to Brazil, which expanded its leather footwear industry through an increase in exports mainly due to the growth in consumer demand for footwear in the United States (Korzeniewicz, 1992). The argument that Brazil should record greater profits than Argentina, due to being closer to the consumption end of the leather production network (Gerefi and Korzeniewicz, 1990) might be in line with the

decision by Argentinean authorities to restrict exports of primary goods, such as raw and semi-tanned bovine hides, with a lower value added.[8]

This descriptive analysis performed for intermediate goods in LA countries indicates the need to empirically test whether LA regionalism has led to increasing regional production networks in LA countries.


3. Hypotheses

The two abovementioned hypotheses that are central to the empirical analysis, as well as three more specific hypotheses, are stated and explained in this section. Concerning the first hypothesis, the issue is whether LA countries have become more integrated into regional production networks within the LA regionalism process (H1). In particular, it is expected that increases in imports of intermediate goods will lead to greater exports of final goods to LA partner countries. As opposed to RIAs that involve developed countries, we expect production networks to have only a small effect on integration as no significant changes have occurred in the pattern of trade over the last 20 years at a very aggregate level (including all sectors, years and countries). However, marked differences are expected when different countries, periods of time and sectors are considered.

The second hypothesis states that the effect of LA integration may have fostered the relocation of production, as manufacturers may prefer to locate an activity or process of their production in countries with more favourable trade policy, greater macroeconomic stability or which are nearer to potential markets (H2). This relationship may be ambiguous. On the one hand, a "substitution" effect might occur, whereby the higher the imports of intermediate goods, the lower the export flow of intermediate goods to partner countries (inverse relationship). On the other hand, a

"complementary" effect might also occur, whereby the higher the imports of intermediate goods, the higher the export flow of intermediate goods to partner countries (direct relationship), hence revealing a stronger and more complex integration relationship through the various stages of production.

The two effects stated in H1 and H2 are summarised in Figure 3. If H1 is true, an increase in imports of intermediate goods in a particular LA country would lead to an upturn in exports of final goods to the region. If H2 implies a direct relationship, an increase in imports of intermediate goods in LA countries would lead to higher exports of intermediate goods bound for LA trading partners, thus indicating that intermediate goods are processed in different countries in the region, which then export them to another country in the region, which assembles and sells the final good.

Figure 3. H1 and H2 production integration networks.
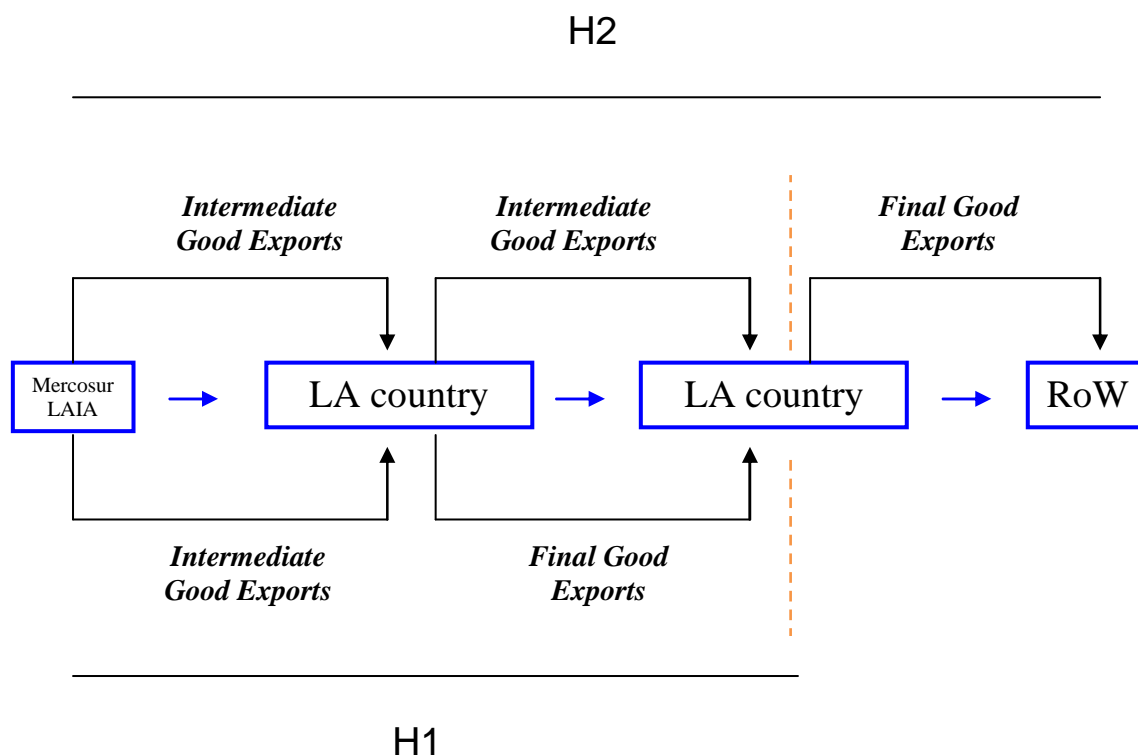
In this paper, imports of intermediate goods from Mercosur, LAIA and the rest of the world (RoW)[9] are distinguished.

Therefore, a direct relationship between imports of intermediate goods from Mercosur or LAIA countries and either exports of final goods (H1) or exports of intermediate goods (H2) is interpreted as a positive effect of integration on regional production networks.

Related to these two main hypotheses, Recalde, Florensa and Iturralde (2010) have shown that exports from LAIA countries to the rest of the world have decreased as a consequence of growth in Brazil's exports and this displacement effect is higher in the case of manufactures than other goods. Therefore, the third hypothesis to be tested is that the effect of regional integration on production networks differs by sector (H3). In order to test H3, and provided that the items in the BEC trade classification aggregate a high number of sectors(see Baldwin and Taglioni 2011), a correspondence table is built (see Appendix) between final and intermediate industries and separate regressions are run for the four different sectors of final goods (food and beverages, capital goods, transport equipment, consumer goods) and for the four sectors of intermediate goods (food and beverages, capital goods, transport equipment, industrial products) considered. Evidence of H1 is found for the capital goods industry, an inverse relationship in H2 for the sector of food and beverages and a direct relationship in H2 for capital goods.

Previous research has found a significant positive impact on the increase in exports within the Mercosur integration process in Argentina (trade creation), whereas no significant effect was found for Brazil (Recalde and Florensa, 2009). Moreover, the trade liberalisation process seems to have been stronger in Mercosur than in LAIA; consequently, the fourth hypothesis to be tested is that the effect of regional integration

on production networks in LAIA and Mercosur might differ (H4). This paper provides empirical evidence for H4 as the effect on regional production networks is stronger in Mercosur than in LAIA.

Finally, Korzeniewicz (1992) and Ciravegna (2003) provided evidence of the existence of a strongly integrated regional value chain in the 1990s in two strategic industries in Mercosur, namely the leather footwear and automotive value chains. However, the significant events that took place at the end of the 1990s and the beginning of the present century affected stability and international investor confidence, thereby interrupting regional production networks.[10] Hence, the last hypothesis to be tested is that the development of LA regional production networks may have been limited to the period immediately after the creation of the Southern Common Market, whereas regional integration *per se* might not guarantee significant production networks because of the continued absence of a serious commitment to regional trade integration in LA (H5). The results of this research support H5, as imports of intermediate goods have a more positive impact on exports of both final and intermediate goods within Mercosur over the period 1991-1999 than over the period 2000-2008. Furthermore, results show evidence of the increasing importance of third countries in LA production networks, as imports of intermediate goods from the RoW increase exports of intermediates to LA countries from 2000 onwards.

4. Empirical Analysis

This paper uses disaggregated data for trade in goods between eleven LAIA members (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela) over the period 1991-2008. The products are classified according to the Broad Economic Categories (BEC) codes as in Baldwin and Taglioni (2011).[11] Trade data and tariffs are obtained from the World Integrated Trade Solution

(WITS). Nominal exchange rates and GDP deflators are taken from the World Development Indicators database and contiguity and distance from CEPII.

A gravity equation is specified and estimated for trade data at sectoral level. Previous literature which uses the gravity equation for both developed and developing countries (Márquez-Ramos, Martínez-Zarzoso and Suárez-Burget, 2010) finds that this model performs better for developed than for developing exporters, for which reason other factors such as exchange rates could be important determinants of exports. As a result, exchange rates are included in the estimated gravity regressions. Additionally, Baldwin and Taglioni (2011) point out that trade is measured on a gross sales basis while GDP is measured on a net sales basis, i.e. value added, presenting empirical evidence that the gravity equation model performs poorly when applied to bilateral flows where there is significant trade in intermediate goods. To address this issue, this paper includes three additional control variables. These variables are imports of intermediate goods from Mercosur, LAIA and the RoW to a particular LA country, respectively. Exporter-time, importer-time and sector-specific fixed effects are included in the model (not reported in Tables 1-4), as the effects of exporter-time and importer-time model "multilateral resistance" terms and sector-specific effects model unobservable characteristics at sector level. Finally, as in Anderson and van Wincoop (2003), the LHS variable in the gravity model is bilateral exports divided by the product of the GDPs of the exporter and the importer. Two different models are specified, for final goods and intermediate goods, respectively:

$$\ln\left(\frac{X\_final_{ijkt}}{Y_{it} \cdot Y_{jt}}\right) = \alpha_0 + \alpha_1 \cdot \ln Dist_{ij} + \alpha_2 \cdot Contig_{ij} + \alpha_3 \cdot \ln ER_{ijt} + \alpha_4 \cdot Merc_{ijt} +$$
$$+ \alpha_5 \cdot \ln Tariff\_final_{jikt} + \alpha_6 \cdot Land_i + \alpha_7 \cdot Land_j + \alpha_8 \cdot \ln M\_int_{Merc\_kt} + \alpha_9 \cdot \ln M\_int_{LAIA\_kt} + \quad (1)$$
$$+ \alpha_{10} \cdot \ln M\_int_{RoW\_kt} + \gamma_{it} + \varphi_{jt} + s_k + \varepsilon_{ijkt}$$

$$\ln\left(\frac{X\_\mathrm{int}_{ijkt}}{Y_{it}\cdot Y_{jt}}\right) = \beta_0 + \beta_1 \cdot \ln Dist_{ij} + \beta_2 \cdot Contig_{ij} + \beta_3 \cdot \ln ER_{ijt} + \beta_4 \cdot Merc_{ijt} +$$

$$+ \beta_5 \cdot \ln Tariff\_\mathrm{int}_{jikt} + \beta_6 \cdot Land_i + \beta_7 \cdot Land_j + \beta_8 \cdot \ln M\_\mathrm{int}_{Merc\_kt} + \beta_9 \cdot \ln M\_\mathrm{int}_{LAIA\_kt} + \hspace{1em}(2)$$

$$+ \beta_{10} \cdot \ln M\_\mathrm{int}_{RoW\_kt} + \eta_{it} + \tau_{jt} + z_k + \delta_{ijkt}$$

where *ln* denotes natural logarithms. X_final_{ijkt} (X_int_{ijkt}) denotes the value of exports of final (intermediate) goods k from country *i* to *j* in the year t; Y_{it} (Y_{jt}) denotes GDP in the exporter (importer)'s country, respectively; $Dist_{ij}$ is the geographical great circle distance in kilometres between the capitals of country *i* and *j*. $Contig_{ij}$ is a dummy for countries sharing a common geographical border and $Land_j$ ($Land_j$) takes a value equal to one if the exporter (importer) is landlocked. ER_{ijt} denotes the real exchange cross-rate[12] between the exporting and importing country.[13] $Tariff\_final_{jikt}$ ($Tariff\_int_{jikt}$) is the weighted average tariff effectively applied to each LA exporter that exports a final (intermediate) good k to each of the 10 importers.[14] $M\_int_{Merc\_kt}$, $M\_int_{LAIA\_kt}$ and $M\_int_{RoW\_kt}$ denote the value of imports of intermediate goods from Mercosur, LAIA and the RoW, respectively, in the year t required to produce a final or an intermediate good k in country *i*. Finally, ε_{ijkt} and δ_{ijkt} are the error terms that are assumed to be independently and identically distributed.

In the next section, estimations obtained from Equation (1) are used to tests hypothesis 1 (H1) and those from Equation (2) are used to tests hypothesis 2 (H2). The rest of hypotheses (H3-H5) are tested by estimating both equations for specific sectors, countries and time periods.

5. Main Results

Equations (1) and (2) are estimated using data from LAIA countries over the period 1991 to 2008. As the dataset is a panel, special estimation techniques are required. The presence of unobserved heterogeneity that is specific to each trading pair could be

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modelled as being random or fixed. A Hausman test indicates that fixed effects are preferred, for which reason fixed effects estimates were employed.[15]

Table 1 and Table 2 show the estimation results of Equations (1) and (2), respectively. First, Column (1) in Table 1 shows the main results for all LAIA countries and for trade in final goods. The estimated coefficients of imports of intermediate goods from Mercosur and the RoW are not statistically significant, indicating that increases in imported intermediated goods have no effect on exports of final goods to LA destinations. Additionally, the estimated coefficient of imports of intermediates from LAIA is found to be negative and significant. Hence, no evidence is found for the significance of production networks (H1) when all goods are pooled together. Columns (2) to (5) show results of adding interactions between the different product categories and imports of intermediate goods. The variables of interest, $M\_int_{Merc\_kt}$, $M\_int_{LAIA\_kt}$, and $M\_int_{RoW\_kt}$ interact with sectors 1, 4, 5 and 6, respectively. The estimated coefficients for the interaction terms show empirical evidence of the existence of H3 among LA members only for capital goods, for which imports of intermediates from Mercosur increase. The higher the level of imports of capital goods from Mercosur, the higher the level of exports of capital goods among LAIA members will be.

With respect to the rest of explanatory variables, the exchange rate is not statistically significant, whereas the coefficient of tariffs is negative and significant as expected, indicating that reductions in trade costs are associated to larger exports of final goods.

Table 1. The effect of imports of intermediate goods on exports of final goods

	(1)	(2)	(3)	(4)	(5)
Imports of intermediate goods from Mercosur	0.091	0.207**	0.048	0.083	0.105*
	1.505	2.566	0.745	1.274	1.719
Imports of intermediate goods from LAIA	-0.097**	-0.172***	-0.074	-0.05	-0.097**
	-2.237	-3.126	-1.507	-0.955	-2.214
Imports of intermediate goods from RoW	0.065	0.029	0.099	0.036	0.055
	0.879	0.253	1.289	0.447	0.727
Imports of intermediate goods from Mercosur *BEC1		-0.204**			
		-2.159			
Imports of intermediate goods from LAIA *BEC1		0.149*			
		1.808			
Imports of intermediate goods from RoW *BEC1		0.004			
		0.027			
Imports of intermediate goods from Mercosur*BEC4			0.231**		
			2.162		
Imports of intermediate goods from LAIA*BEC4			-0.076		
			-0.846		
Imports of intermediate goods from RoW*BEC4			-0.275*		
			-1.718		
Imports of intermediate goods from Mercosur*BEC5				0.121	
				0.948	
Imports of intermediate goods from LAIA*BEC5				-0.170*	
				-1.867	
Imports of intermediate goods from RoW*BEC5				0.079	
				0.506	
Imports of intermediate goods from Mercosur*BEC6					-0.152
					-0.933
Imports of intermediate goods from LAIA*BEC6					0.164
					0.884
Imports of intermediate goods from RoW*BEC6					0.198
					0.805
Exchange rate	0.212	0.204	0.212	0.207	0.221
	0.841	0.808	0.84	0.818	0.874
Tariffs	-0.107***	-0.107***	-0.109***	-0.107***	-0.109***
	-5.384	-5.392	-5.442	-5.34	-5.461
Constant Term	-42.537***	-42.376***	-42.661***	-41.853***	-43.389***
	-37.052	-33.697	-33.59	-34.761	-35.498
Number of observations	4002	4002	4002	4002	4002
R2_within	0.2827977	0.2844253	0.2844134	0.2836707	0.2841377
R2_between	0.0035142	0.0132486	0.006126	0.0000518	0.0482605
R2_overall	0.0078055	0.0285451	0.0139782	0.0023091	0.0323813
AIC	10090.3	10087.2	10087.27	10091.42	10088.81
BIC	11783.53	11799.32	11799.39	11803.54	11800.93

RMSE	0.9375769	0.9369972	0.937005	0.9374911	0.9371855

As regard to bilateral trade in intermediate goods, Column (1) in Table 2 shows the results of estimating Equation (2). In relation to H2 and the development of production networks in the area, among the target variables (imports of intermediate goods from Mercosur, LAIA and the RoW), only imports of intermediate goods from the RoW shows a positive and statistically significant coefficient. Hence, no evidence is found for the significance of production networks (H2) when all goods are pooled together. Descending to specific sectors, Columns (2) to (4) add interaction dummies between the target variables and specific BEC sectors to Equation (2). A "substitution" effect is observed for food and beverages, i.e. higher imports of intermediate goods from Mercosur leads to lower exports of intermediate goods to LAIA countries, whereas a "complementary" effect is found for capital goods.

As expected, higher tariffs have a negative effect on LA exports of intermediate goods, while the exchange rate displays a negative sign. This result could be due to country and/or time heterogeneity in the sample; although, a negative relationship between the real exchange rate and exports in Latin America has also been found by using a Vector Error Correction Model (see Brunini and Mordecki, 2011).

Table 2. The effect of imports of intermediate goods on exports of intermediate goods

	(1)	(2)	(3)	(4)	(5)
Imports of intermediate goods from Mercosur	-0.027	0.105	-0.078	-0.033	-0.034
	-0.451	1.357	-1.217	-0.497	-0.554
Imports of intermediate goods from LAIA	0.023	0.015	0.007	0.044	0.019
	0.54	0.286	0.141	0.848	0.444
Imports of intermediate goods from RoW	0.171**	-0.015	0.171**	0.197**	0.181**
	2.303	-0.131	2.231	2.406	2.425
Imports of intermediate goods from Mercosur *BEC1		-0.275***			
		-2.903			

Imports of intermediate goods from LAIA *BEC1	-0.044				
	-0.539				
Imports of intermediate goods from RoW *BEC1	0.230*				
	1.701				
Imports of intermediate goods from Mercosur*BEC4		0.236**			
		2.244			
Imports of intermediate goods from LAIA*BEC4		0.024			
		0.262			
Imports of intermediate goods from RoW*BEC4		-0.042			
		-0.267			
Imports of intermediate goods from Mercosur*BEC5			0.077		
			0.694		
Imports of intermediate goods from LAIA*BEC5			-0.054		
			-0.651		
Imports of intermediate goods from RoW*BEC5			-0.123		
			-0.86		
Imports of intermediate goods from Mercosur*BEC2				0.039	
				0.257	
Imports of intermediate goods from LAIA*BEC2				0.052	
				0.292	
Imports of intermediate goods from RoW*BEC2				-0.238	
				-1.012	
Exchange rate	-0.487*	-0.485*	-0.477*	-0.488*	-0.483*
	-1.907	-1.9	-1.868	-1.908	-1.89
Tariffs	-0.084***	-0.083***	-0.081***	-0.083***	-0.084***
	-4.313	-4.258	-4.156	-4.281	-4.306
Constant Term	-44.749***	-45.066***	-44.724***	-44.257***	-43.320***
	-37.552	-32.437	-36.917	-37.675	-35.774
Number of observations	4034	4034	4034	4034	4034
R2_within	0.1836796	0.1862003	0.186934	0.184239	0.1841733
R2_between	0.0115684	0.0168875	0.0002929	0.0128213	0.0365035
R2_overall	0.0296035	0.0291722	0.0007808	0.0267564	0.0131765
AIC	10467.58	10461.1	10457.46	10470.81	10471.14
BIC	12162.95	12175.38	12171.75	12185.1	12185.42
RMSE	0.9424627	0.9414596	0.9410352	0.9425934	0.9426314

Notes: ***, **, * indicate significance at 1%, 5% and 10%, respectively. T-statistics are provided below every coefficient. Exchange rate and tariffs are also included as control variables in the estimations.

With the aim of testing H4, an additional variable is included in Equations (1) and (2), namely the interaction between one of the variables of interest and Mercosur membership (Imports of intermediate goods from Mercosur*Mercosur), the new interaction variable is positive for exports of final goods and negative for exports of

intermediate goods, however is non-significant in both cases.[16] Therefore, we re-calculate the target variable without distinguishing by importing region (namely, Mercosur, LAIA or the RoW) and interact it with Mercosur membership (Imports of intermediate goods*Mercosur). Table 3 show the results for trade in final (first column) and intermediate goods (second column), respectively. The new interaction variable is positive and significant for exports of final goods, but is non-significant for exports of intermediate goods. This result is in line with H4 for final goods, which predicted a higher effect of integration on regional production networks among Mercosur members than among LAIA countries.

Table 3. The effect of imports of intermediate goods on exports of final and intermediate goods in LAIA and Mercosur

	Final goods (1)	Intermediate goods (2)
Imports of intermediate goods	0.025	-0.054
	0.232	-0.513
Imports of intermediate goods* Mercosur	0.383**	0.02
	2.029	0.111
Exchange rate	0.206	-0.497*
	0.816	-1.943
Tariffs	-0.102***	-0.084***
	-5.114	-4.341
Constant Term	-41.780***	-40.506***
	-28.73	-28.676
Number of observations	4002	4034
R2_within	0.28	0.18
R2_between	0.03	0.01
R2_overall	0.04	0.02
AIC	10092.00	10473.47
BIC	11778.94	12162.54
RMSE	0.94	0.94

Notes: ***, **, * indicate significance at 1%, 5% and 10%, respectively. T-statistics are provided below every coefficient. Exchange rate and tariffs are also included as control variables in the estimations.

With regard to H5, Equations (1) and (2) are estimated for two different periods, 1991-1999 and 2000-2008. Columns (1) and (3) in Table 4 show the estimation results for the first period and Columns (2) and (4) for the second. A direct relationship is found between imports of intermediate goods from Mercosur and exports of final goods

among Mercosur members over 1991-1999 (Column (1), Table 4). Table 4 provides evidence in line with H5 expectations, as imports of intermediate goods from Mercosur and LAIA are found to have a non-significant effect on exports of both final and intermediate goods from 2000 onwards. Results show a positive effect of imports of intermediate goods from the RoW on exports of intermediate goods among LAIA countries from 2000 onwards (Column (4), Table 4). Finally, concerning other control variables, lower tariffs are associated to higher exports of intermediate and final goods in both periods, being the effect lower in the second period, and the real exchange rate shows a non-significant coefficient.[17]

Table 4. The effect of imports of intermediate goods on exports of final and intermediate goods over different periods of time

	Final goods		Intermediate goods	
	1991-1999	2000-2008	1991-1999	2000-2008
Imports of intermediate goods from Mercosur	0.056	0.081	0.219*	0.139
	0.402	0.852	1.695	1.516
Imports of intermediate goods from Mercosur* Mercosur	0.667**	-0.069	-0.279	0.053
	2.241	-0.302	-1.034	0.23
Imports of intermediate goods from LAIA	0.006	0.034	0.106	-0.018
	0.063	0.436	1.232	-0.234
Imports of intermediate goods from RoW	-0.005	0.105	-0.245*	0.229*
	-0.035	0.879	-1.951	1.954
Exchange rate	-0.332	-0.695	0.273	-0.084
	-1.02	-0.611	1.087	-0.082
Tariffs	-0.164***	-0.088***	-0.111**	-0.065***
	-2.74	-3.84	-2.033	-2.974
Constant Term	-45.036***	-44.457***	-40.454***	-47.248***
	-19.772	-23.499	-18.115	-25.753
Number of observations	1865	2095	1857	2139
R2_within	0.1672441	0.2724876	0.1490803	0.2272825
R2_between	0.0064851	0.0012701	0.0107387	0.008473
R2_overall	0.0108612	0.0063046	0.0104108	0.0132722
AIC	3962.179	4316.169	3968.839	4502.491
BIC	4553.998	5112.44	4560.198	5301.693
RMSE	0.8915618	0.8321647	0.8469076	0.8079509

Notes: ***, **, * indicate significance at 1%, 5% and 10%, respectively. T-statistics are provided below every coefficient. Exchange rate and tariffs are also included as control variables in the estimations.

6. Conclusions

This paper analyses intra-LAIA and intra-Mercosur trade in intermediate goods by linking them to trade in final goods and tests whether LA countries have become more integrated into regional production networks (H1), in which case, an increase in imports of intermediate goods from LA countries leads to higher exports of final goods to LA partners. This analysis also tests whether the effect of LA agreements may have consequences in terms of the relocation of production (H2); then, higher imports of intermediate goods from LA countries might lead to higher or lower exports of intermediate goods to LA countries (direct or inverse effect, respectively). These two main hypotheses are also tested for different sectors (H3), agreements (H4) and periods of time (H5).

Our results indicate evidence of H1 in capital goods, suggesting that the higher level of imports of intermediates in capital goods from Mercosur, the higher level of exports of capital goods to LA countries. Evidence is also found concerning H2, results being in line with the existence of a "substitution" effect in the sector of food and beverages and a "complementary" effect in capital goods.

The effect on regional production networks is found to be greater for Mercosur members than for LAIA members but only over the period 1991-1999. As opposed to the apparently greater production integration among the members of the RIAs in LA due to the increase in the importance of intermediate goods trade, the results obtained in this paper do not show clear evidence of the development in production networks in the last two decades among LAIA members. Otherwise, the positive effect of imports of intermediate goods from the RoW on exports of intermediate goods among LAIA members might be due to the LA trade policy strategy of giving easier access to intermediate goods. It could indicate the emergence of a global production network with

other developing countries, such as China, as LAIA countries situate closer to the consumption end of the value chain. The obtained results are in contrast to the results obtained for other integration agreements in which both developed and developing countries are involved, such as the European Union with Maghreb countries or Central and Eastern European Countries.

1. Imports of intermediate goods for each LAIA country represent around 60% of total goods from LAIA and Mercosur .
2. Cuba has been a member since 1999, but is not considered in the empirical analysis.
3. Cooper and Massell (1965), page 475.
4. According to the BEC classification.
5. The first and last years of the period considered to analyse the change by sector were selected in accordance with data availability.
6. See for example the recent case "Brasil informará hoy si acepta las condiciones argentinas para negociar" ("Brazil will announce today whether it accepts Argentina's conditions for negotiations" in English), Page 12, 16th May 2011. http://www.pagina12.com.ar/diario/economia/2-168230-2011-05-16.html
7. The Mercosur agreement included special conditions for the automotive sector, as it was not included in the common market. The automotive sector became both a central and controversial issue within Mercosur's regional trade integration process (Ciravegna, 2003).
8. The scarcity of raw materials in the international leather market and the increase in production of synthetic footwear manufactures in Brazil are also behind these figures.
9. Note that RoW denotes countries other than Mercosur and LAIA countries.
10. The Brazilian devaluation in 1998 and the Argentinean crisis at the beginning of the present century.
11. The sectors considered in the analysis are 1, 4, 5 and 6 (final goods) and 1, 2, 4 and 5 (intermediate goods).
12. The real exchange cross-rate is constructed as EAxPB/EBxPA, where E denotes the nominal exchange rate in a particular country (A or B) and P denotes the GDP deflator in country A or B.
13. An increase in this variable indicates devaluation in the exporter country. As Ecuador was dollarised in the year 2000, the exchange rates series in Ecuador was transformed by

multiplying the nominal exchange rate in 1999 by the GDP deflator in every year t from the year 2000 onwards.

14. It is important to note that export taxes are also of great relevance in the case of Argentina as, for example, is the case of soybean. Due to data restrictions, export taxes were not considered in the empirical analysis.

15. As the estimate is based on fixed effects, the Tables in this Section do not show the coefficients of distance, contiguity, Mercosur and landlocked dummies. Nonetheless, when Equations (1) and (2) are estimated using random effects, distance is found to be significant and displays a negative sign, whereas contiguity and Mercosur dummies are positive and significant, as expected. Landlocked is only negative and significant in the case of the importing country. These results are available upon request.

16. These results are available upon request.

17. It is worth noting that the evolution of trade among LA countries is strongly associated to international trade trends and trading terms. Hence, this result must be treated with caution due to the different role of prices in explaining trade trends or cycles (Díaz-Cafferata et al, 2002; Díaz-Cafferata and Fornero, 2003).

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Appendix - Correspondence Table

Final	Intermediate
51, 52	53
61, 62, 63	21, 22
112, 122	111,121
41	42