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INTERNATIONAL LINKAGES, VALUE ADDED TRADE AND LAC FIRMS' PRODUCTIVITY

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International Linkages, Value Added Trade and LAC Firms' Productivity

Pierluigi Montalbano[♣] Silvia Nenci[*] Carlo Pietrobelli[§]

Abstract

This paper addresses the following research questions: i) are firms characterized by international linkages more productive than other firms? ii) are those belonging to industries more involved in GVCs even more productive? To this end, we combine the WB Enterprise Survey dataset with the new OECD-WTO TiVA dataset and present three main empirical exercises: 1) an analysis of productivity premia associated with participation in international trade and presence of inward FDI; 2) a Cobb-Douglas output function expanded to firms international linkages; 3) a further expanded version of the above relationship including the TIVA-based indicators of value added trade and industry participation and position in global value chain. Our empirical outcomes confirm the presence of a positive causal relationship between participation in international activities and firm performance in the LAC region. Focusing on four big Latin American countries we show that the actual level of involvement into GVCs matters as well.

Keywords: International Trade; Trade in Value added; Global value chains; Firm productivity.

JEL: F140; F610; D240; L220; O540

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1 Introduction

One of the key issues in the current empirical debate on the determinants of firm performance is the influence of international linkages. The aim of this paper is to study the causal relationship between international linkages and firm performance in Latin America and the Caribbean (LAC). The notion of firm international linkages adopted in this analysis includes two different dimensions: (i) participation in international trade; (ii) presence of inward foreign direct investments (FDI). To this end, we take advantage of the new firm level data provided by the World Bank Enterprise Survey (ES). Moreover, by matching ES firm level data with the new OECD-WTO Trade in Value Added (TiVA) data set, we provide a richer picture of the relationship between firm performance and country/industry actual involvement in international production networks in the LAC region. In particular, this paper addresses the following research questions:

- Are firms characterized by international linkages more productive than other firms?
- And, eventually, are those belonging to industries more involved in global value chains even more productive?

To derive empirically the causal relationship between firms performance and their international linkages we provide: i) a static analysis of productivity premia associated with participation in international trade and presence of inward FDI; ii) a version of the standard Cobb-Douglas output function expanded to firms international linkages; iii) a further expanded version of the above relationship including indicators of value added trade as well as the degree and the typology of industry involvement in global value chains (GVCs). In carrying out the empirical exercises we control for firms' heterogeneity by country (year) and industry, and for endogeneity bias by using instrumental variables and control function techniques.

Our empirical outcomes confirm the presence of a positive causal relationship between participation in international activities and firm performance in the LAC region. Focusing on four big LAC countries (Argentina, Brazil, Chile and Mexico) we show that the actual extent of involvement in GVCs matters as well. More specifically, we highlight the key role of both trade in value added and GVC position, with a positive impact of upstreamness on firm performance. These empirical results also appear relevant for policy- making.

The work is organized as follows: Section 2 reviews the literature on international linkages and firm productivity; Section 3 describes how to trace countries' production of value added as well as their level of integration in global markets. Section 4 reports some stylized facts on the main LAC firm characteristics related to internationalization and the relevant GVC indicators; Section 5 presents the empirical analysis; Section 6 concludes.

2 International linkages and firm productivity: review of the literature

Participation in international trade can be an important source of information, knowledge spillover, technology transfers, technical assistance, competitive pressures and other productivity advantages for firms, leading to significant performance improvements (Grossman and Helpman, 1991; Clerides et al., 1998; Verhoogen, 2007; Fafchamps et al., 2008; Bernard et al. 2003). At the same time, the presence of FDI and /or multinational firms may generate total cost reduction through low-priced production factors. All these factors would generate a positive learning effect of global activities. This "learning-by-exporting hypothesis" spurred a large number of empirical studies that seek to assess the causal effect of exporting at the firm level.[1] However, there is no consensus among scholars on whether such learning effect exists or the specific factors that may be behind it. Whilst a comprehensive survey by Wagner (2007) indicates that the evidence on this learning effect is mixed and unclear, a significant positive effect of the export experience on firm's productivity has been found in several studies.[2] Recently, the meta analysis conducted by Martins and Yang (2009) indicates that the impact of exporting upon productivity is higher for developing than for developed economies. Most importantly, the direction of causality between openness and firm performance is controversial (see Greenaway and Kneller, 2007). Firm productivity and sunk costs play important roles in the selection mechanism of firms international activities. These costs would discourage less productive firms from setting their international linkages, and therefore firms would self-select to participate in global markets. Such a selection mechanism according to the level of productivity is called the 'selection effect' in exporting. The work of Melitz (2003) - in which he shows that exporting firms have relatively higher productivity - has been the theoretical benchmark on the selection mechanism in firms exporting, while the study of Bernard and Jensen (1999) on US firms has represented the pioneering empirical work that has been followed by a vast series of subsequent analyses (López, 2005, Greenaway and Kneller, 2007, and Wagner, 2007 provide surveys on the topic). Most of these studies (Clerides et al., 1998 and Alvarez and López, 2005) find that the more productive producers self-select into the export market (Hayakawa et al., 2012).

Also participation in GVCs can improve the performance of firms in several ways, while providing them with opportunities to obtain managerial expertise, technical knowledge, innovation channels and new markets, thereby enhancing their productivity (Agostino et al. 2014; Pietrobelli and Rabellotti, 2007). Four distinct channels for upgrading and improving performance are identified by the GVC literature: 1. product innovation; 2. process innovation; 3. functional upgrading; and 4. inter-chain upgrading (Bair and Gereffi, 2001; Bazan and Navas-Aleman, 2004; Dolan and Humphrey, 2000; Giuliani et al., 2005). Recently, Woldesenbet et al. (2012) find that entrepreneurial and dynamic capabilities have significant impacts on the performance of British small firms, specifically operating in supply chains,

[1] The learning effect has not been fully examined theoretically in the literature. The major exception is Clerides et al. (1998).

[2] Girma et al.(2004) for UK firms, Van Biesebroeck (2005) for sub-Saharan African countries, Fernandez and Isgut (2005) for Colombia, Alvarez and López (2005) for Chile, De Loecker (2007) for Slovenia, Lileeva and Trefler (2007) and Serti and Tomasi (2008) for Italy, and Park et al. (2010) for China.

while Theyel (2013) – focusing on US small and medium-sized manufacturing companies - emphasizes the abilities of these firms to take advantage of process and product innovations through the use of open innovation practices along different value chain activities. Lastly, Agostino et al. (2014) argue that joining global value chains may be decisive for supplier firms in developed countries by providing incentives and opportunities to upgrade their capabilities to export and innovate. More specifically, focusing on Italian manufacturing firms, they find that some Italian suppliers have succeeded in increasing their ability to enter GVCs and thereby, developing their propensities to innovate and export.

The identification of learning effects of FDI is an important issue as well. The presence of FDI may improve the performance of domestic firms, particularly in the case of inward FDI in the form of cross border mergers and acquisitions (M&A). Fostered by the superior know-how, human capital and organization of foreign firms, local firms would strengthen their local advantages (i.e., experience in the local market and knowledge of the local institutional environment) and enhance their productivity (UNCTAD, WIR various years). Helpman et al. (2004) theoretically show that investing firms have relatively high productivity. Several studies have empirically tested this proposition (see Greenaway and Kneller, 2007, for a survey within this literature).[3] Studies in this literature do not necessarily succeed in detecting a positive causal effect of investing on firms productivity. While Barba Navaretti and Castellani (2004) and Kimura and Kiyota (2006) find significant positive impacts, Aitken and Harrison (1999), Hijzen et al. (2007) and Ito (2007) detect a small or non-positive effect. Hijzen et al. (2006) and Barba Navaretti et al. (2006) further explore a possible qualitative difference in learning due to the presence of two types of FDI: horizontal and vertical. For French firms they find positively significant enhancements in productivity from horizontal FDI but not from vertical ones. Other papers focus specifically on the impact of MA on firms performance and most of them find a positive significant impact.[4]

3 Trade in valued added and global value chains (GVCs): definition and measurement

The increasing international fragmentation of production that has occurred in recent decades has challenged the conventional wisdom on how we look at and interpret trade. Traditional measures of trade record gross flows of goods and services each and every time they cross borders leading to a multiple counting of trade, which may lead to misguided empirical analyses (Cattaneo et al., 2013, OECD-WTO 2012). Furthermore, since nowadays a large number of countries has developed comparative advantages in specific parts of the value chains and not necessarily on final goods, standard trade statistics are becoming much less informative.

[3] Papers analyzing the learning effect in investing include, among others, Aitken and Harrison (1999) for MNEs in Venezuela, Murakami (2005), Kimura and Kiyota (2006), Hijzen et al. (2007) and Ito (2007) for Japanese MNEs, Barba Navaretti and Castellani (2004) for Italian MNEs, and Hijzen et al. (2006) and Barba Navaretti et al. (2006) for French MNEs.

[4] Arnold and Javorcik (2005) and Petkova (2008) for Indonesia, Conyon et al. (2002), Girma (2005), Girma et al. (2007) and Harris and Robinson (2002) for the United Kingdom, Bertrand and Zitouna (2008) for France, Salis (2008) for Slovenia, Piscitello and Rabbiosi (2005) for Italy, Fukao et al. (2006) for Japan and Chen (2011) for the USA.

The relevance of this issue is confirmed by the many initiatives and efforts that try to address the measurement of trade flows in the context of the fragmentation of world production and try to estimate the so called trade in value-added. Value-added reflects the value that is added by industries in producing goods and services. It is equivalent to the difference between industry output and the sum of its intermediate inputs. Looking at trade from a value-added perspective better reveals how upstream domestic industries contribute to exports as well as how much (and how) firms participate in global value chains (OECD-WTO, 2012). The overall perspective is shifting from exports to imports: in a world of international fragmentation access to efficient imports matters as much as does access to markets (Ahmad, 2013).

A new literature has emerged recently with the idea of tracing the value added of a country's trade flows by combining input-output tables with bilateral trade statistics and proposing new indicators.[5] In addition, advanced research on constructing appropriate databases is also being conducted by the World Trade Organization (WTO) and the Organization for Economic Co-operation and Development (OECD). However, the interpretation of these indicators and results for individual countries in the temporal, geographic and industry dimensions is still a work in progress and poses new challenges to scholars and policy experts. In this paper we use data from the new OECD-WTO TiVA database, that aims at better tracking global production networks and value chains. [6] This dataset presents three clear advantages with respect to its main counterpart, the World Input-Output Database (WIOD): first, it covers four big LAC countries instead of two; second it presents a set of ready-to–use trade in value added decompositions and GVC indicators.; third, it links together the OECD Inter-Country Input-Output (ICIO) tables using Bilateral Trade Database in goods by Industry and End-use category (BTDIxE) and estimates of bilateral trade flows in services.[7]

Our aim is to go beyond the information set provided by standard trade statistics. Specifically, we gather a set of TiVA indicators able to map out country trade relations and describe the competitiveness of country industries by looking at their production of value added as well as their level of integration in global markets. These indicators are the following:

1. The decomposition of the value added embodied in national exports;
2. The participation into GVCs;

[5] Hummels et al., 2001; Johnson and Noguera, 2012a, 2012b; Miroudot and Ragousssis, 2009; Koopman et al., 2011 and 2014; De La Cruz et al., 2011; Stehrer, 2013.

[6] The World Input-Output Database (WIOD) is a related but separate data initiative is the World Input-Output Database (WIOD) funded by the European Commission and developed by the University of Groningen, based on individual countries' supply-and-use tables (Timmer et al. 2014). Another source of data, characterized by a further level of detail, is the Global Trade Analysis Project (GTAP) database which is not grounded on official national I/O and does not distinguish trade flows between intermediate and final consumption.

[7] The current TiVA version provides 39 indicators for 57 countries (34 OECD countries and other 23 economies including Argentina, Brazil, China, India, Indonesia, the Russian Federation, and South Africa) with a breakdown into 18 industries. Like for the ES the industry classification is based on the ISIC Rev. 3.1. The time coverage includes the years 1995, 2000 2005, 2008, 2009.

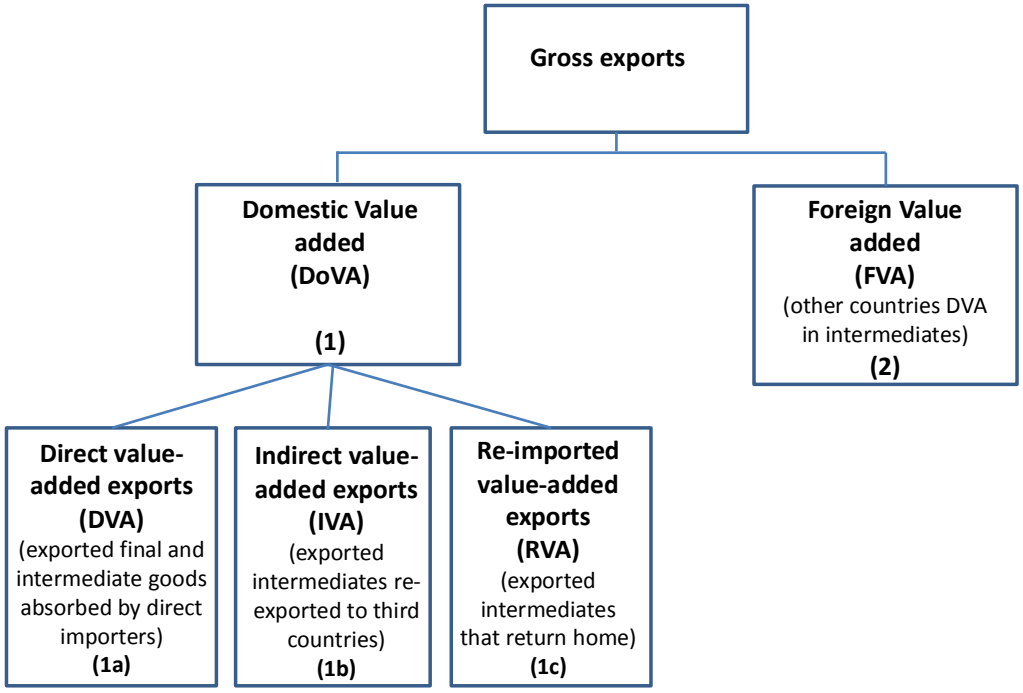
3. The position in GVCs.

Concerning the first point, we follow the decomposition of the value added embodied in national gross exports proposed by Koopman et al. (2011). According to this methodology, gross exports can be decomposed in the following components (see Figure 1):

- *Direct domestic value-added embodied in exports of goods and services (DVA)*. This reflects the direct contribution made by an industry in producing a final or intermediate good or service for export (i.e. value added exported in final goods or in intermediates absorbed by direct importers) (1a);
- *Indirect domestic value added embodied in intermediate exports (IVA).* This reflects the indirect contribution of domestic supplier industries of intermediate goods or services used in other countries exports (i.e. value added exported in intermediates re-exported to third countries) (1b);
- *Re-imported domestic value added embodied in gross exports (RVA).* This reflects the domestic value added that was exported in goods and services used to produce the intermediate imports of goods and services used by the industry (i.e. exported intermediates that return home)(1c);
- *Foreign value-added embodied in gross exports (FVA).* This reflects the foreign value added content of intermediate imports embodied in gross exports (i.e., other countries domestic value added in intermediates used in exports) (2).

Components 1a, 1b, 1c represent the value of exports that is created domestically (i.e., the domestic value added - DoVA, see Figure 1), while component 2 shows the value of exports created abroad. Only components 1b, 1c and 2 can be thus considered as part of the global value chain framework.

Figure 1- Gross export decomposition in value added



Source: adapted from Koopman al. (2011)

By combining these value-added components it is possible to assess both the level of participation and whether a country (or industry) is located upstream or downstream in the global production chain. Thus, a first indicator, namely the GVC participation index, takes into account the indirect domestic value added exports (IVA) and the foreign value-added exports (FVA) to summarize the importance of global production chains in country (or industry) exports. The higher (or lower) the value of the index, the larger (or smaller) is the participation of a country in GVCs. It is worth noting that a high IVA component shows the importance of domestic production in global value chains while a high FVA component reveals that the country/industry is deeply embedded in global value chains but only captures a small part of value added.

To complete information on international integration into global markets, we present a second index that characterizes the position of country (or industry) exporters in GVCs: the GVC position indicator. It measures the level of involvement of a country (or industry) in vertically fragmented production. It is determined by the extent to which the country (or industry) is upstream or downstream in the GVCs, depending on its specialization (Koopman et al., 2011). A country lies upstream either if it produces inputs and raw materials for others, or provides manufactured intermediates or both, A country lies downstream if it uses a large portion of other countries intermediates to produce final goods for exports (i.e., it is a downstream processor or assembler adding inputs and value towards the end of the production process). The position indicator is given by the ratio of the IVA exports and the FVA exports. Since at the global level, IVA and FVA

equal each other, the average IVA/FVA ratio is equal to 1. Therefore, a ratio larger than 1 indicates the country lies upstream in the GVCs, while a ratio lower than 1 means the country lies downstream in the GVCs.[8] Since two countries can have identical values of the GVC position index in a given sector while having very different degrees of participation in GVCs, it is important to look at both these two indicators in order to have a correct picture of the degree of integration of a country in global value chains (Koopman et al., 2011).

4 LAC firms characteristics and trade in valued added performance: a descriptive analysis

Enterprise-level data offer crucial information to understand the drivers of productivity and competitiveness, as aggregate performance depends strongly on firm-level factors (such as size, ownership and technological capacity). In conducting our empirical exercise we use a subset of the ES database specifically focused on LAC countries' firms. It provides information on the characteristics of firms across various dimensions, including size, ownership, trading status, and performances, and collects data for 14,657 firms and 31 LAC countries.[9] Tables 1A in the Appendix present a synthetic view of the international linkages under analysis (i.e. exports, imports and foreign owned firms) for the whole LAC sample by country and survey year. In addition, in order to provide a richer picture of the phenomena under analysis (and combine different levels of aggregation) to map out sources and components of trade in value added, we use the new OECD-WTO TiVA data set by industries (see Section 3). To take advantage of the joint availability of ES and TiVA data, we focus specifically on the following countries for which TiVA and ES data are both available for the same fiscal year: Argentina, Brazil, Chile, and Mexico.[10] Looking at both data on firms and industries from ES and TiVA we can draw a synthetic picture of the current international linkages of the four LAC countries as well as trade in value added components and GVC characteristics.

Table 1 presents a descriptive analysis of the firms international linkages' characteristics (from the ES dataset) and GVC indicators (from the TiVA dataset) for the above four LAC countries.[11] This ES LAC sub-sample includes overall 5,120 firms split up quite homogeneously across the four LACs. Looking at the first five columns of the tables (ES data section) we detect that overall almost

[8] It is worth noting the presence of a caveat in this decomposition at the industry level since while the value added embedded in a given imported intermediate could travel across many sectors before it is exported, the adopted decomposition traces only the direct and the indirect effects.

[9] The ES uses a stratified random sampling method where the strata are business sector, location, and firm size. Indicators are representative at the country level but more care is necessary when interpreting indicators by subgroups since this sampling method does not stratify by gender of the top manager, exporter status, or ownership (www.enterprisesurveys.org for details, accessed 25 August 2014). We take this into account in our empirical exercises by controlling for a full set of industry and country dummies.

[10] We use the firm level data of the 2010 ES survey for Argentina, Chile and Mexico since the information collected in the surveys refers to characteristics of the firm to the last completed fiscal year (2009), and the 2009 ES survey for Brazil.

[11] Further details on this analysis by industries for each of the four LAC countries is available by the authors upon request.

15% of these firms declare to be exporters[12] and their export intensity is on average over 1/3 of their total sales.[13] Only 8.5% are foreign owned firms but foreign investors own on average a significant share (85.4%). These four LAC countries present heterogeneous levels of firm internationalization. With regards to international trade, Argentina holds the highest number of exporting firms (over 27%), while Chile, Mexico and Brazil lag behind (respectively, 16.7%, 15.2% and 7% are exporting firms). Chile shows the highest export intensity (41.8%), coming before Mexico (35.5%), Argentina (33%) and Brazil (30.3%). With regards to FDI, Chile and Argentina present the highest number of foreign owned firms (both around 13%) while Brazil registers the weakest presence (3.7%). The foreign ownership share of these firms is high, ranging on average from about 83% in Mexico to nearly 90% in Argentina.

For what concerns trade in value added components, columns from 6 to 9 of Tables 1 (TiVA data section) present the main components of the decomposition of the overall gross exports described in Figure 1 by country (IVA and FVA). The last two columns in the TiVA section provides a synthetic view of the role and position in GVCs by country, using the indicators of GVC participation and position illustrated in Section 3.

[12] Only direct exporters with exports above 10% of total sales are considered as exporters.
[13] Because of the adopted threshold of 10% of exports on total sales the registered export intensity is slightly higher than that reported in similar analyses (see, among others, Lederman, 2010, 2013).

Table 1 - Firms international linkages and TiVA indicators for the four LAC countries (2010)

	ENTERPRISE SURVEY DATA					TiVA DATA			
	Firms internationalisation					Gross export decomposition in value added components***		GVCs indicators	
Country	**# firms**	**# exporters***	**exp.intensity ****	**# foreign owned**	**% foreign ownership**	**IVA** (%)	**FVA**(%)	**GVC participation** (a)	**GVC position** (b)
Argentina	1010	276	33.30	129	89.68	22.53	12.08	34.61	1.86
			24.30		*22.44*				
Mexico	1421	216	*35.49*	126	*83.08*	11.46	30.33	41.79	0.38
			27.18		*26.99*				
Chile	897	150	*41.80*	116	*83.13*	33.75	18.46	52.21	1.83
			30.23		*27.83*				
Brazil	1792	126	*30.33*	66	*85.55*	27.17	9.03	36.20	3.01
			27.01		*27.34*				

Note: Export intensity and & foreign ownership are sample means. Standard deviations are reported in italics.

* Only direct exporters (above 10% of total sales).

** Ratio of exports to total sales

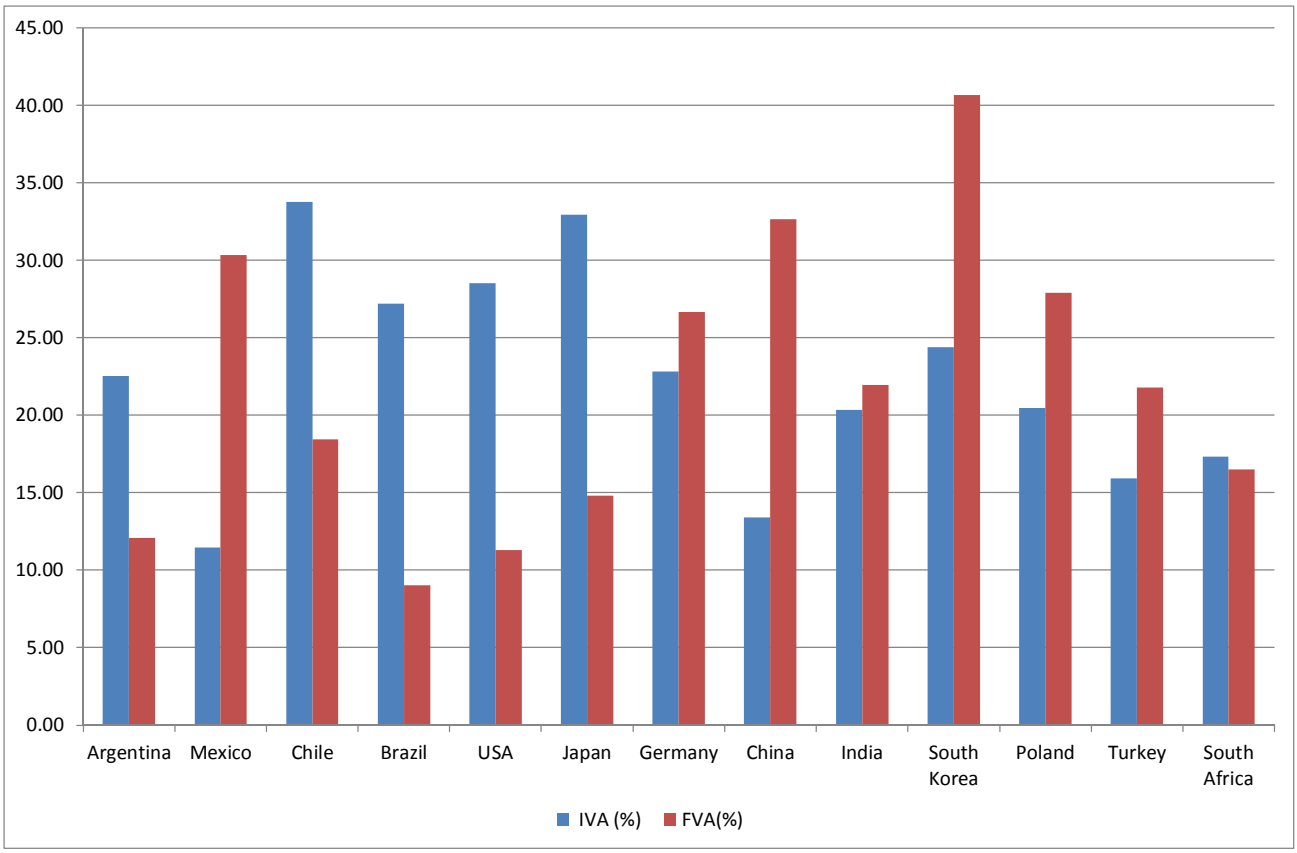
***Following Iossifov (2014), the IVA measure is obtained from data on the TiVA variable EXGR_FVA for its trade partners (i.e. value-added from country embodied in trade partners total exports, in % of country total exports). The FVA measure is obtained from data on EXGR_FVA for the country (i.e. value added from trade partners embodied in country total exports , in % of country total exports).

(a) GVC participation (in % of country total exports) = IVA +FVA

(b) GVC position= IVA /FVA

The reported decomposition components show some degree of heterogeneity among the big LAC countries. Specifically, Chile presents the highest IVA value suggesting it provides relatively higher domestic added value inputs to other countries' exports. It is followed by Brazil and Argentina. Mexico presents the lowest value of IVA. This is in line with its relative specialization in processing foreign inputs. On the other hand, Argentina and Brazil show, on average, a lower level of FVA suggesting they contribute to their gross exports mainly with domestic value added, relying less on imported inputs. It can be related to the fact that these countries are, on average, more involved in exporting goods in which the main source of inputs comes from the domestic primary sector (Blyde, 2014). To be noted that Brazil shows the smallest share of FVA - only 9% of the value added incorporated in the Brazilian exports comes from other countries. On the contrary, Chile and Mexico show a relatively higher level of FVA suggesting a relevant presence of foreign inputs in their overall exports. It is worth noting that about 1/3 of the value of Mexican processing exports comes from abroad. This heterogeneity is associated to some extent to the country dimension (Cattaneo et al., 2013) but also to differences in the patterns of specialization: a relative specialization in the production of primary goods requires, on average, less imported inputs than manufacturing one.

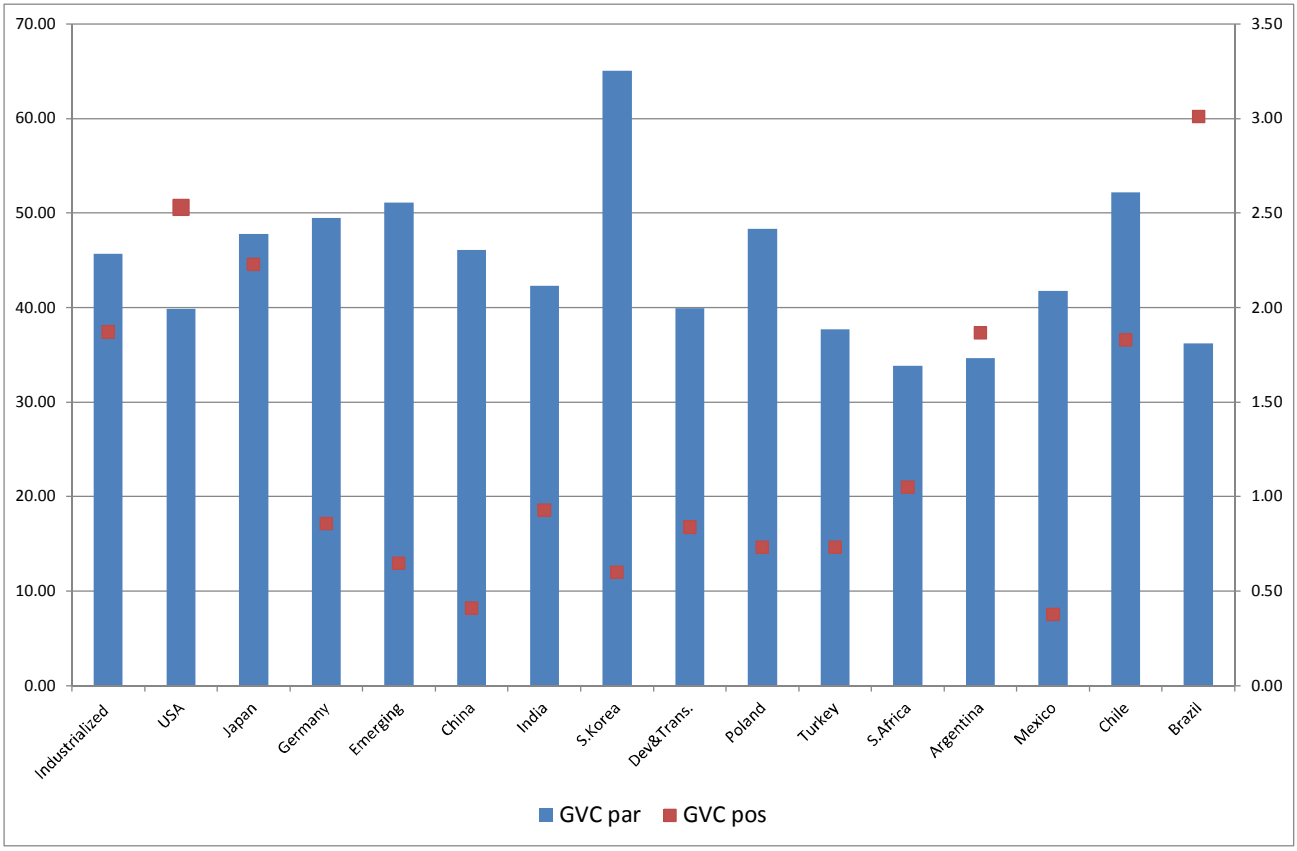
Figure 2: Trade in value added components: IVA and FVA



Source: Authors' calculation on OECD-WTO TiVA data.

Figures 2 presents the international comparison of the value added decomposition with some selected countries that are representative of industrialized, developing and transition economies [14]. As shown in the picture, LAC countries present, on average, a high level of IVA with respect to their main international counterparts and, on average, a lower FVA (i.e., a lower content of intermediate inputs coming from abroad) than that of the selected developing/emerging countries. This confirms the relative specialization of LAC countries within global value chains in exporting goods which are relatively intensive in primary goods. The details on the main value added components of gross exports of the selected countries in the above regions are reported in Tables 2A in the Appendix.

Figure 3 - GVC indicators international comparison



Source: Authors' calculation on OECD-WTO TiVA data.

Regarding the GVC indicators, Figure 3 shows the international comparison of both participation and position in GVC. As is apparent from the Figure, participation in the GVC at country level is substantial for Chile and to a lesser extent for Mexico, while the involvement of Argentina and Brazil in the GVC is well below the selected world counterparts, except for South Africa. Again this heterogeneity can be attributed both to a size effect – i.e., larger economies tend to have a relatively

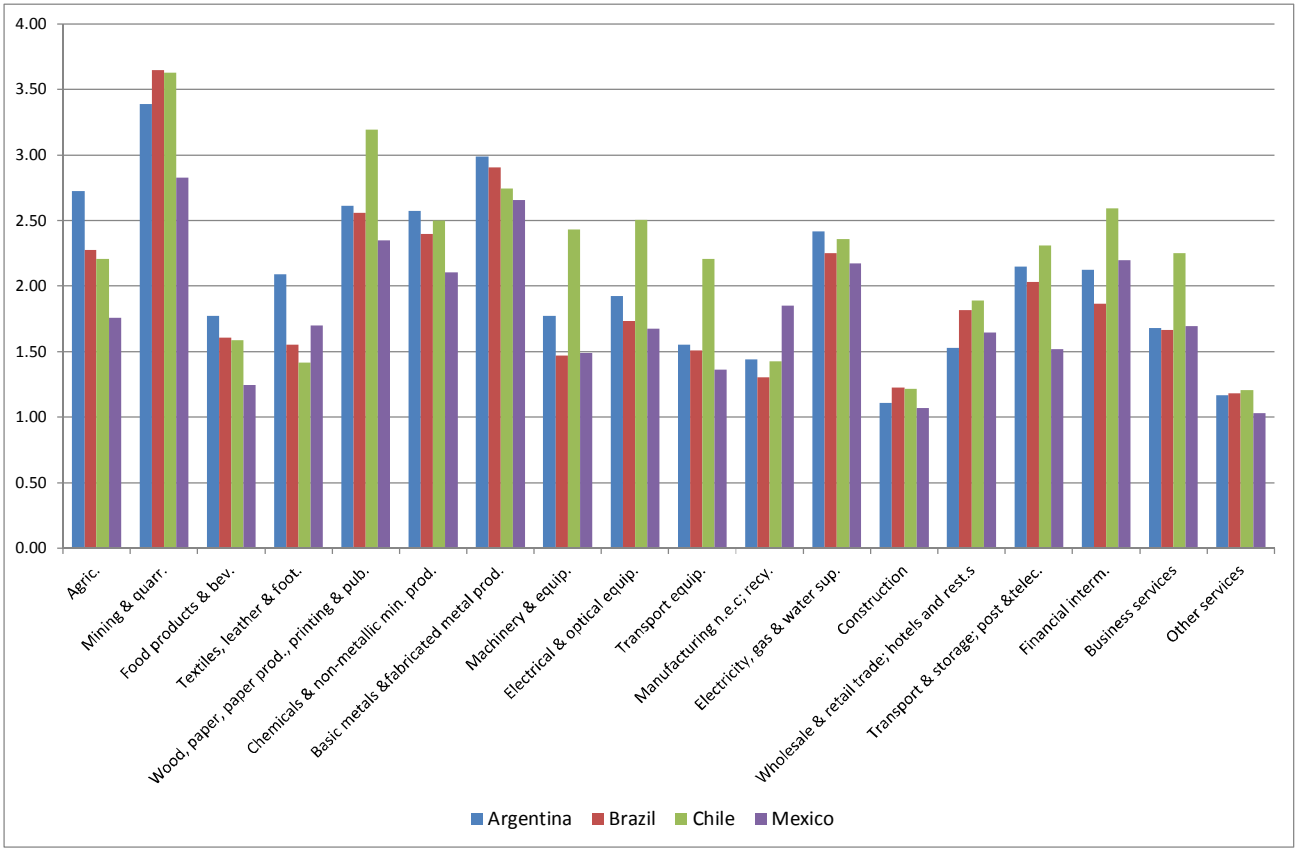
[14] For the industrialized economies, we selected USA, Japan, and Germany; for the developing and transition economies we selected China, India, South Korea, Poland, Turkey, and South Africa,

higher degree of self-sufficiency in producing inputs for exports (as in the case of Brazil and Argentina) – and/or to heterogeneity in the patterns of specialization – e.g., a relative specialization in manufacturing can justify a higher degree of global participation (as in the case of Chile and Mexico). This empirical evidence is consistent with similar analyses on LAC integration into the global value chain (see UNCTAD, 2013; Blyde, 2014). As stated in section 3, the GVC position index reflects where countries are located in the value chain. A country can be upstream or downstream in GVCs, depending on its specialization. Countries upstream produce inputs and/or raw materials involved at the beginning of the production process and do not rely much on foreign inputs for its exports, while countries downstream do the assembly of processed products and provide relatively less intermediates to other countries exports. The higher the value of the index (higher than 1), the more upstream the country exporters are situated in GVCs. In general, our LAC countries are located upstream (i.e., away from the final customer) in GVCs more than their international counterparts. However, also in this case there is a certain degree of heterogeneity among LAC countries, Brazil is the most upstream among our LAC countries and has the highest GVC position in our international comparison.. This is again consistent with the fact that Brazil, more specialized in natural resources, mainly provides inputs to other countries' exports and does not rely much on other countries' inputs. Thus, it is positioned more at the beginning of the GVCs., On the opposite side there is Mexico which is located more at the end of GVCs and acts as a final producer using inputs provided by upstream countries in the form of *maquila* processing operations (Contreras et al., 2012, De La Cruz et al., 2011; Dussel Peters, 2003) and does not provide many intermediates to other countries' exports.

Figure 4 presents the comparison of the GVC position indicator by industries for the four big LAC countries. The international comparison with the selected counterparts is reported in Table 3A in the Appendix. The indicator used for the industry analysis is obtained from TiVA data as proposed by Fally (2012) and Antràs et al. (2012).[15] In line with the literature, industries such as mining and quarrying, wood, paper products, printing and publishing, chemicals and non-metallic mineral products, and basic metals and fabricated metal products are those presenting the highest level of upstreamness since they provide raw materials and inputs at the beginning of the value chain. Among those industries, the big LAC countries (with the relevant exception of Mexico) show a relative specialization, with a degree higher than 2. Brazil is the country with the highest index of upstreamness in the mining and quarrying activity, with a value higher than 3.5. Concerning services, Figure 4 shows that the most upstream services are, on average, telecommunications and financial services. Among LAC, Chile is positioned more upstream in the value chain in all the services sectors, while Mexico, in line with the result at the aggregate level is, on average, the most downstream also in the service sector, with the relevant exception of financial intermediates.

[15] For a given industry, the index measures how many stages of production are left before the goods or services produced by this industry reach final consumers. High values of the index are associated with industries that are more involved in upstream activities, while lower values are found in correspondence of industries specialized in downstream activities and, therefore, closer to final consumption.

Figure 4 - GVC Industry Position Index



Source: Authors' calculation on OECD-WTO TiVA data.

5 The econometric analysis

The aim of our empirical exercise is to investigate whether LAC firms characterized by international linkages actually tend to have higher productivity than other LAC firms. Specifically, we would like to look more in depth whether there is a causal relationship between the degree and typology of involvement in international production networks and firm performance in the LAC region.

First and foremost, we start presenting static differences in firm productivity premia between exporters and non-exporters, foreign owned enterprises[16] and domestic owned ones. This first empirical exercise is conducted pooling data for the entire sample of LAC countries included in the ES. Productivity premia are measured as the coefficients for export and inward FDI dummies in a regression of the form:

$$\theta_i = \alpha_1 + \alpha_2 d_i + \eta_c + \eta_j + \varepsilon_i \qquad \text{Eq. [1]}$$

[16] As common in the literature, we consider firms as foreign owned only if the foreign ownership is 10 per cent or higher.

Where θ_i is the log of firm labor productivity[17], d_i is a set of dummies for exporting firms and firms characterized by foreign ownership (i.e., our proxy of inward FDI); η_c and η_j are dummies for country and industry, respectively, to control for bias due to unobserved factors; ε_i is the error term.

As is apparent in Table 2, the expected positive relation between international linkages and firm productivity is confirmed by firm level LAC data. These findings are in line with the theoretical predictions that low productivity firms stay in the domestic market while firms with higher productivity export and/or engaged in FDI stay in the international market (Helpman et al., 2004).

Table 2: Exports and FDI productivity premia

dependent variable: (ln) labor productivity

	Coef.	SE (robust)	Coef.	SE (robust)	Coef.	SE (robust)
exporter	0.177***	(0.0193)			0.144***	(0.0200)
inward fdi			0.218***	(0.0258)	0.170***	(0.0265)
cons	1.705***	(0.186)	1.715***	(0.204)	1.654***	(0.196)
country dummies (§)	yes		yes		yes	
industry dummies	yes		yes		yes	
No. Obs	11,505		11,158		11,150	
R^2	0.052		0.051		0.056	

***,**,* denote significance at the 1, 5 and 10 per cent level, respectively.
(§) It includes dummies for different survey rounds for the same country.

As already underlined the above are essentially stylized facts which cannot yet provide any causal interpretation. Taking advantage of the availability of the set of firm level covariates provided by the ES, we can test the above relationship by presenting a version of the standard constant returns to scale Cobb-Douglas production function with labor, capital, and knowledge expanded to international linkages as follows:

$$\theta_i = \beta_1 + \beta_2 k_i + \beta_3 z_i + \beta_4 d_i + \eta_c + \eta_j + \epsilon_i \qquad \text{Eq. [2]}$$

Eq. 2 adds - with respect to Eq. 1 - the following explanatory variables (all variables are in logs): k_i that stands for firm "capital intensity" and z_i that stands for a bundle of firms level observables, namely "human capital", "employment", and "technological innovation". As in Farole and Winkler (2012), the latter variable is a dummy that controls whether firms use technology licensed from a foreign owned company (excluded office software), own internationally recognized quality certification (e.g., iso), use own website and/or emails to communicate with clients and suppliers. To

[17] Although labor productivity is a quite imperfect measure of firm productivity, our cross-sectional data set is not suited to calculate total factor productivity using the standard methodologies.

avoid bias due to unobservable factors[18] we control, as before, for the geographical location and industry of the firms. A full description of the above variables is provided in Table 4A in the Appendix.

Table 3 shows the regression results of the base model. It is organized in ten columns. The first five columns report the estimates of Eq. 2. Columns from 6 to 10 report the same estimates for the subsample of exporting firms by substituting the dummy variable for exports with a continuous variable (i.e., the value of sales exported directly). As for the export premia, this empirical exercise uses pooled data for the entire LAC data set. The signs of the relationship between labor productivity and the set of firm level explanatory variables are significant and consistent with the theory. A positive coefficient is estimated for the relation between labor productivity, capital intensity, employment and innovation while a negative coefficient is estimated for unskilled workers (a proxy of human capital). Also in this case, our findings are consistent with the view that exporter and/or foreign owned firms (i.e., characterized by inward FDI) show, on average and *ceteris paribus*, higher productivity. To look more in depth at firms' heterogeneity we also carried out separate regressions by firm size (distinguishing micro, small, medium and large firms' categories). The subsample of exporting firms (columns from 6 to 10) confirms for all the size categories the positive relationship, on average and *ceteris paribus*, between the level of gross exports and firms' productivity.

[18] For instance, country dummies capture also the heterogeneity in price differences across countries.

Table 3 - Base Model

dep: (ln) labor productivity

	export dummy					export values				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		micro firms	small firms	medium firms	large firms		micro firms	small firms	medium firms	large firms
ln K intensity	0.110***	0.0907***	0.106***	0.151***	0.138***	0.0495***	0.193***	0.00681	0.0942***	0.0412
	(0.00820)	(0.0191)	(0.0126)	(0.0132)	(0.0216)	(0.0126)	(0.0531)	(0.0288)	(0.0141)	(0.0261)
ln unskilled L	-0.344***	-0.168***	-0.143***	-0.162***	-0.259***	-0.388***	0.0478	-0.185***	-0.218***	-0.218***
	(0.0127)	(0.0409)	(0.0198)	(0.0214)	(0.0312)	(0.0209)	(0.158)	(0.0386)	(0.0270)	(0.0349)
ln Employment	0.551***	0.725***	0.659***	0.654***	0.710***	0.105***	0.388***	0.187***	0.256***	0.295***
	(0.0121)	(0.0357)	(0.0202)	(0.0242)	(0.0391)	(0.0257)	(0.135)	(0.0656)	(0.0331)	(0.0496)
tech	0.112***	0.0706	0.191***	0.238*	-0.695***	-0.287	-0.787*	-0.276		-1.162***
	(0.0390)	(0.0626)	(0.0551)	(0.135)	(0.203)	(0.178)	(0.426)	(0.258)		(0.258)
exporter	0.0567**	0.180	0.0996**	0.136***	-0.0243					
	(0.0275)	(0.128)	(0.0446)	(0.0382)	(0.0638)					
inward fdi	0.0496	0.106	0.244***	0.109*	0.0397					
	(0.0402)	(0.162)	(0.0886)	(0.0557)	(0.0702)					
ln export value						0.424***	0.486***	0.466***	0.451***	0.429***
						(0.0181)	(0.0817)	(0.0299)	(0.0223)	(0.0442)
cons	4.217***	2.345***	3.243***	3.426***	3.337***	2.795***	-1.006	2.765***	-0.219	2.334***
	(0.232)	(0.412)	(0.899)	(0.448)	(0.534)	(0.484)	(1.183)	(0.798)	(0.453)	(0.654)
country dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
industry dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	6,438	1,084	2,892	1,864	598	1,422	51	401	650	320
R^2	0.543	0.568	0.558	0.558	0.719	0.664	0.954	0.722	0.747	0.810

***,**,* denote significance at the 1, 5 and 10 per cent level, respectively.

Country dummies include dummies for different survey rounds for the same country.

Because of the lack of panel data, our base model cannot avoid further bias due to unobserved characteristics that are correlated with both firms' characteristics and firms' productivity. To this end, we provide additional empirical estimates for the sub-sample of exporting firms located in the LAC region by controlling for endogeneity bias in the relationship between firm productivity levels and the value of their gross exports with excluded instruments. More specifically, from the ES dataset we select some additional firm level explanatory variables that are supposed to be correlated with LAC firms' gross exports but not with domestic firm productivity: namely, the 'Average time to clear imports from customs (days)' and the number of 'Days to Obtain Import License'. They can be considered as proxies of international trade obstacles that are negatively correlated with export flows but do not depend on firms productivity.[19]

Table 4 provides both instrumental variable (IV-2SLS) and control function (CF) estimates again for the pooled data (for short the first stage estimates are not reported in the Table). The IV results are robust and significant. Moreover, the Hansen's J statistics of over-identifying restrictions - which is consistent in the presence of heteroskedasticity - does not reject the null hypothesis that our instruments are valid. However, the Angrist-Pischke (AP) F-statistics of weak identification is significant only at the 5% level. Since the IV inconsistency actually increases with the number of instruments used, we opt for a more parsimonious behavior by using only one instrument, namely 'Average time to clear imports from customs'. We further apply a CF approach which controls for the endogeneity bias by adding directly the estimated residual of the first stage equation to the main regression providing a CF unbiased estimator which is generally more precise than the IV one (Wooldridge, 2010). The significance of the CF estimates confirms the above evidence of the presence of a relationship between trade and firm level productivity, for the full sample and by firms' size categories (with the exception of small firms)[20] as well as the absence of reverse causality.[21]

[19] One can argue that better performing firms are more likely to better prepare trade documents and shipments and thereby spend less time in customs or in getting a license. However, in our case, the weak correlation between firm labor productivity and the above instruments confirms that these trade obstacles are more related to causes that are external to firms (e.g., red tape procedures, institutional efficiency, etc.).

[20] The number of micro firms is not sufficient to carry out these empirical analysis for the subsample of exporting firms.

[21] The lack of significance of the ρ coefficient is normally considered as a reliable test for the absence of endogeneity bias. This assumption is not rejected in all our estimates with the relevant exception of the sub-sample of large firms.

Table 4 -Instrumental Variables 2SLS and CF (sample restricted to exporting firms only)

dep: (ln) labor productivity

	(1) IV	(2) CF	(3) small firms	(4) medium firms	(5) large firms
ln K intensity	-0.0130	0.0881***	0.0137	0.130***	0.0980***
	(0.0518)	(0.0118)	(0.0449)	(0.0185)	(0.0138)
ln unskilled L	-0.439***	-0.364***	-0.214***	-0.247***	-0.231***
	(0.0458)	(0.0180)	(0.0488)	(0.0297)	(0.00948)
ln Employment	-0.0921	0.273***	0.435***	0.361***	0.499***
	(0.200)	(0.0250)	(0.0597)	(0.0268)	(0.0579)
tech	-0.338*	0.288	1.403***	0.0675	-0.435
	(0.203)	(0.218)	(0.151)	(0.315)	(0.294)
ln export value	0.653***	0.426**	0.921	0.338**	0.364***
	(0.213)	(0.169)	(0.819)	(0.137)	(0.0305)
ρ		-0.231	-0.701	-0.113	-0.220***
		(0.168)	(0.796)	(0.135)	(0.0447)
cons	-2.141	0.584	-9.649	1.128	-2.224
	(2.524)	(3.066)	(12.07)	(2.540)	(1.524)
country dummies	yes	yes	yes	yes	yes
industry dummies	yes	yes	yes	yes	yes
N	518	1,389	345	671	358
R-sq	0.397	0.588	0.631	0.659	0.748
instruments	2	1	1	1	1
Hansen J (prob>z)	0.14				
AP (prob >F)	0.05				

***,**,* denote significance at the 1, 5 and 10 per cent level, respectively.
country dummies include dummies for different survey rounds for the same country.

Finally, we provide a more detailed investigation of the linkages between firm level exports and productivity and specifically address our second research question that is related to the effect of firm GVCs involvement (both participation and position) on firm productivity. Thus, we present a further empirical test of Eq. 2 for the sub-sample of exporting firms by controlling for the decomposition of the value added embodied in national exports as well as the GVC indicators (see Sections 3 and 4) both at the industry level. This means to assume that firm performance in value added trade is heterogeneous across industries but homogeneous within them. We acknowledge this is a strong assumption. However, it is consistent with the high level of aggregation of TiVA industry data that support the hypothesis of firms' heterogeneity across industries as well as with detailed investigations at the industry level that show a very low degree of firms' heterogeneity across functions within industries in the LAC region (Gereffi_ et al., 2005; Pietrobelli and Rabellotti, 2011). To test empirically the assumption of higher firms' heterogeneity across industries than within industry we applied a Levine test (i.e., similar to the standard Anova test but less sensitive to the violation of normality assumption) to a set of firm characteristics. The outcomes of the Levine test suggest that the null hypothesis of equal variances of the set of firm level characteristics across industries can be

rejected with a probability below 0.05. This supports the assumption of the relative intra-industry firms' homogeneity and, thus, the relative homogeneity also in value added trade across them.

Before presenting this further empirical test, it is worth recalling that FVA and IVA are the key value added components of total exports since they indicate, respectively, the foreign value added embodied in total exports and the indirect domestic value added embodied in intermediate exports used in other countries exports. Moreover, the ratio between these two components provide a measure of country/industry relative upstreamness/downstreamness (i.e., the GVC position index). Since the GVC index of participation is a linear combination of IVA and FVA, the parameters associated to these components of gross exports are jointly considered also as indicators of GVC participation.

Table 5: GVC participation, position and productivity estimates (sample restricted to exporting firms and four LACs: Argentina, Mexico, Chile and Brazil)

dep: (ln) labor productivity

	(1) Gross	(2) GVC
ln K intensity	0.0815*	0.0843*
	(0.0396)	(0.0406)
ln unskilled L	-0.412***	-0.415***
	(0.0309)	(0.0302)
ln Employment	0.177***	0.179***
	(0.0322)	(0.0292)
tech	.	.
	.	.
ln export value	0.434***	0.432***
	(0.0382)	(0.0371)
IVA		-0.0537
		(0.101)
FVA		0.0355**
		(0.0149)
GVC Pos		0.0376**
		(0.0161)
cons	0.897	1.273*
	(0.621)	(0.560)
country dummies	yes	yes
industry dummies	yes	yes
N	392	390
R-sq	0.649	0.650

(§) Sample restricted to ex-porting countries and four LACs: Argentina, Mexico, Chile and Brazil
***,**,* denote significance at the 1, 5 and 10 per cent level, respectively.

Table 5 presents the results of the value added and GVC estimates. Unfortunately, due to data constraints we can run this last test only for a restricted sample of exporting firms from the four LAC countries for which TiVA data are available (Argentina, Brazil, Chile and Mexico).[22] The results are fully consistent with the theory and with the results of the previous empirical exercises (the coefficients of the base model are all significant and show the expected signs): firms' international linkages are positively correlated with firms' productivity. It appears to be an additional and heterogeneous impact on firm productivity in clustering firms by trade in value added (specifically in terms of value added embodied in foreign intermediate imports), once controlled for the causal impact of gross exports. These estimates confirm that international trade involvement has a positive effect on productivity at the firm level, and suggest this to be no independent from the actual decomposition of the added value of gross exports by industries . Furthermore, the robust and positive relationship between firm level productivity and the industry GVC position suggests that the position of the industry in the global value chain matters as well: the higher the industry upstreamness in the GVCs the greater the impact of its international linkages on firms' productivity performance. In other words, firms operating in the industries that get value added by exporting intermediates and primary goods used in other countries' exports tend to be, *ceteris paribus*, more productive than firms operating in industries whose value added comes primary from imported inputs.

6 Conclusions

This paper addresses two key research questions; i) are firms characterized by international linkages more productive than other firms? ii) and, eventually, are those belonging to industries more involved in global value chains more productive? This empirical analysis provides a rich picture of the relationship between firm performance and country/industry actual involvement in international production networks in the LAC region by combining the new World Bank ES firm level data and the new OECD-WTO TiVA data.

Specifically, we first estimate the productivity premia associated to the participation in trade and the presence of inward FDI, while controlling for firms heterogeneity by using dummies for country (year) and sector. Second, we analyze the relationship between firm international linkages and productivity by using a standard output function with constant returns to scale Cobb-Douglas technology with labor, capital, and knowledge, presenting both OLS, IV and CF estimates. Third, we run a final test of the same equation expanded to account for TIVA-based indicators of value added trade and industry involvement in global value chain.

[22] Furthermore in this exercise we cannot further test the hypothesis of absence of endogeneity due to reverse causality. The positive outcomes of the tests in the previous empirical exercises make us confident that this condition holds even when it is not directly testable.

Our empirical analysis confirms the presence of a positive causal relationship between international activities and firm performance in the LAC region. Furthermore, focusing on four big Latin American countries (Argentina, Brazil, Chile and Mexico), we show that the actual level of involvement into GVCs matters as well. More specifically, our empirical analysis highlights both the key role of trade in value added and the GVC position, with a positive impact of upstreamness on firm performance. Firms operating in the industries that exporting intermediates and primary goods used in other countries' exports tend to be, *ceteris paribus*, more productive than firms operating in industries whose value added comes primary from imported inputs. A natural improvement of this analysis is to add information on the actual constraints preventing a country from fuller engagement in GVCs; to propose adequate criteria for the prioritization of different constraints depending on whether a country tries to go upstream and/or to integrate downstream; to broaden the variety of its exports and opportunities to attract greater GVC participation by feasible changes in the business or policy environment.

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Appendix

Table 1A -The LAC sample: exporting, importing and foreign owned firms by country

Country	Total firms	exporting	importing	foreign	exp\&foreign	exp\&imp	Country	Total firms	exporting	importing	foreign	exp\&foreign	exp\&imp
Antiguaandbarbu	151	29	21	15	3	5	Guyana2010	162	37	51	41	16	19
Argentina2006	975	281	329	139	71	122	Honduras2006	433	52	135	62	17	28
Argentina2010	1010	276	441	130	78	162	Honduras2010	334	25	86	38	8	15
Bahamas2010	148	21	28	33	10	6	Jamaica2010	375	36	81	52	9	16
Barbados2010	150	48	60	29	15	33	Mexico2006	1420	133	269	123	50	84
Belize2010	149	31	46	19	9	7	Mexico2010	1436	216	526	127	58	137
Bolivia2006	608	74	271	80	14	42	Nicaragua2006	470	42	212	45	10	24
Bolivia2010	340	33	84	45	6	17	Nicaragua2010	320	21	68	36	8	10
Brazil2003	1642	0	381	0	0	0	Panama2006	587	77	169	71	18	24
Brazil2009	1792	126	355	68	22	41	Panama2010	362	10	31	69	5	2
Chile2006	984	129	393	74	26	66	Paraguay2006	604	73	292	68	20	41
Chile2010	899	150	448	118	55	99	Paraguay2010	348	37	82	38	13	20
Colombia2006	980	102	288	29	8	40	Peru2006	536	101	217	65	24	55
Colombia2010	845	151	384	77	35	100	Peru2010	882	203	455	100	45	124
Costarica2005	343		145	0	0	0	Stkittsandnevis2	150	26	28	31	8	11
Costarica2010	525	94	216	85	39	63	Stlucia2010	150	51	31	28	13	11
Dominica2010	150	40	9	35	8	4	Stvincentandtheg	154	26	36	24	9	12
Dominicanrepubl	360	39	87	57	13	28	Suriname2010	152	19	36	9	2	5
Ecuador2006	599	72	247	80	15	41	Trinidadandtobag	366	61	88	47	14	33
Ecuador2010	360	21	84	62	5	13	Uruguay2006	605	99	275	77	20	65
Elsalvador2006	679	158	294	85	36	109	Uruguay2010	585	110	261	63	25	67
Elsalvador2010	332	72	87	57	15	47	Venezuela2006	500	15	0	0	0	0
Grenada2010	153	10	20	26	2	4	Venezuela2010	251	1	41	27	0	0
Guatemala2006	520	106	207	56	21	63							
Guatemala2010	547	119	212	68	23	87	Total	26423	3653	8607	2708	921	2002

Table 2A - Gross export decomposition in value added and GVC indicators in selected countries (2009)

Countries	Gross export decomposition in		GVCs indicators	
	IVA (%)	**FVA**(%)	**GVC participation**	**GVC position**
Selected Developed Countries			(a)	(b)
USA	28.53	11.29	39.82	2.53
Japan	32.94	14.79	47.73	2.23
Germany	22.82	26.64	49.46	0.86
Selected Emerging Countries				
China	13.42	32.63	46.05	0.41
India	20.34	21.92	42.27	0.93
South Korea	24.38	40.64	65.03	0.60
Selected Developing & Transition Countries				
Poland	20.45	27.89	48.34	0.73
Turkey	15.93	21.79	37.72	0.73
South Africa	17.33	16.49	33.82	1.05

*Following Iossifov (2014), the IVA measure is obtained from data on the TiVA variable EXGR_FVA for its trade partners (i.e. value-added from country embodied in trade partners total exports, in % of country total exports). The FVA measure is obtained from data on EXGR_FVA for the country (i.e. value added from trade partners embodied in country total exports , in % of country total exports).

(a) GVC participation (in % of country total exports) = IVA +FVA

(b) GVC position= IVA /FVA

Table 3A – International Comparison of GVC Industry Position Index (2009)

Position index	Germany	Japan	Inited State	China	India	Korea	Poland	Turkey	South Africa	Argentina	Brazil	Chile	Mexico
Agric.	1.99	2.29	2.43	3.10	1.57	2.20	2.05	1.72	1.63	2.72	2.27	2.21	1.76
Mining & quarr.	3.04	3.30	2.38	4.42	3.78	4.11	3.03	2.62	2.76	3.39	3.65	3.63	2.83
Food products & bev.	1.32	1.56	1.53	2.55	1.35	1.77	1.58	1.33	1.35	1.77	1.60	1.58	1.24
Textiles, leather & foot.	1.50	1.99	1.70	2.53	1.61	2.40	1.41	1.85	1.72	2.09	1.55	1.42	1.70
Wood, paper, paper prod., printing & pub.	2.49	3.07	2.08	3.64	2.56	3.09	2.49	2.47	2.76	2.61	2.56	3.19	2.35
Chemicals & non-metallic min. prod.	2.62	2.92	2.30	3.41	2.67	3.54	2.42	2.30	2.16	2.58	2.40	2.50	2.10
Basic metals &fabricated metal prod.	3.03	3.55	2.70	3.48	2.58	3.70	2.80	2.40	2.35	2.99	2.90	2.74	2.66
Machinery & equip.	1.99	1.66	1.73	2.34	1.73	2.32	1.92	1.45	0.00	1.77	1.47	2.43	1.49
Electrical & optical equip.	2.21	2.23	1.95	2.55	1.89	3.13	1.79	1.67	2.20	1.92	1.73	2.50	1.67
Transport equip.	1.94	2.36	1.76	2.34	1.57	2.28	1.63	1.25	1.70	1.55	1.51	2.21	1.36
Manufacturing n.e.c; recy.	1.51	2.80	1.47	2.53	1.93	3.01	1.78	1.37	1.66	1.44	1.30	1.43	1.85
Electricity, gas & water sup.	2.31	2.40	1.67	4.15	2.84	3.09	2.22	2.49	2.20	2.42	2.25	2.36	2.17
Construction	1.47	1.27	1.31	1.05	1.24	1.13	1.70	1.18	1.59	1.11	1.22	1.22	1.07
Wholesale & retail trade; hotels and rest.s	1.68	1.85	1.40	2.59	2.07	2.08	2.05	1.86	1.89	1.53	1.82	1.89	1.64
Transport & storage; post &telec.	2.42	2.11	1.97	2.97	2.17	2.60	2.22	1.96	2.49	2.15	2.03	2.31	1.52
Financial interm.	2.16	2.52	2.08	3.27	2.55	2.34	1.77	2.22	2.44	2.12	1.86	2.60	2.19
Business services	2.20	1.77	1.90	2.24	1.62	2.33	2.02	1.59	2.16	1.68	1.67	2.25	1.69
Other services	1.24	1.17	1.13	1.51	1.14	1.13	1.23	1.12	1.31	1.17	1.18	1.20	1.03

Table 4A - Variables used in the analysis

Variable name	Definition
Dependent variable	
Labour productvity	Sales per worker (US$ 2010)
Covariates	
Exporter	Firm with at least 10 percent of its annual sales derived from direct exports
Inward FDI	Firm with at least 10 percent of ownership held by private foreign investors
K intensity	Capital stock per worker
Unskilled L	Number of full-time unskilled workers at end of the surveyed fiscal year
Employment	Number of permanent and temporary full-time workers
Firm size categories	Micro (less than 10 employees), small (between 10 and 50), medium (between 50 and 250) and large enterprises (over 250 employees)
Tech	(Technology innovation). tech=1 if firms use technology licensed from a foreign owned company (excluded office software), own internationally recognized quality certification (e.g., iso), use own website and/or emails to communicate with clients and suppliers, and tech= 0 otherwise
Export value	Sales exported directly (% of sales)
Excluded instruments	
	Average time to clear imports from customs (days)
	Days to obtain import license