Value chains and inclusive employment in Latin America

Álvaro Lalanne

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Abstract

Setting out from a recognition of the diversity of forms taken by international trade participation across Latin America, this study analyses the participation of seven countries of the region (Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru) in global value chains and compares the associated employment patterns with those linked to traditional trade and domestic demand. The analysis focuses on employment and wages and their relationship to value added, occupational categories and gender gaps. Drawing on a newly constructed database with information on these variables for the aforementioned countries, the study examines the extent to which greater participation in global value chains is associated with the narrowing of certain employment gaps in Latin America.

Keywords

International trade, employment, labour market, value chains, employment policy, employment creation, women's employment, wages, social integration, Latin America

JEL classification

F15, F63, C67

Author

Álvaro Lalanne is a professor at the University of Montevideo (Uruguay). Email: alvaro.lalanne@gmail.com.

I. Introduction

The global fragmentation of production in recent decades has led to production and supply being organized through global value chains. While these have undergone some reconfiguration in recent years, it remains clear that traditional methods of measuring the role and effects of trade in national economies must be adapted to this fragmented model of production (Timmer et al., 2019). Beyond the discussion on measurement, an even more pressing issue is how to quantify the effects that different modalities and degrees of participation in global value chains have on certain key socioeconomic variables.

International trade affects employment quality in numerous ways, which differ according to a country's mode of participation and level of development. With the rise of production organized through global value chains, there has been growing interest in advancing policies to ensure that this form of trade is not only a source of income but also a catalyst for decent work, particularly in countries still experiencing major difficulties in generating employment that fosters virtuous social inclusion (International Labour Organization [ILO], 2016). Although the issues associated with decent work predate the rise of global value chains, in some cases participation in such chains has tended to perpetuate them, particularly where subcontracting and price competition among suppliers place pressure on countries' labour standards (ILO, 2016). In addition, many countries hosting offshore production activities struggle to enforce regulations.

This article quantifies the contribution of trade (distinguishing between trade in global value chains and traditional trade) to employment and the occupational structure in seven Latin American countries. It also examines the relationship between the degree and modality of participation and labour market outcomes.

Following this introduction, the second section provides a brief overview of the relevant literature. The third section identifies the activities integrated into global value chains and quantifies the jobs and occupations associated with trade. The fourth section explores the relationship between the modality and depth of trade participation and various employment gaps, and the fifth section sets out the conclusions.

II. Literature review

The literature examining the relationship between the fragmentation of production and labour market outcomes identifies different effects depending on the type of country and employment and, more recently, the modality of trade participation. With regard to the effects in developed economies, the most influential model is that of Grossman and Rossi-Hansberg (2008), which identifies three ways in which offshoring affects wages in the country of origin. The first is a positive productivity effect stemming from the cost savings that firms achieve by relocating tasks abroad. The second is a relative price effect arising from changes in the terms of trade, as imports become cheaper and prices for the task-intensive jobs that are offshored are reduced. The third is a labour supply effect linked to the reabsorption of workers who lost their jobs as a result of offshoring. Researchers have used this model to assess the relationship between fragmentation, or participation in global value chains, and employment or wages. For example, Feenstra and Sasahara (2018) find that in the United States, the growing demand for services arising from increased trade with China has offset job losses in the industrial sector.

Foster-McGregor et al. (2016) argue that offshoring has a negative impact on labour demand. Likewise, with regard to wages, Ebenstein et al. (2015) find that offshoring to China has had an adverse effect on wage levels, with evidence suggesting that globalization has led to a reallocation of affected workers into lower-paid occupations. Nonetheless, in line with other studies (Goos et al., 2014), the trade channel appears less significant than that of technological change. Szymczak and Wolszczak-Derlacz (2022) estimate a direct negative correlation between participation in global value chains and domestic wages, showing that the productivity effect identified by Grossman and Rossi-Hansberg (2008) is outweighed by the other effects. Notably for the purposes of this study, the authors distinguish between participation in global value chains and traditional trade (understood as trade in final goods) and find that each is associated with distinct outcomes. Moreover, the authors report that a country's position within the value chain (upstream or downstream) is negatively correlated with labour market outcomes, suggesting that, in the case of middle-income countries, upstream participation does not translate into upgrading.

In their analysis of developments in the functional distribution of income along global value chains, Riccio et al. (2023) find that the expansion of value chains has reduced the labour share of income, particularly in downstream production roles, in both developed and developing economies. The authors point to the offshoring of tasks by multinational corporations to countries with weaker labour standards as a key driver of the rise in functional income inequality.

Some of the most comprehensive empirical studies, combining multiple countries, participation modalities and tasks, reveal a diverse range of effects. Drawing on a person-level panel from the Programme for the International Assessment of Adult Competencies, along with sectoral measures of participation in global value chains, Lewandowski, Madoń and Winkler (2023) explore the relationship between participation in value chains, task routinization and inequality in countries. Their findings indicate that higher levels of participation in global value chains lead to greater routinization of tasks that can be offshored to poorer countries and within the industrial sector, but to lower routinization in service occupations that cannot be offshored. The study finds that global value chains reduce inequality in recipient countries but increase it in the countries that offshore tasks.

The varying impacts of different forms of participation in global value chains remain underexplored, partly owing to measurement challenges. While strong backward linkages reflect the most common mode of participation for offshoring host countries, forward linkages characterize both innovation-driven economies, such as Japan and the United Kingdom and those whose participation is based on mining resources, such as Australia and Peru (World Bank, 2019). Lewandowski, Madoń and Winkler (2023) find no association between backward linkages and the prevalence of routine tasks; however, they do find such an association in the case of forward linkages, though only in low-income countries.

The global organization of production also influences the dynamics of task de-routinization, understood as the reduction of occupations with more routine content. Lewandowski, Park and Schotte (2023) analyse global employment trends with special reference to routinization content and show that disregarding the country-specific nature of routine task content can lead to inaccurate results. First, de-routinization proceeds more slowly in low- and middle-income countries. Second, the gap in average routinization levels between these countries and high-income economies is wider than would be expected from the difference in occupational structure, as the nature of the tasks performed within occupations varies. As a result, the gap has widened over time, despite greater integration into global value chains and increased technology transfer.

Trade can affect all dimensions encompassed within the concept of decent work, with effects that vary by country type, both theoretically and empirically, making it useful to examine the particular context of Latin America (Aleman-Castilla, 2020).

Regarding the relationship between trade and labour informality, Dix-Carneiro et al. (2021) develop a model that incorporates firm heterogeneity (Melitz, 2003), collective bargaining, job search costs and weak and asymmetric enforcement of tax and labour regulations, which allows firms to determine for themselves whether to operate formally or informally. Calibrating the model with matched employer-employee data from Brazil, the authors confirm several previous findings while also generating new insights. Increased trade exposure reduces informality in the tradable sector but may raise informality in the non-tradable sector, rendering the overall effect ambiguous or small. Moreover, the informal sector acts as a buffer during negative productivity shocks. In addition, the effect of trade liberalization on productivity is underestimated when informality is not taken into account, particularly in the tradable sector.

The labour market impact of multinational corporations integrated into global value chains has been studied extensively in Costa Rica, the conclusion being that transnational firms pay higher wages and also generate wage increases among domestic firms operating in the sectors most exposed to them (Alfaro-Ureña et al., 2019), in addition to improving the productivity of their local suppliers (Alfaro-Ureña, Manelici and Vásquez, 2022). The imposition of responsible sourcing standards by multinational corporations has led to wage increases for one third of low-skilled workers, while also reducing the share of such workers in the supplier firms' workforce. At the same time, unskilled workers not employed in these supplier firms have been adversely affected by lower wages and higher living costs (Alfaro-Ureña, Faber et al., 2022).

In summary, the impact of global value chain participation on variables related to employment gaps differs between countries that offshore tasks and those that host them. For the latter, the effects on wages (Alfaro-Ureña et al., 2019; Riccio et al., 2023) and informality (Dix-Carneiro et al., 2021) remain inconclusive. Moreover, recent evidence indicates that outcomes vary according to the mode of integration: in countries participating through backward linkages, the routine content of jobs does not appear to increase, and inequality seems to decline (Lewandowski, Madoń and Winkler, 2023); by contrast, countries integrating through forward linkages experience greater routinization (Lewandowski, Madoń and Winkler, 2023) and show little evidence of upgrading (Szymczak and Wolszczak-Derlacz, 2022).

III. Activities, jobs and occupations associated with value chains in seven countries of Latin America

1. Measuring activities integrated into value chains

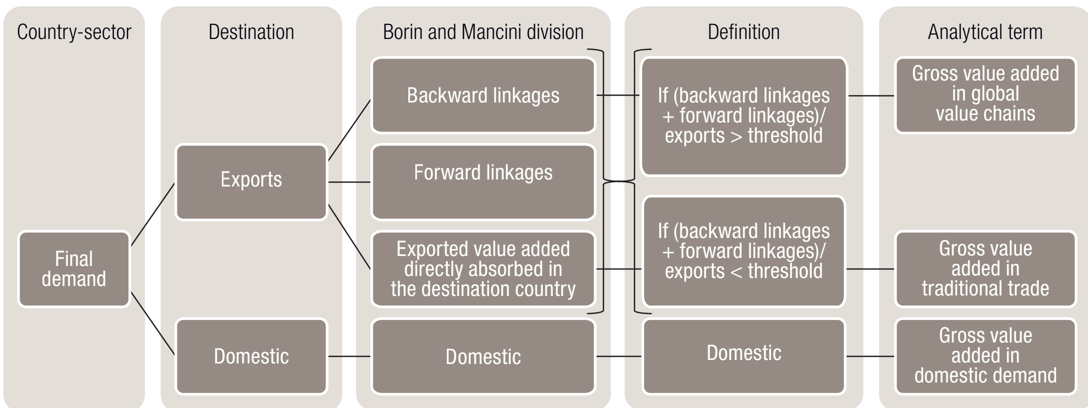
Although current crises have been driving a trend towards the reconfiguration of supply chains in pursuit of resilience (nearshoring) or favourable political environments (friendshoring), a significant share of global trade continues to be driven by interactions among firms organized within global value chains (Antràs and Chor, 2021). However, the literature does not provide a single, universally accepted definition of what constitutes a value chain or how it should be measured (Antràs, 2020). Many of the measurement approaches developed in recent years are useful for quantifying certain aspects, such as participation in value chains, but not others, such as exposure to them (Baldwin et al., 2022).

In determining how to measure participation, it is helpful to identify the dimensions to be considered. First, the measurement should encompass the full scope of domestic productive activity, not just the portion directly involved in the export stage. This requires the use of input-output techniques to incorporate the domestic linkages of exports. Second, the measurement should be compatible with internationally accepted definitions of what constitutes value chain trade. Measures of participation in value chains that examine both backward and forward linkages require global datasets. Lastly, to ensure that the employment analysis reflects conditions within the country, it should be compared with domestic economic activities.

The defining feature of trade within global value chains is the exchange of intermediate goods, and thus the participation of two countries in the production of a single good. A broad interpretation of this idea suggests that all trade in intermediate goods is value chain trade, since more than one country contributes to the production process (Wang et al., 2017). A more restrictive definition treats only value added that crosses two or more borders before reaching the final consumer as value chain trade (Koopman et al., 2014). This definition is the most widely used in trade reports (Antràs, 2020; World Bank, 2019), and the basic algebra for its calculation is set out in Borin and Mancini (2019), who resolve certain inconsistencies found in pioneering measurements (Koopman et al., 2014; Wang et al., 2013). Multi-country input-output tables can be used to infer, at the sectoral level, how the value of an input was constructed or how it will be used in the destination country.

This article adopts the conceptual framework of Borin and Mancini (2019) to define trade in value chains. Their analysis distinguishes the share of each country's trade that is traditional from the share linked to global value chains and then aggregates the results for all sectors or countries. While this approach provides a useful estimate of the weight of value chain trade within overall trade flows, it is not designed to analyse the types of employment it entails. In this article, a threshold for participation in value chains will be set for each country-sector: if the ratio between exported value that crosses two or more borders and total exports exceeds a given threshold, then all exports from that country-sector are classified as value chain trade; otherwise, they are considered traditional trade (see diagram 1).

Diagram 1
Accounting decomposition of exports and classification of trade types

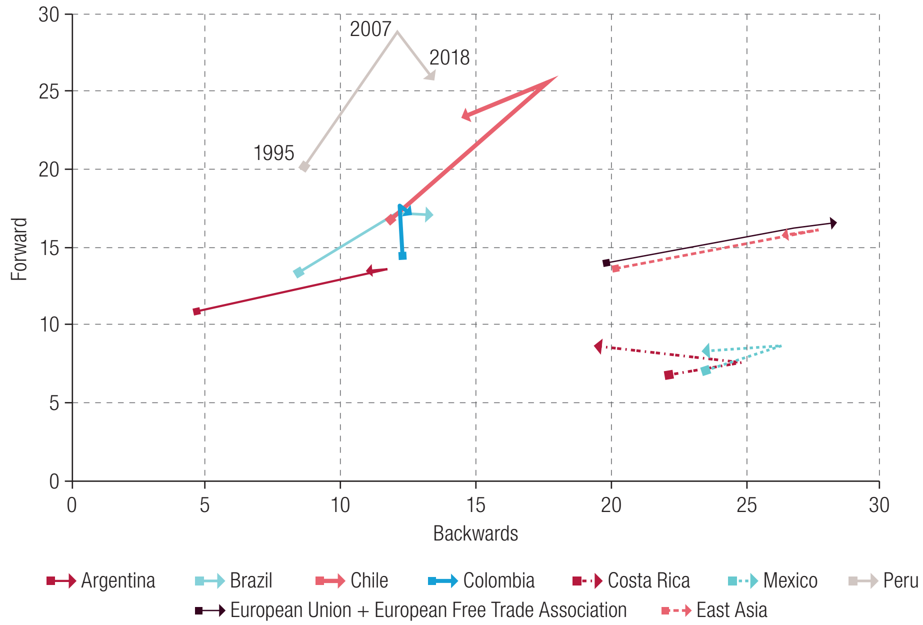


Source: Prepared by the authors, on the basis of Borin, A. and Mancini, M. (2019). Measuring what matters in global value chains and value-added trade. *Policy Research Working Paper* (8804). World Bank.

Backward linkages represent the portion of export value that originates from imported inputs. The fragmentation of production has led industries to increasingly source inputs from abroad, which serves as an indicator of participation in global value chains. Meanwhile, forward linkages represent the domestic value that is exported, incorporated into the production process in the destination country and subsequently re-exported. Exported value added that is directly absorbed in the destination country crosses borders only once. A country's participation in value chains depends on the size of sectors in trade, the origin and incidence of the inputs used in production and the use made by purchasing country-sectors of the goods it exports.

Figure 1 presents measures of participation in value chains arrived at following the methodology of Borin and Mancini (2019). The sum of forward and backward linkages provides an overall measure of countries' participation in value chain trade during the period under review. The Latin American countries display very different positions and levels of participation. Chile and Peru are typical of countries with forward linkages, providing value that is re-exported by other countries. Their trajectories are largely shaped by the price trends of their main export products. Argentina, Brazil and Colombia fluctuate between forward and backward linkages, though at internationally low levels. Costa Rica and Mexico are at the other extreme, with very high levels of backward linkages and a slight decline in participation in recent years. The two blocs most representative of trade in global value chains, namely the European Union and East Asia, greatly fragmented their production during the period and register overall participation rates above 40%.

Figure 1
Selected countries and groupings: participation in value chains by type of linkage, 1995, 2007 and 2018

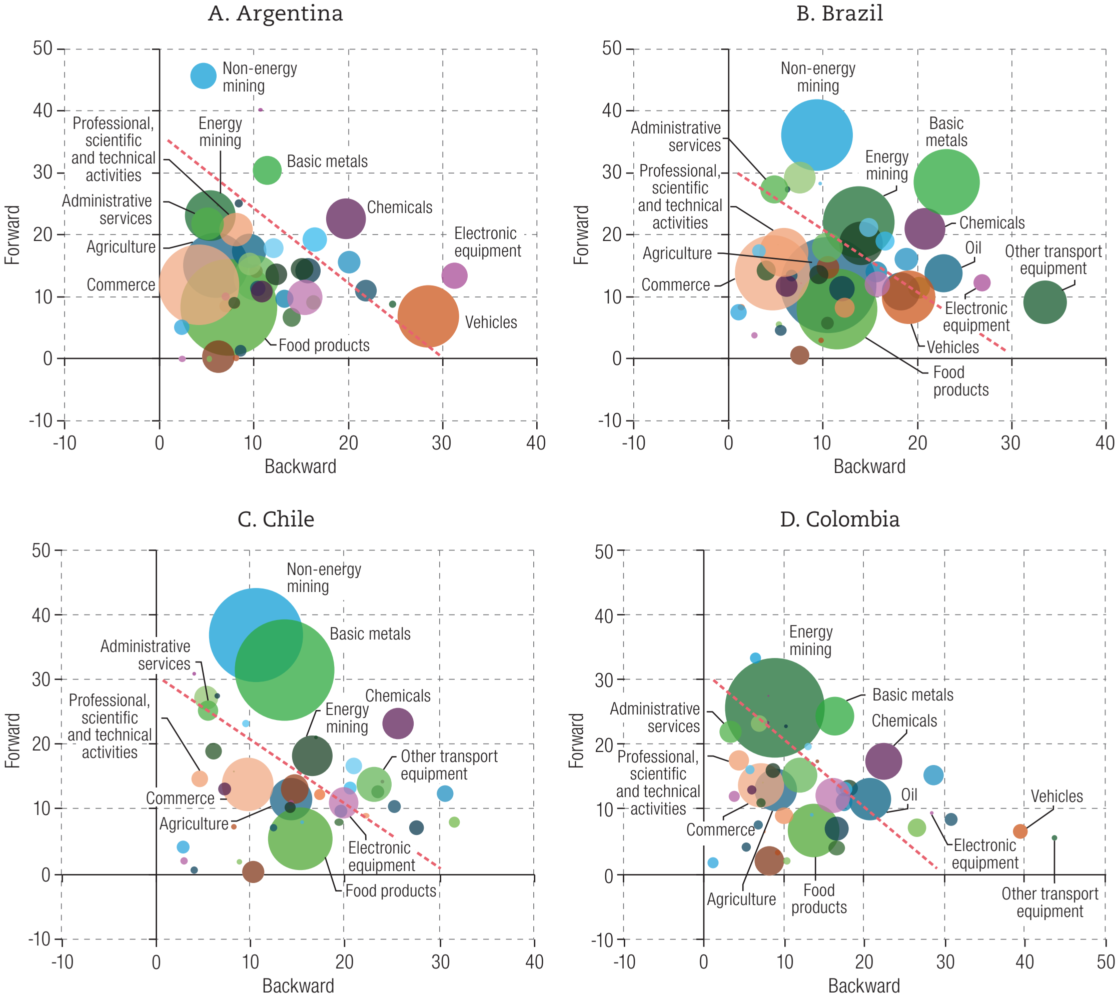


Source: Prepared by the authors, on the basis of Organisation for Economic Co-operation and Development. *Inter-country input-output tables*. https://www.oecd.org/en/data/datasets/inter-country-input-output-tables.html and Borin, A. and Mancini, M. (2019). Measuring what matters in global value chains and value-added trade. *Policy Research Working Paper* (8804). World Bank.

The global value chain participation of the seven Latin American countries shown ranges from 24% in Argentina to 39% in Peru. This range should be considered when setting a threshold for backward and forward linkages that determines whether a country-sector is participating in global value chains. Country-sectors in whose exports the combined share of backward and forward linkages exceeds 30% of the value exported are considered to be participating in global value chains. Those falling below this threshold are thus classified as engaging in traditional trade and not value chain trade. Once a country-sector is assigned to one of the two categories (global value chains or traditional trade), all its exported value added, including that generated upstream, is considered to fall within the same classification.

Figures 2 and 3 illustrate the extent of each country's integration into global value chains in 2018. The size of each bubble reflects the sector's export share. Sectors with forward and backward linkages above the 30% threshold (indicated by the dotted line) are considered part of global value chains. The greater the distance from the origin, the greater the level of integration.

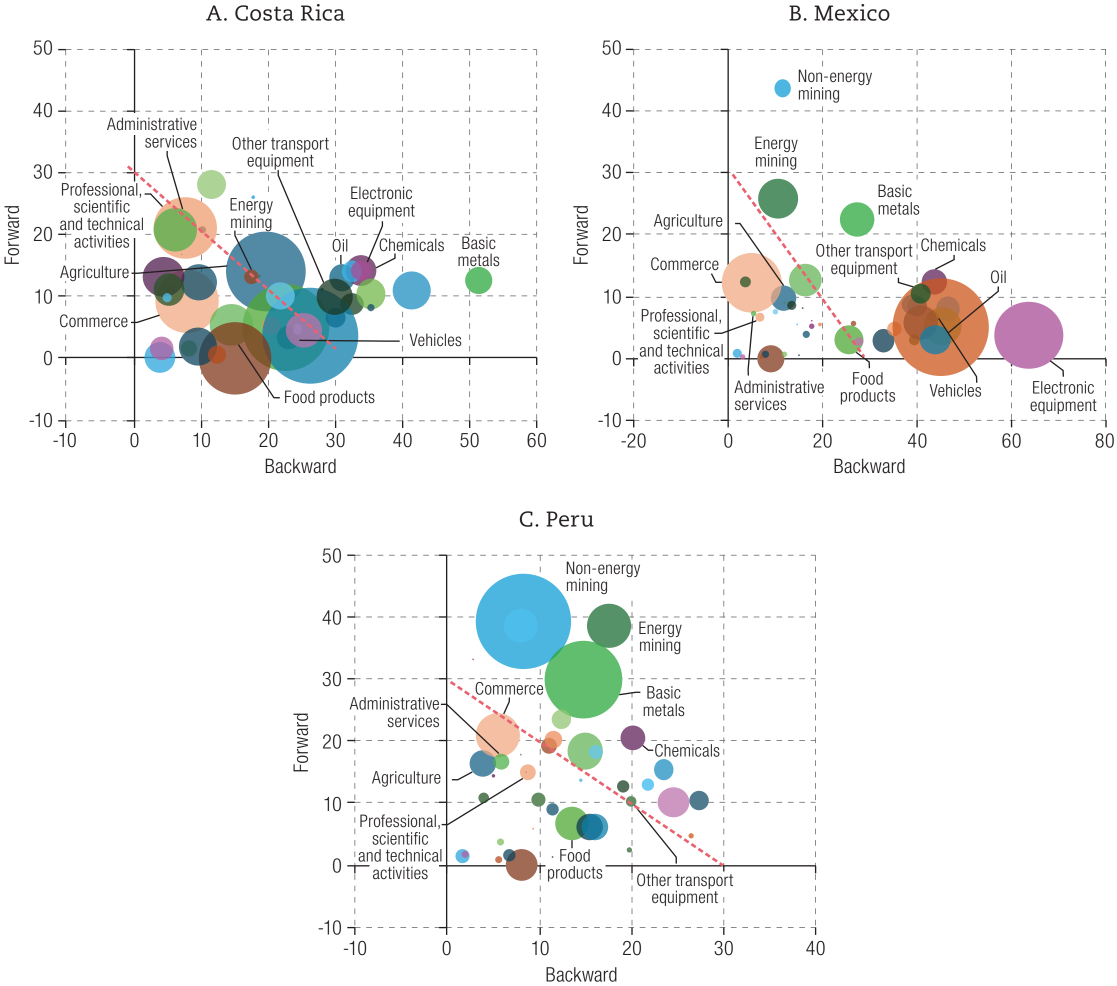
Figure 2
Latin America (4 countries): forward and backward linkages in global value chains, by sector, 2018



Source: Prepared by the authors, on the basis of Organisation for Economic Co-operation and Development. *Inter-country input-output tables.* https://www.oecd.org/en/data/datasets/inter-country-input-output-tables.html.

Argentina shows a pattern of low integration into global value chains, which reflects the nature of its key export sectors, its low import intensity and the destination markets of its manufactured exports, which are mainly regional and centred on domestic consumption. Brazil also displays a low level of integration, although with greater dispersion: agriculture, commerce and the food industry are not integrated into value chains, whereas both types of mining participate through forward linkages and several manufacturing sectors through backward linkages. Colombia also shows a low level of integration into global value chains. Its mining and basic metals sectors, which are forward-linked, account for a large share of exports. Chile's exports exhibit strong forward linkages, particularly in primary mining and metals. There is also some degree of backward integration in the chemical industry. Overall, Chile shows a greater reliance on imported inputs than Brazil and Argentina, reflecting a more open trade structure.

Figure 3
Latin America (3 countries): forward and backward linkages in global value chains, by sector, 2018



Source: Prepared by the authors, on the basis of Organisation for Economic Co-operation and Development. *Inter-country input-output tables.* https://www.oecd.org/en/data/datasets/inter-country-input-output-tables.html.

Costa Rica and Mexico exhibit much greater backward integration than the other countries. In the case of Costa Rica, forward integration is very low, with the notable exception of professional and administrative services and professional, scientific and technical activities, which are important to the country's export basket. In addition, the category of other manufacturing industries, which includes medical devices, shows a high level of backward integration. Mexico has strong forward linkages in energy mining and basic metals, with motor vehicles and electronic equipment also playing a major role. Peru has a similar structure to Chile, characterized by a strong presence of mining and basic metals sectors with forward linkages.

The mining, chemicals, oil, paper, metals, computers, motor vehicles and other transport equipment sectors are integrated into global value chains in at least six of the seven countries. Argentina is the country with the fewest industries integrated into value chains. Among services, transport-related activities show the highest degree of value chain participation.

Table 1 summarizes key indicators of participation in global value chains and traditional trade. In Mexico and Peru, value chain trade accounts for 77% of total exports, whereas in Argentina it represents just 21%.

Table 1
Latin America (7 countries): selected indicators of participation in global value chains and traditional trade

Indicator	Argentina	Brazil	Chile	Colombia	Costa Rica	Mexico	Peru
Manufacturing sectors integrated into global value chains *(Number)*	8	10	11	12	14	16	13
Other sectors integrated into global value chains *(Number)*	4	8	10	6	10	3	7
Share of exports in global value chains relative to total exports *(Percentage)*	21	43	70	55	65	77	77
Share of gross value added in global value chains relative to total gross value added *(Percentage)*	3	7	18	8	18	17	14
Share of gross value added in traditional trade relative to total gross value added *(Percentage)*	11	7	8	6	10	5	12
Employment in global value chains relative to total employment *(Percentage)*	2	4	9	4	20	11	6
Employment in traditional trade relative to total employment *(Percentage)*	10	8	10	9	11	13	8
Wage differential in global value chain demand relative to domestic demand *(Percentage)*	8	16	7	13	7	27	49
Wage differential in traditional trade relative to domestic demand *(Percentage)*	0	-5	-14	-9	-7	-3	-3

Source: Prepared by the authors, on the basis of Organisation for Economic Co-operation and Development. *Inter-country input-output tables.* https://www.oecd.org/en/data/datasets/inter-country-input-output-tables.html; and International Labour Organization. *ILOSTAT*. https://ilostat.ilo.org/.

In Argentina, Brazil and Colombia, export activities account for less than 15% of total gross value added. In the remaining Latin American countries included in the analysis, export-related gross value added accounts for approximately one quarter of the total, rising as high as 28% in Costa Rica. Activities linked to global value chains represent the bulk of international trade in all these countries, and particularly Peru. By way of reference, external demand in the East Asian countries averages 20% of gross value added, while in Western and Central Europe it averages 30% of gross value added, most of which is integrated into value chains.

2. Employment and occupations associated with global value chains and international trade

Estimating the employment embedded in global value chains requires a vector containing sector-level employment to be incorporated into the input-output matrices. The primary source of information on sectoral employment is the International Labour Organization (ILO).[1] The input-output matrix of the Organisation for Economic Co-operation and Development (OECD) is based on revision 4 of the International Standard Industrial Classification of All Economic Activities (ISIC). This classification is available from ILO only for certain countries; for others, data are based on ISIC revision 3, requiring the use of correspondence tables. Another series of adjustments was also necessary.[2]

[1] https://ilostat.ilo.org/

[2] In Argentina, adjustments were applied to the agricultural sector (Bisang et al., 2018); in Colombia, the Annual Manufacturing Survey was used to identify employment in several sectors; and in Mexico, information from the National Institute of Statistics and Geography on employment in "global manufacturing" was used to determine the number of jobs in the "export processing" segment.

The input-output matrix estimates the production required to meet a given share of final demand and associates that required production with another variable, such as value added, employment or emissions. As this linkage is established at the country-sector level, the method is tantamount to assuming homogeneity from the standpoint of production units, so that all those in a given country-sector are presumed to have an identical relationship with the variable of interest, regardless of where they are selling. In other words, these units are considered uniform in both their sales structures and their production functions. Since Melitz (2003), mainstream economic literature has recognized firms' heterogeneity, depending on their orientation. Exporting firms, especially those integrated into global value chains, are generally larger and have higher labour productivity than firms operating in domestic markets. As a result, the input-output method tends to overestimate the employment content of exports. The more heterogeneous a sector, the greater the overestimation.

The basic method for estimating employment is as follows:

$$EMP_{in} = emp_{in}.X_{in} = emp_{in}.\sum_j L_{ijn}\, Y_{in} = emp_{in}.\sum_j L_{ijn}(Y_{c,in+}\, Y_{g,in+}\, Y_{i,in+}\, E_{in}) \qquad (1)$$

where EMP_{in} is total employment in sector i in country n; emp is the employment-to-output ratio, with output represented by X_{in}; and L_{ijn} is the (i, j)-th element of the domestic Leontief inverse matrix for country n. The information linking occupations to sectors of economic activity is drawn from the countries' household surveys. Using the 2018 survey for each country,[3] a matrix of sectors and occupations was constructed to represent the full spectrum of the country's employed population. This made it possible to determine the share of each occupation within each sector, which was then multiplied by the employment estimated for each sector of origin, broken down by type of demand (total, global value chain exports and traditional exports). Given the differences between the countries' sectoral structures and occupational classifications, correspondence tables were required (see annex table A1.1).[4]

Employment associated with global value chains (emp_{in}^{CGV}) is estimated as follows:

$$emp_{in}^{CGV} = \frac{emp_{in}.\sum_j L_{ijn} E_{GVC,in}}{EMP_{in}} \qquad (2)$$

where $E_{GVC,in}$ are the exports of sector i in country n if they exceed the threshold to qualify as global value chain exports. If they do not exceed the threshold, the employment associated with the sector's exports is allocated to traditional trade activities. Remaining employment is allocated to production for the domestic market.

Table 1 shows the employment shares for global value chains and traditional trade in the seven Latin American countries analysed. Costa Rica is the country with the highest export-related employment: this encompasses 30% of all jobs, two thirds of them in sectors integrated into global value chains. Despite having different integration strategies, Chile and Mexico also exhibit high levels of export-related employment, although traditional trade accounts for a larger share than global value chains. In the remaining countries, export-related jobs represent between 12% and 14% of total employment, with traditional trade invariably predominating.

Most foreign trade-related employment is within the export sector itself. However, each direct job generates an average of 0.7 indirect jobs. Contrary to what might be expected, given their higher content of imported inputs, sectors integrated into global value chains create proportionally more downstream

[3] The source of the household surveys is the Household Survey Data Bank (BADEHOG) of the Economic Commission for Latin America and the Caribbean (ECLAC).

[4] In the case of Colombia, it was not possible to reproduce all the two-digit categories of the International Standard Classification of Occupations, 2008 (ISCO-08) because the original data were recorded using an outdated nomenclature and at a high level of aggregation.

domestic employment than traditional sectors: the former generate 1.5 indirect domestic jobs per direct job, while the latter generate only 0.5. To better understand these overall employment outcomes, it is useful to carry out a sectoral breakdown by country, grouping employment into five macrosectors: agriculture and fishing, mining, manufacturing, traditional services and modern services. In Chile, nearly all mining jobs and close to one fifth of industrial and modern services jobs are integrated into global value chains. In Colombia, only the mining sector has a large proportion of such jobs. In Costa Rica, half of all industrial employment is tied to global value chains, especially in the electronic equipment, manufactures not elsewhere classified,[5] metal products, rubber and plastics, food industry and textile sectors. In modern services, the highest shares are in professional and administrative services, where over 30% of sectoral employment is associated with global value chains. As previously indicated, Argentina exhibits a low level of integration into global value chains, which are important only in certain industrial sectors (automobiles, chemicals and metals). Brazil's global value chain integration is concentrated in mining; in both industry and modern services, approximately 1 in 10 jobs is associated with global value chains, with a similar share tied to traditional trade. In Peru, trade-linked employment is generally low in all sectors except mining, where almost all of it is linked to global value chains. Modern financial, professional and administrative services have strong forward linkages with mining. In Mexico, international trade plays a major role across all sectors. In each sectoral grouping, at least 10% of employment is associated with global value chains. Within manufacturing, the basic metals, electronic equipment and electrical appliances, and automotive sectors are the most integrated, with over 75% of employment in activities linked to global value chains.

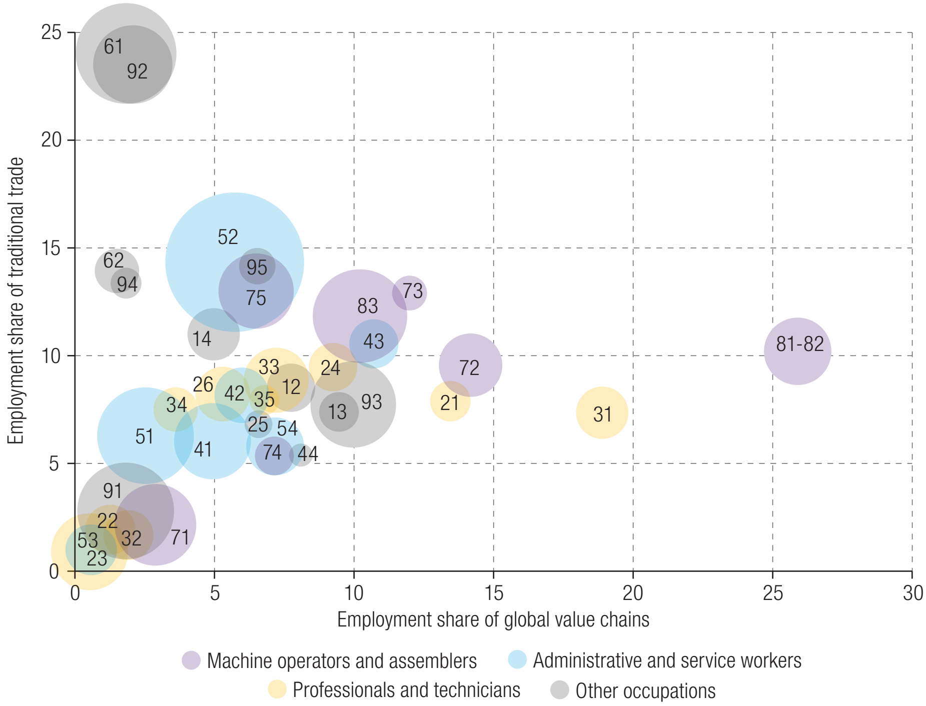
Figure 4 presents the weighted average shares of the different occupations in foreign trade for the seven countries examined. The horizontal axis represents the share of employment in each occupation associated with global value chain demand, while the vertical axis corresponds to the share linked to traditional trade. The size of each bubble represents the total employment in that occupation across the seven countries considered. Certain occupational groups stand out: machine operators and assemblers, administrative and service workers, and professionals and technicians. Barring a few exceptions, machine operators and assemblers are most exposed to trade, while administrative and service occupations in Latin America continue to have low exposure, except for those related to the tourism sector. Among professionals and technicians, only engineers (see the bubbles marked 21 and 31) have a large presence in global value chains. In other sectors, farmers (61 and 62) and agricultural labourers (92) are closely linked to traditional trade in Latin America.

Only in Argentina and Brazil do agricultural workers represent a substantial share of external demand, while mobile equipment operators show the highest incidence in both traditional trade and global value chains. In Chile and Peru, 1 in 5 mobile equipment operators and 1 in 10 administrative workers are linked to participation in global value chains. Traditional trade is also very important for farmers and elementary agriculture-related occupations in Chile. Within the professional segment, only 9% of Chilean workers are associated with global value chains. In Costa Rica, the penetration of global value chains is greater: in five of the nine occupational groups, over 20% of employment is linked to them. In Mexico, by contrast, professionals are the segment with the lowest level of participation in these chains. In Colombia, employment related to global value chains is concentrated among equipment operators and elementary occupations, although it is still limited.

The segment that includes machine and equipment operators and vehicle drivers is closely linked to high-technology manufacturing and extractive industries. In the countries with the strongest backward linkages in global value chains (Costa Rica and Mexico), machine operators account for over 40% of employment in this segment. Drivers are more associated with traditional trade owing to their linkages with the agricultural sector (see figure 5).

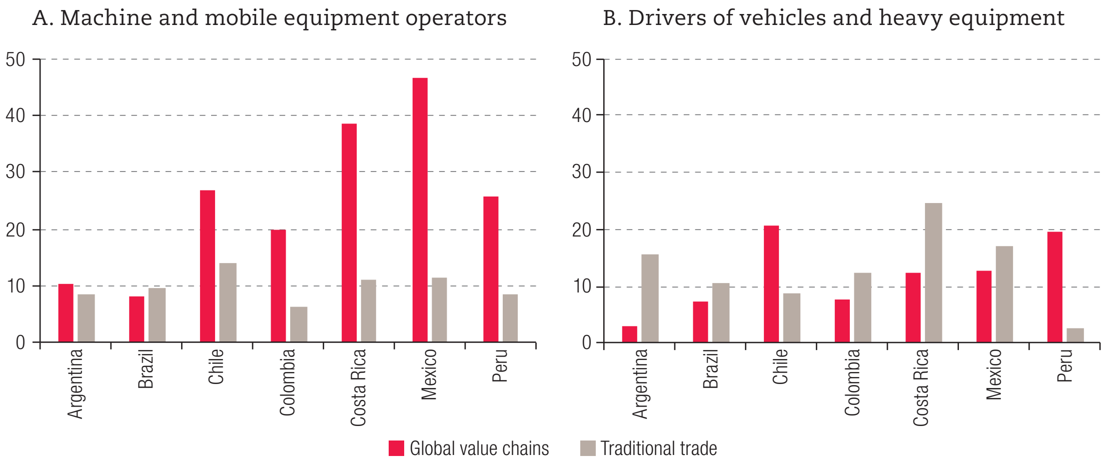
[5] Information from other sources indicates that these are mainly devices for medical use.

Figure 4
Latin America (7 countries):[a] employment shares of global value chains and traditional trade, by occupation, 2018
(Percentages of total employment)



Source: Prepared by the author.
Note: Bubbles are labelled with two-digit codes from the International Standard Classification of Occupations, 2008 (ISCO-08). The size of each bubble represents estimated total employment in that occupation.
[a] Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru.

Figure 5
Latin America (7 countries): global value chain and traditional trade shares of employment of machine and equipment operators and drivers, 2018
(Percentages)



Source: Prepared by the author.

IV. Value chain participation and employment gaps

This section explores the relationship between the degree and type of participation by sectors or countries in value chain activities and different variables that are important to inclusive employment. To this end, it analyses the co-variation of these variables of interest with the degree of participation in global value chains and in traditional trade, applying different controls as appropriate. Constructing each variable of interest required the compilation of statistics at the highest possible level of disaggregation (generally, at the two-digit level of ISIC revision 4) for as many countries as possible included in the OECD input-output matrix database. This section begins by examining the relationship between participation in value chains and women's employment. It then shows the relationship with wages, and lastly, the link between participation in global value chains and the type of occupation and task demanded.

1. Women's participation in global value chains

Manufacturing sectors are the most closely linked to global value chains and are generally more male-dominated than service sectors. It can thus be said that the Latin American countries participate in value chains within sectors where women are underrepresented. Worldwide, the sectors with the highest levels of women's employment tend to be oriented towards domestic demand. Accordingly, women's participation is negatively associated with global value chains. Peru shows the largest gap between women's participation overall and in global value chains, at 15 percentage points, while in Mexico the difference is only 3 points.

However, this finding does not clarify whether participation in global value chains leads to an increase in women's labour market participation. To answer this question, it is necessary to explore differences in their participation and sectoral exposure to global value chains, specifying an econometric model that controls for variation in women's participation across sectors and countries. The model is as follows:

$$wpr_{np} = \alpha + \beta.gcv_{np} + \gamma.trad_{np} + \delta_n + \rho_p + \epsilon_{np} \quad (3)$$

where wpr_{np} is the women's participation rate in sector n of country p; gcv_{np} and $trad_{np}$ are the share of employment in sector n of country p associated with demand induced by global value chains and traditional trade, respectively; δ_n captures sector fixed effects; ρ_p captures country fixed effects; and ε is the error term. The model was applied to all sectors and also to manufacturing sectors only, and alternative specifications to the baseline model were tested, as detailed in table 2.

Table 2
Selected countries of the world (34 countries): participation by women and participation in global value chains and traditional trade, 2018

Model	1	2	3	4	5	6
Sectors	All (44)	Manufacturing	All (44)	All (44)	Backward linkages (10)	Forward linkages (14)
Countries	All (34)	All (34)	All (34)	All (34)	All (34)	All (34)
Regressors						
Particip_gvc	0.08***	0.17***	-0.26***	0.03**	0.16***	0.15***
Particip_trad	0.07	0.10	-0.11*	0.07**	0.05	0.17*
Controls						
Sectors	Yes	Yes	No	Yes	Yes	Yes
Countries	Yes	Yes	No	Yes	Yes	Yes
Size	No	No	No	Yes	No	No
Observations	1 418	552	1 418	1 418	324	552
Variables	79	51	3	79	44	51

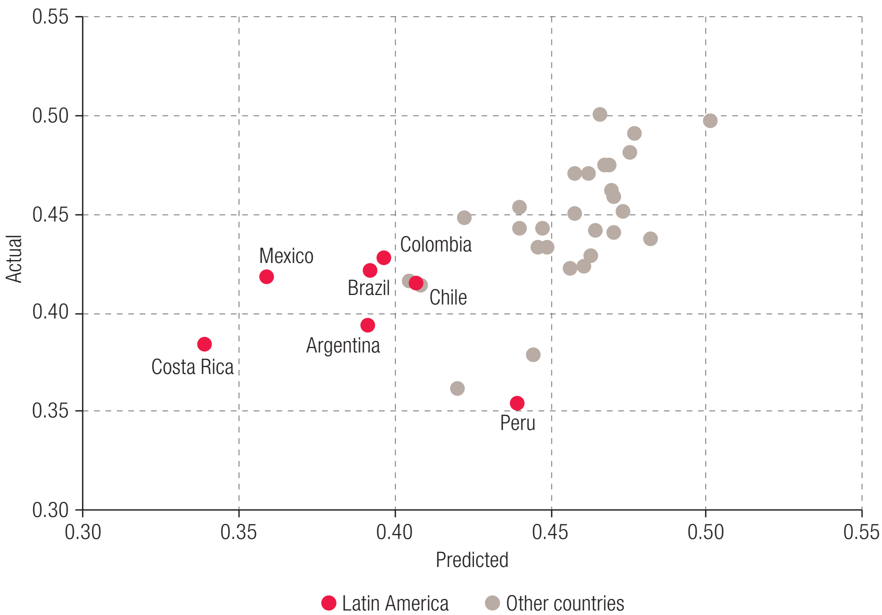
Source: Prepared by the author.
Note: *, ** and *** indicate that the t-statistic is significantly different from zero at the 90%, 95% and 99% confidence levels, respectively, while the absence of asterisks indicates that the null hypothesis of no association cannot be rejected. Model 1 corresponds to equation (3) without restrictions; model 2 restricts the analysis to manufacturing sectors only; model 3 does not control for countries or sectors; model 4 weights the results by sector size; model 5 restricts the analysis to sectors with backward linkages; and model 6 restricts it to sectors where forward linkages prevail.

Overall, the results indicate that greater participation in value chains is positively associated with women's participation, while no significant relationship is found between the participation of women and participation in traditional trade. Models 5 and 6 present the results for sectors according to their type of involvement in international trade. To this end, the 44 sectors were classified on the basis of their participation in external markets: primarily through backward linkages, forward linkages or traditional trade. Although value chain participation is concentrated in male-dominated sectors, controlling for sectoral differences reveals that women's participation is positively linked to participation in global value chains, but not in traditional trade. This finding also holds when only industrial sectors are considered and when both types of participation in global value chains are taken into account.

To determine whether the estimated model reflects the reality of Latin America, the actual participation rates of each country-sector were compared with those predicted by model 1. Overall, the correlation is 0.89 at the global level, and most Latin American countries are close to this value. However, Colombia, Costa Rica and Mexico show a lower degree of alignment. Figure 6 presents the actual women's participation rates for each country and those predicted by the model. As can be seen, participation levels are lower in Latin American countries. Moreover, in Costa Rica and Mexico (the two Latin American countries in the sample with the greatest backward linkages), the model overestimates women's participation. In other words, women's participation is considerably lower than would be expected given the level of sectoral engagement in global value chains in those countries. The opposite occurs in Peru, where the model underestimates women's participation (see figure 6).

Figure 6

Latin America (7 countries): actual and predicted rates of participation by women in global value chains, 2018



Source: Prepared by the author.

2. Value chain participation and wages

Employment data disaggregated by type of demand reveal the structural composition of employment. By combining sectoral employment data with information on average wages, it is possible to analyse the wage levels associated with each form of trade. In all the countries, wages are higher for jobs linked to global value chains than for jobs associated with domestic demand (see table 1). The largest differences are observed in Peru, followed by Mexico. Argentina, Chile and Costa Rica, which have higher per capita incomes, register differences of less than 10%. When wages associated with traditional trade are compared, the pattern is reversed, with these jobs paying lower wages in almost all the countries.

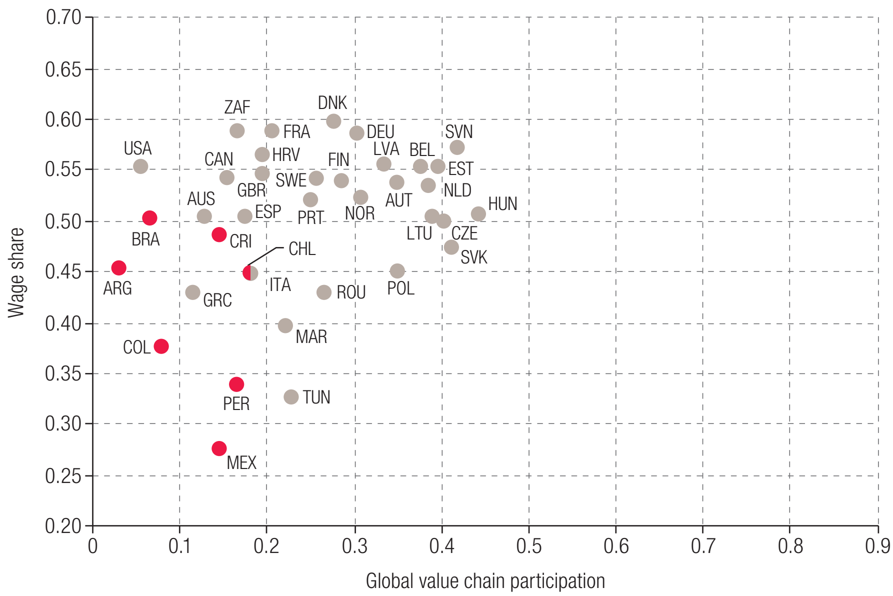
Nevertheless, after controlling for sector and country, no association is observed between the degree of participation and the national average wage across the large panel of countries analysed. In other words, jobs in sectors that are more integrated into global value chains pay higher wages than the others, but this reflects a structural effect rather than necessarily a causal impact of chain participation on wages.

The literature on value chains has not reached a consensus on the relationship between greater participation in chains and the wage share in value added, although Riccio et al. (2023) suggest that fragmentation reduces the employment share. Naturally, a country's institutional arrangements and the relative weight of different sectoral structures are more significant in determining the value structure of sectors than the degree of international trade penetration, whether in value chains or otherwise.

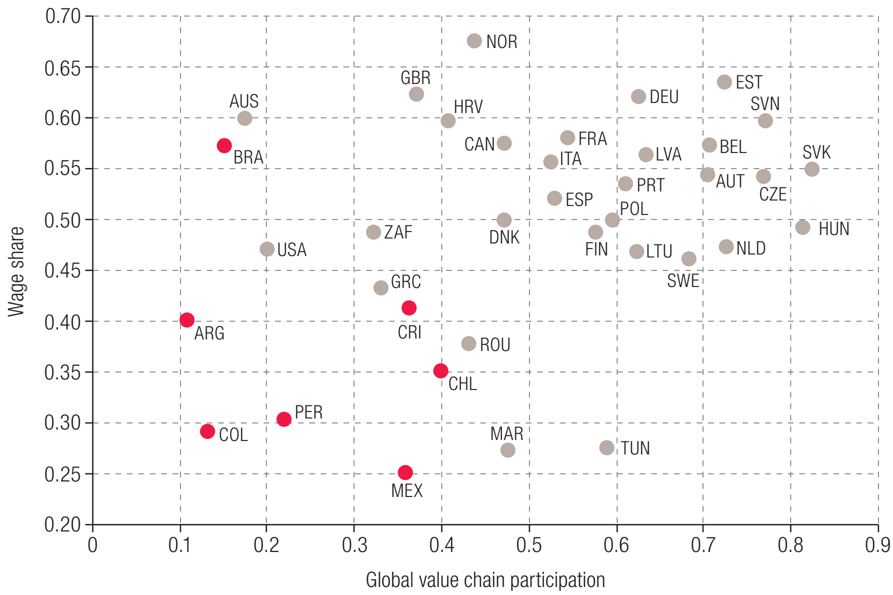
To examine the (static) relationship between value chain participation and the wage share, data were generated on the wage share in gross value added for the Latin American countries analysed and for most of the countries included in the OECD input-output matrix. Asian countries were excluded owing to the lack of data for the region's two largest economies (China and Japan). Including data from countries outside Latin America strengthens the analysis and provides a benchmark for interpreting the Latin American results. Most of the countries included are European. A database was constructed with wage shares and sectoral ratios for the gross value added shares of global value chain trade and traditional trade, covering 37 countries and 44 sectors. Figure 7 presents the overall results. Comparatively, the Latin American countries combine low participation rates with low wage shares, both for the economy as a whole and for the manufacturing sector. Figure 7 also shows a widening gap between Latin America and other regions in manufacturing, with the exception of Brazil.

Figure 7
Selected countries: global value chain participation and wage shares, 2018

A. All sectors



B. Manufacturing sectors



Source: Prepared by the author.

Assessing the relationship between participation in global value chains (or in traditional trade) and the wage share requires differences between sectors (which have different production functions) and between countries (which have different institutions) to be controlled for. To this end, a linear regression including participation in global value chains and in traditional trade, together with sectoral and country effects, was generated to explain the wage share:

$$ws_{np} = \alpha + \beta.gvc_{np} + \gamma.trad_{np} + \delta_n + \rho_p + \epsilon_{np} \tag{4}$$

where ws_{np} is the wage share (including employer contributions) in the gross value added of sector n in country p, and the remaining variables are as previously defined.

Table 3 presents the results.

Table 3
Results of the regression model linking global value chain participation and the wage share, 2018

Model	1	2	3
Sectors	All	Manufacturing	Non-manufacturing
Regressors			
Particip_gvc	-0.04	-0.11***	0.00
Particip_trad	-0.12***	-0.28***	-0.08
Controls			
Sectors	Yes	Yes	Yes
Countries	Yes	Yes	Yes

Source: Prepared by the author.
Note: *** indicates that the t-statistic differs significantly from zero at the 99% confidence level; the absence of asterisks indicates that the null hypothesis of no association cannot be rejected.

The most reliable model is the one focusing exclusively on manufacturing, as this is the sector where international competition associated with labour costs is most evident. The results show that, controlling for sectoral and country effects, greater participation in value chains is associated with a lower wage share. At the same time, this negative relationship is also evident (and even more pronounced) in traditional trade. Overall, exposure to trade is associated with a lower wage share.

With regard to Latin America, the model provides a good estimate of the wage share for all countries except Mexico, where predicted values differ from the actual ones in several sectors. In particular, the model predicts much higher wage shares in the basic metals and automotive sectors, which have a high level of participation in global value chains, although it also does for the food industry, which has only very limited participation in such chains.

3. Global value chain participation and occupational categories by routine task content

The previous section examined which types of jobs in Latin America were most closely associated with value chains and found that machine operators and assemblers had by far the greatest exposure. This finding held regardless of whether the dominant mode of integration was backward (as in Costa Rica and Mexico) or forward (as in Chile and Peru). Professionals were the occupational category with the lowest level of participation in global value chains.

This section examines the relationship between participation in value chains and the prevalence of certain occupational categories, with the aim of determining whether, after controlling for sector- and country-specific structural factors, participation in value chains is associated with the prevalence of certain categories. To this end, a model similar to that used in the previous sections was constructed:

$$share\_occup_{i\_np} = \alpha + \beta . gvc_{np} + \gamma . trad_{np} + \delta_n + \rho_p + \epsilon_{np} \quad (5)$$

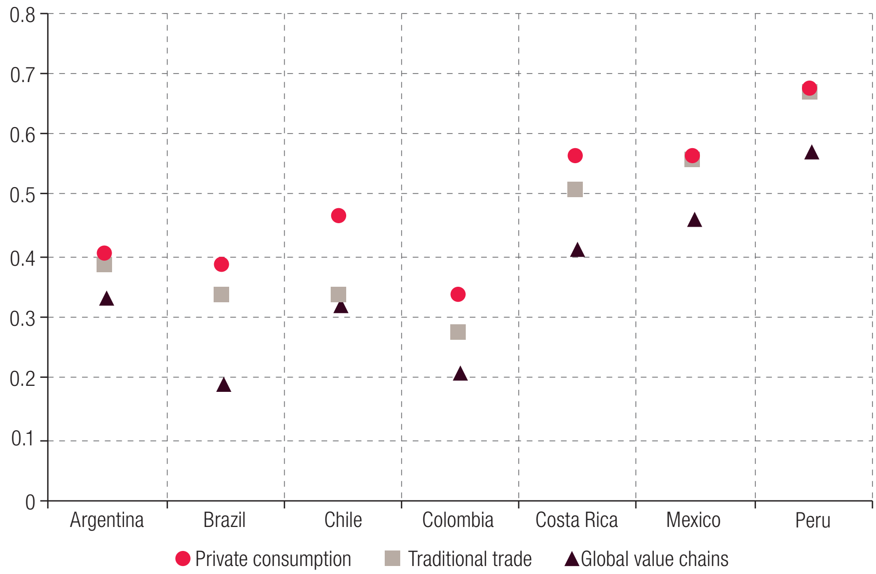
where $share\_occup_{i\_np}$ represents the share of occupation i (defined at the one-digit level of ISCO-08) in the employment of sector n in country p, and the other variables are as previously defined.

For nearly all the occupational categories considered, no association was found between participation in global value chains or traditional trade and the share of that category. The sole exceptions were, once again, plant and machine operators and assemblers (category 8), for whom a positive and statistically significant association (at the 95% confidence level) was observed for participation in both global value chains and in traditional trade. This suggests that, depending on the sector, countries that are more exposed to trade (of either type) have a higher proportion of such workers. This positive relationship does not hold when the sample is restricted to the seven Latin American countries analysed.

The literature on offshoring generally indicates that technological change biased towards routine tasks has been gaining importance and that, unlike technological change biased towards cognitive activities, it leads to polarization in the countries experiencing it (Acemoglu and Autor, 2011; Goos et al., 2014). However, robotization and the substitution of routine jobs have not yet had major impacts in developing countries (Martins-Neto et al., 2024). The benchmark studies measuring the routine content of occupations were based on data from the United States (Acemoglu and Autor, 2011), but there is growing evidence that the same occupational category may require different skill sets depending on a country's level of development. Lewandowski, Park and Schotte (2023) analyse differing patterns in the evolution of routine task content across a sample of developed and developing countries by constructing a database that combines various standardized surveys and developing a routine task intensity classification for more than 87 countries, at the ISCO-08 two-digit level.

Using the classification developed by Lewandowski, Park and Schotte (2023), this section examines the routine task content of total employment and of jobs generated by global value chains, traditional trade and private consumption (see figure 8). Costa Rica, Mexico and Peru display the highest average values. On average, jobs associated with global value chains are less routine-intensive than those generated by household private consumption demand, suggesting that participation in global value chains is not significantly increasing the demand for routine-intensive labour. At the same time, with the exception of Peru, jobs associated with traditional trade have a higher routine task component than those linked to domestic private consumption. The differences between these two modes of international engagement (global value chains and traditional trade) are most pronounced in Brazil and Chile.

Figure 8
Latin America and the Caribbean (7 countries): index of routine task intensity of employment by associated demand type



Source: Prepared by the author, on the basis of Lewandowski, P., Park, A. and Schotte, S. (2023). Global divergence in the de-routinization of jobs. *ADB Economics Working Paper Series* (683). Asian Development Bank, and the author's own data.

To better interpret the results, it is important to consider differences in the routine task content of employment across occupational categories and across countries. Differences in the degree of routine task intensity between the Latin American countries analysed are not substantial, although Peru exhibits higher index values for almost all occupational categories. In the case of managers, professionals, service workers and elementary occupations, the degree of routine task intensity in Latin American countries is similar to that of countries such as Czechia, Germany and the United States. In the machine operator and plant operator categories, the degree of routine task intensity is lower in the Latin American countries analysed, particularly those with the lowest participation in global value chains, namely Argentina, Brazil and Colombia. Developed countries display a higher degree of routine task intensity than Latin America in administrative occupations and a lower degree in farming.

A more comprehensive assessment of the relationship between participation in value chains and routine task intensity requires differences in participation levels between countries and occupations to be controlled for. To that end, the following linear regression with fixed effects was estimated:

$$rout_{op} = \alpha + \beta.gvc_{op} + \gamma.trad_{op} + \delta_o + \rho_p + \epsilon_{op} \quad (6)$$

where $rout_{op}$ is the routine task intensity index of occupation o (at the ISCO-08 two-digit level) in country p (Lewandowski, Park y Schotte, 2023); gvc_{op} and $trad_{op}$ are the shares of employment in occupation o in country p associated with demand induced by global value chains and by traditional trade, respectively; δ_o captures occupation fixed effects; ρ_p captures country fixed effects; and ε is the error term. The model was applied to the seven Latin American countries under study, as comparable indicators of trade participation by occupation at the two-digit level are not available for the other countries[6] (see table 4).

Table 4
Latin America (7 countries): regression results for routine task intensity and participation in world trade, by type of participation

Model	1
Sectors	All
Countries	Latin America (7)
Regressors	
Partic_gvc	0.30***
Partic_trad	0.06
Controls	
Sectors	Yes
Countries	Yes
Observations	264
Variables	46

Source: Prepared by the author.
Note: *** indicates that the t-statistic differs significantly from zero at the 99% confidence level; the absence of asterisks indicates that the null hypothesis of no association cannot be rejected.

In sum, although the jobs involved in global value chains might be less routine-intensive on average than other types of employment, greater participation in global value chains is positively associated with higher routine task intensity once sector and occupation are controlled for. This finding is consistent with other studies showing that, given the mode of participation of the Latin American countries analysed, integration into global value chains tends to generate demand for standardized tasks. By contrast, participation in traditional trade is not associated with higher routine task intensity.

V. Conclusions

The literature addressing the effects of global value chain participation on employment has yet to establish a set of stylized facts. Obtaining results remains difficult owing, among other factors, to the wide range of possible approaches for measuring participation in value chains in distinction to traditional trade. This is compounded by the very nature of production fragmentation, which gives rise to a wide variety of modalities that make it difficult to straightforwardly identify the role of each country in a given sector or chain. In general, the field of value chain metrics has been linked with offshoring models to explain the effects of value chain participation on labour markets, without this yet having produced a robust set of testable predictions. The growing use of matched employer-employee data, which makes it possible to differentiate intra-firm effects and reallocations within occupations and to track employment trajectories, still faces challenges regarding the external validity of results, limiting its application for regional political economy analysis. Studies that combine a larger number of countries, longer time

[6] These indicators are derived from a detailed analysis of household surveys, and there are no comprehensive databases linking sectors and occupations at this level.

series, greater sectoral disaggregation and variables that accurately capture participation modalities are likely to yield more robust findings. Nevertheless, some important aspects of value chains, such as governance, generally cannot be incorporated into the results.

The present study contributes methodological approaches for measuring the degree of participation in global value chains in distinction to traditional trade, and for differentiating the results of backward and forward integration. By applying this methodology to widely used multi-country input-output matrices, the study provides a standardized description of both the modality and degree of value chain participation in trade and in the level of activity, employment and occupation type for seven Latin American countries. To assess the effects of participation on labour market-related variables, the analysis incorporates indicators capturing gender, wages, occupational category and routine task intensity. Empirical tests were designed to cover as many countries as possible, and both the general results and model fit are analysed for the Latin American countries under study.

The Latin American countries analysed exhibit a great variety of modalities and degrees of participation. In Chile and Peru, global value chains are prevalent in trade because of forward linkages in their mining sectors and account for a very large share of value added, although their impact on employment is more limited. In Costa Rica and Mexico, features typical of backward linkages also tend to dominate international trade, while also having a great impact on employment. In Costa Rica, participation is more sectorally diverse, as it also extends to services. In comparison, the penetration of global value chains (and trade in general) in Argentina, Brazil and Colombia is very low.

Several key findings emerge from the econometric exercises. At the global level, higher participation in value chains is associated with a larger share of women's employment, perhaps reflecting the observed tendency of global value chains to demand more routine-intensive tasks, which are more often performed by women. However, in Mexico and Costa Rica, the Latin American countries with the greatest penetration of global value chains in the labour market, the actual share of women's employment is lower than the predicted share.

Although wages in sectors integrated into global value chains are higher than average, no association was found between the degree of participation and higher wage levels. Indeed, a global panel revealed a negative relationship between value chain participation and the wage share, which can be explained by the fact that offshoring labour also involves offshoring other value-generating assets. If these assets, whether physical or intangible, are valued at their price in the investing countries, their share in the composition of value may increase relative to labour, which is valued at its price in the receiving countries, thereby compressing the wage share.

Lastly, the occupational categories of stationary and mobile equipment operators appear to be the only ones that have an association with the degree of participation, in that the share of such employment is positively correlated with participation in global value chains. In Latin America, a distinctive pattern emerges: the size of this employment segment grows with global value chain participation, regardless of whether the modality is forward (typical of Chile and Peru) or backward (typical of Costa Rica and Mexico). This is noteworthy given that the sectors involved in each modality are different.

Over the course of this paper, the participation of sectors (and occupational categories) in global value chains has been measured, and the domestic linkages of exporting sectors have been examined. In all the models, participation in global value chains has been distinguished from participation in traditional trade. The results presented are for the variables capturing trade in global value chains, but it needs to be said that, with some exceptions, no significant associations have been found for traditional trade. This reinforces the idea that the employment patterns linked to global value chains have distinctive characteristics compared to those associated with traditional trade, which in turn do not differ greatly from those linked to domestic demand.

Lastly, some limitations of the analysis should be noted. First, it would be useful to include smaller Latin American economies, as an appropriate global value chain integration strategy is likely to have a greater impact in these countries than in large or medium-sized ones. This study prioritized the use of databases with greater sectoral disaggregation at the price of representing fewer countries, the reason being that since input-output analysis uses the country-sector as its minimum unit of analysis and therefore does not capture firm-level heterogeneity, greater sectoral disaggregation helps to reduce the bias that results from assuming homogeneity. In addition, the variables constructed for the global panels (gender, wage share and occupational categories) lack information for several countries, which may be biasing the results. In particular, Asian countries, characterized by both the diversity and the depth of their participation, are underrepresented.

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Annex A1

Table A1.1
Classifications and correspondences

Country	Economic activity sector		Main occupation	
	Classification	Standardization method	Classification	Correspondence table
Argentina	Classification of Economic Activities for Sociodemographic Surveys (CAES) of the Southern Common Market (MERCOSUR)	Correspondence between CAES and revision 4 of the International Standard Industrial Classification of All Economic Activities (ISIC)	National Classification of Occupations (CNO), 2001 version	CNO – International Standard Classification of Occupations 1988 (ISCO-88) – ISCO-08
Brazil	National Classification of Household Economic Activities (CNAE-Domiciliar) 2.0	Correspondence between CNAE-Domiciliar and National Classification of Economic Activities (CNAE) 2.0, and between CNAE and ISIC revision 4	Classification of Occupations for Household Surveys (COD)	COD – ISCO-08
Chile	Classification based on ISIC revision 3	Correspondence between ISIC revision 3 and ISIC revision 4	Classification based on ISCO-88	ISCO-88 – ISCO-08
Costa Rica	Classification based on ISIC revision 4	---	ISCO-08	---
Colombia	Classification based on ISIC revision 3	Correspondence between ISIC revision 3 and ISIC revision 4	Unique Classification of Occupations for Colombia (CUOC) (based on ISCO-68)	Brazilian Classification of Occupations (CBO) 94– CBO 2002 (Brazil); CBO 2002 – ISCO-88; ISCO-88 – ISCO-08
Mexico	Catalogue of Economic Activities (based on the North American Industry Classification System [NAICS] 2007)	Correspondence between NAICS 2007 and ISIC revision 4	National System of Classification of Occupations (SINCO) 2011	SINCO 2011 – ISCO-08
Peru	Classification based on ISIC revision 3	Correspondence between ISIC revision 3 and ISIC revision 4	Occupational Code of 1995	Occupational Code of 1995– National Classification of Occupations 2015, and the latter with ISCO-08

Source: Prepared by the author.