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Global value chain analysis of the automotive and garment sectors: A study of Germany, Spain, Romania, Indonesia and Mexico for 2000-2014

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▶ Abstract

Since the end of the last century, there has been an increasing trend of production fragmentation. Although all manufacturing sectors have become globalised to some degree, the case of automotive and garment stand out. This report analyses the trends in employment, value-added and functional income distribution of the automotive and garment supply chains of Germany, Spain, Romania, Indonesia and Mexico for 2000-2014. It also focuses on the spatial and sectoral distribution of these variables. The empirical framework for the analysis is the multiregional input-output model. The data employed comes from the World Input-Output Database, Release 2016. The heterogeneity of the selected producer countries allows to provide a rich picture of the alternative organisations of global supply chains across different regions.

Keywords: automotive, garment, production fragmentation, automation, employment, value-added.

JEL: F60, D33, D57

▶ Introduction

Since the end of the last century, there has been increasing financial and commercial integration among countries. Production fragmentation, defined as "the cross-border dispersion of component production/assembly within vertically integrated production processes" (Athukorala, 2005, p. 2), has changed the world's production landscape. There is an ongoing discussion about the drivers of this phenomenon and its implications for employment and value-added generation and distribution.

Among the most globalised manufacturing sectors, the cases of automotive and garment sectors stand out. These sectors have been pioneers in the trend of internationalisation and have captured the attention of the specialised literature. For example, Dicken (2015) focuses on these two manufacturing sectors when discussing case studies of internationalisation in his widely acclaimed and cited *Global Shift*. These sectors are also the usual cases to distinguish between buyer-driven (garment) and producer-driven (automotive) global value chains.

Although all sectors become "globalised" to some degree, technology and institutions may have a different effect and lead to alternative supply chain organisations. This report focuses on the automotive and garment supply chains of five diverse countries to grasp potential differences. We consider the cases of Germany, Spain, Romania, Indonesia and Mexico and analyse the trends in employment, value-added and functional income distribution for 2000-2014. We also focus on the regional and sectoral distribution of these variables along the chains.

After this brief introduction, Section 1 provides a review of the relevant literature. Section 2 presents the methodology of the study. The empirical framework is the multiregional input-output model. The data employed comes from the World Input-Output Database, Release 2016. Section 3 provides an initial overview of the final exports and output trends of the selected case studies. Section 4 proceeds to analyse in-depth the trends in employment, value-added, functional income distribution of the automotive sector. Section 5 performs the same analysis for the garment sector. Section 6 provides some concluding remarks.

▶ 1. Literature review

Drivers of production fragmentation

The global production landscape has changed in recent decades. Supply chains, especially manufacturing, now involve multiple firms geographically dispersed that produce different components of a good or service and operate in a highly coordinated way and increasingly through market exchanges.

Underlying this process is the change in multinational enterprises business strategy (Dunning, 1988). For some time now, large multinationals have outsourced the production of intermediate inputs to—but not exclusively—foreign suppliers or/and relocated in other countries production stages previously integrated. Many scholars refer to this phenomenon as "production fragmentation". In other words, the change in the business strategy by multinational enterprises has led to the formation of genuinely global supply chains.

The literature identifies several factors that have made possible production fragmentation. The most featured is technical change. In the case of transportation technologies, the development of jet aircraft and containerisation reduced shipping costs (Hummels, 2007). However, lowering natural barriers can lead to higher trade volumes (in finished goods) but not necessarily to reorganising supply chains (higher trade of intermediates). More relevant for production fragmentation was the progress in information and communication technologies based on satellites and optic fibre, which improved the speed and capacity of information transmission (Dicken, 2015). These innovations facilitated the coordination of geographically dispersed production stages. They enabled what Baldwin (2013) refers to as "globalisation's second unbundling".

In addition to these innovations, a general trade liberalisation trend that started in the 1980s partially reduced some of the usual "artificial" trade barriers. Within this trend, the creation of the WTO in the mid-1990s and its efforts to promote broader multilateral agreements stands out (Amador & Cabral, 2016). Additionally, regional and bilateral trade and investment agreements boomed during the 1990s. Finally, there was a general unilateral tariff reduction, especially in large developing countries like India and China (Milberg & Winkler, 2013).

The entry of new economies into the global marketplace also opened opportunities for production fragmentation. Although the mechanism is not entirely precise, the transition of former socialist republics in Europe, the capitalist turn of China, and the opening of India made available a vast, cheaper labour supply for multinational enterprises (Hillberry, 2011; Milberg & Winkler, 2013).

Another factor was the development of an international capital market. Domestic financial deregulation during the 1980s and the expansion of global finance facilitated capital movements among countries (Fröbel et al., 1977). Thus, it became easier for firms to shift their resources abroad to get a higher return rate. According to Milberg (2008), increasing financialisation also stimulated production fragmentation. Firms reduce production costs by importing cheaper inputs from abroad and employ the profits to increase shareholders returns.

Besides the improvements in connective technologies, there has been an innovation spur in manufacturing technologies, known as automation. These technologies consist of the introduction of electronic control mechanisms into productive equipment.[1] Such advancements have implied a step forward in replacing human labour for machines because they also entail "the displacement of some decision-making capabilities of the operator by providing adaptable feedback control" (Alcorta, 1994, p. 148).[2]

These new technologies have emerged in concomitance to new organisational innovations such as cellular manufacturing, group technology, just-in-time production, and total quality management. An essential feature is the flexibility that they introduce in the production process. The new technologies have a greater capacity to produce a wider variety of products, adjust output proportions and alter the product mix or modify the quality of existing ones.

One of the effects of these technologies is the shortening of the learning process. Machines are far less and more similar and embody a great deal of knowledge. The production process flows in a much more orderly manner, thereby reducing

[1] The new equipment includes computer numerical control machine tools, industrial robots, computer-aided design/manufacturing, automated guided vehicles, and the combination of these into computer-integrated manufacturing and flexible manufacturing systems (see Alcorta, 1994).

[2] See Anzolin (2021) for a literature review about the employment effects of automation, focusing on automotive and garment sectors.

the overall complexity of the production process. A shorter learning period allows obtaining more easily best practice standards. This change can benefit firms from developing countries, which previously had longer learning curves. It also favours foreign technology transfer and relocation of production into developing countries where local demand is large or transnational have already established bases (Alcorta, 1999).

For Fröbel et al. (1977), the new technologies were a critical condition for production fragmentation. Since the mastery of the novel equipment requires less training period and a basic skill set, it allows the replacement of more trained and better-paid workers from developed countries by workers from developing countries who accept lower wages and can be trained quickly.

Assuming new technologies have a lower learning curve and smooth best practice standards across firms and industries, wage differences become increasingly relevant in deciding the production location, at least of manufacturing activities, especially in industries with higher labour costs. This fact triggered concerns in all nations, especially developed, concerning their competitiveness. Therefore, many developed countries have attempted to reform their labour markets and avoid job losses due to increasing international competition. According to Garbellini (2021), the reforms also seek to debilitate employees' and unions' claims on the production flows operating parameters and establish more intensive work rhythms compatible with the new technologies.

Global value chain studies of the automotive industry

There have been several attempts to grasp the dynamics of production fragmentation in different industries. Among these, the global value chains (GVC henceforth) stands out. This theoretical framework analyses the interaction among geographically dispersed firms and the distribution of labour and value-added within a supply chain.

The GVC framework roughly distinguishes between producer-driven and buyer-driven chain governance (Gereffi, 1999). Producer-driven chains usually dominate in industries with high technological and capital requirements, where capital and proprietary know-how constitute the main entry barriers (e.g., automotive, aircraft and electronics). In these chains, leading firms tend to keep control of capital-intensive operations and sub-contract more labour-intensive tasks, often in the form of vertically integrated networks. Buyer-driven chains are found generally in more labour-intensive sectors, where information costs, product design, advertising and advanced supply management systems set entry barriers (e.g., clothing and footwear). Lead firms usually outsource production functions and concentrate on branding, design and marketing.

The framework also examines how subsidiary firms, usually from low-income countries, can upgrade within a global value chain. To this end, it distinguishes three elementary forms of upgrading: product upgrading (improving its quality or design), process upgrading (improvements in efficiency and productivity) and task upgrading (perform more complex tasks) (Gereffi et al., 2001).

The GVC approach has spawned a vast body of studies on specific value chains. The automotive industry is a classic illustration of a producer-driven chain. According to Sturgeon and Florida (2004), the automotive value chain presents a hierarchical structure; large carmakers control the production process from initial stages, such as design, to final stages, such as assembly. Below are the first-tier suppliers that produce complete subsystems by cooperating with an extensive network of low-tier suppliers and subcontractors. Carmakers and first-tier suppliers developed close relations as the latter gradually assumed more responsibilities in the production process. Thus, these suppliers have increasingly developed into global suppliers.

Sturgeon et al. (2009) identify four distinctive features of the automotive industry. First, the market structure is highly concentrated; eleven firms from Japan, Germany and the United States dominate production in the primary markets.[3] Second, the assembly of vehicles and parts production has been kept close to end markets. Third, as a consequence of the previous feature, automotive production presents a solid regional structure. Fourth and last, parts and subsystems of car models are very customised and, therefore, cannot be used in other end products.

Since the 1990s, the automotive industry began a process of spatial reconfiguration in two directions (Pavlínek et al., 2009). The first was developing regional production systems by integrating peripheral areas into the supply chains of Central Europe and North America. The main drivers behind this integration were lower production costs and geographical proximity. Additionally, these peripheral areas record lower per capita car ownership and thus potential demand growth.

[3] For a description of the consolidation process in the automotive industry, see Wong (2018, Chapter 2).

The second was rapid automotive manufacturing growth in developing countries not necessarily integrated into core supply chains, such as China, India and Brazil.

Sturgeon, Biesebroeck and Gereffi (2008) also highlight the role of political pressures and technical reasons behind both trends. For these reasons, automotive value chains are neither fully global nor tied to national or specific local borders.[4] In a related article, Sturgeon and Biesebroeck (2011) claim that the global integration process has advanced more at the level of carmakers-suppliers relationships. Production tends to be organised regionally or nationally. Bulky and heavy auto parts productions are close to assembly plants to guarantee timely delivery (e.g., engines, transmission, car seat production). Instead, lighter and generic parts are located more distantly to take advantage of scale economies and lower labour costs. As a result, these regional production clusters "are "nested" within global organisational structures and business relations of lead firms" (Sturgeon & Biesebroeck, 2011, p. 184).

According to Jürgens and Krzywdzinski (2009), relocating plants to the periphery of the main markets has allowed the import of components at lower costs, thereby increasing major carmakers international competitiveness. Pavlínek (2020) also comments that the increasing internationalisation of Central European automotive supply chains leads to an uneven geographical jobs creation and losses within Europe.

Heneric et al. (2005) provide a detailed overview of the European automotive industry. The authors provide sectoral data of employment and value-added for 1999-2002. They also perform an analysis of the forward and backward linkages of the German automotive industry based on a national input-output model. Finally, they assess the position of Europe in global markets.

Studies of the automotive value chain also suggest that different strategies of internationalisation of the automotive industry may affect export performance. Chiappini (2012) provides a comparative analysis of the internationalisation process of the German, French and Italian automotive industries. The author distinguishes between two broad strategies: production fragmentation and offshoring. The first consists of outsourcing upstream stages, buying inputs from foreign suppliers, and exporting the finished product from the home country. The second consists of moving the final production stages to foreign countries. According to Chiappini, the main difference in export performance between German and French carmakers is that the former followed the first strategy, while the latter the second.

Global value chain studies of the garment industry

The GVC framework has also focused extensively on the garment industry. Given its low entry barriers, garment production was among the first to take on a global dimension. As Dicken (2015, Chapter 14) comments, it is one of the few global value chains prevalent and relevant in many developing countries. Indeed, since the 1970s, outsourcing manufacturing activities to developing countries has increased exponentially. However, the industry continues to be also an essential source of jobs in developed countries.

The garment value chain is buyer-driven, led by large multinational companies (retailers, brand marketers and brand manufacturers) primarily based in developed countries. These companies have the power and resources to coordinate all suppliers within the production chain. In a landmark analysis, Gereffi (1994) explains how the power asymmetry between multinationals and the rest of the firms contributes to understanding the spatial task division within the global value chain. The industry's global buyers decide what to produce, where and by whom, and their market power strongly influences the price paid for inputs. They are in charge of research and development and offshore production functions to other companies or their filières, usually located in developing countries, mainly due to lower labour costs.

Gereffi and Memedovic (2003) discuss the general organisation of the garment value chain. According to the authors, the industry contains five main parts. First, the supply of raw material that consists mainly of synthetic and natural fibres. Second, the provision of components such as yarn and fabrics manufactured by textile companies. Third, production networks, composed of garment factories, including domestic and overseas subcontractors. Fourth, export channels, established by trading intermediaries. And, fifth, marketing networks at the retail level. Within these segments, lead companies perform the following functions: research and development, design, marketing and services (Gereffi & Frederick, 2010).

Naturally, upgrading possibilities are related to firms' ability to take on the abovementioned functions (cf. Schmitz, 2006). In turn, this possibility is strongly conditioned by their capacity to develop a network supplier within their country and their closeness to larger markets. Broadly, one can find two broad production systems in the garment industry: assembly

[4] The authors also claim that the automotive industry is neither fully global nor tied to nation-states or specific localities.

and original equipment manufacturing (OEM). As Bair and Gereffi (2003) comment, the typical case of upgrading within the value chain is moving from assembly to OEM,[5] where contract manufacturers provide a complete bundle of services, including sourcing raw inputs, production activities, quality control and logistics.

In 2005, the garment industry entered a new phase. The multi-fibre agreement (MFA henceforth), which regulated international trade in the industry, ceased to exist. The MFA established import quotas from developing countries, limiting their export capacity.[6] As Staritz (2011, Chapter 2) comments, the purpose of the MFA was to protect major import markets such as Europe, the United States and Canada from increasing foreign competition while restructuring their local industries. However, the quota system allowed a higher number of developing countries to establish a segment of the garment industry. The system allowed manufacturers, primarily from Asia, to set up clothing production or source in the countries that did not use their entire quota.

The phaseout of the MFA reshaped the global production landscape, leading to increased output concentration in Asian countries (Alam et al., 2019; Gereffi & Frederick, 2010). Increasing liberalisation gives international buyers a more substantial contracting power when choosing their suppliers and subcontractors. Therefore, price competitiveness is increasingly relevant. This may lead to growing competition among developing countries in terms of lower wages. However, according to Athukorala and Ekanaye (2018), buyers can also demand product quality, variety and timely delivery. Alam et al. (2019) thoroughly review the most relevant determinants affecting garment exports in post-MFA.

Recently, a discussion has emerged about the prospects for reshoring or nearshoring production back towards high-income countries in the garment industry. Kucera (2020) stands out rising labour costs in many developing countries as the main reason. Indeed, the development of new automation technologies (such as automatic sewing and 3D printing) in the industry may overcome the competitive advantage of low-wage countries. However, based on interviews with representatives from lead firms within garment GVCs, Bárcia de Mattos et al. (2021) conclude that automation and reshoring are long-term endeavours and pose mild threats to the labour-intensive production model.

Input-Output analyses of production fragmentation

The increasing availability of multiregional input-output tables has enabled the use of interindustry analysis to study value chains. The initial empirical analyses were devoted to assessing the degree of production fragmentation of different industries. Such endeavour led to the development of alternative indicators to measure value-added flows between countries.

Stehrer (2013) distinguishes between two relevant concepts. The first is “value-added exports”, developed by Johnson and Noguera (2012), which measures a country’s value-added activated by final foreign demand. The second is the “value-added content in trade”, which decomposes the value of a country’s gross exports into domestic and foreign value-added. Arto, Dietzenbacher and Rueda Cantuche (2019) develop a methodology that integrates all relevant indicators.

De Backer and Miroudot (2014) provide a brief analysis of the automotive value chain based on indicators derived from the “value-added content in trade” approach.[7] The authors perform a comparison of several indicators, such as the import content of exports, the GVC participation index and the average propagation length of the automotive industry across a large set of countries.

Timmer et al. (2013) developed an indicator called “global value chain income”. This measure permits the decomposition of the value of a final product into the value-added by each country involved in its production process. Value-added accrues as income to labour and capital residing in the country. This approach presents two key advantages. Firstly, it avoids the so-called double-counting problem. Secondly, it allows tracking the domestic income activated in any country and sector by a specific final product. Based on this approach, the authors provide a brief analysis of the German automotive industry.

In a related article, Timmer et al. (2015) provide empirical evidence of the industry’s simultaneous trend toward regionalisation and globalization. The authors find that most European automotive chains activate most of the value-added within Europe. However, the share of foreign (extra-regional) value-added is increasing. Finally, the authors provide

[5] In this case, contract manufacturers provide a complete bundle of services, from sourcing raw material, production activities, quality control, and logistics.

[6] Cf. Alam et al. (2019) for a review.

[7] To the best of our knowledge, there are no multiregional input-output analyses that focus exclusively on the garment industry. Therefore, we will only provide a review of works that deal with the automotive industry.

a succinct analysis of the trend in the income shares in the final output of global automotive production, considering all countries. The analysis shows that the share accruing to capital has increased during 1995-2009.

Fana and Villani (2021) and Sangalli (2020) are other notable papers based on this methodology. Fana and Villani analyse the trends on employment, value-added and functional income distribution of the automotive supply chains of Germany, France, the United Kingdom and Italy for the period 2000-2014. Additionally, the authors analyse the occupational composition of the employment within the chain. On the other hand, Sangalli provides a detailed analysis of the linkages between German carmakers and European suppliers in producing motor vehicles and their intensity. The ultimate purpose is to assess the countries' vulnerability to shocks from Germany's automotive production.

▶ 2. Methodology

The empirical framework for the analysis is the multiregional input-output accounting system. An input-output table is a double-entry table that records transactions (specifically, sales and purchases) between sectors of an economy, usually a country, for productive purposes. A multiregional input-output table extends this procedure to consider many regions within the economy. A global input-output table takes the world as the national unit and countries as the subnational units.

Figure 1 presents an example of a global input-output table with G countries and N sectors. That means that it presents information on $G \times N$ *geo-localised industries*. The table has three relevant blocks. The block of intermediate deliveries, the block of final sales and the vector of value-added.

Figure 1. A global input-output table

	Intermediates use			Final demand			Total output
	Country 1	[...]	Country G	Country 1	[...]	Country G	
Country 1	Z^{11}	⋯	Z^{1G}	f^{11}	⋯	f^{1G}	x^1
[...]	⋮	⋱	⋮	⋮	⋱	⋮	⋮
Country G	Z^{G1}	⋯	Z^{GG}	f^{G1}	⋯	f^{GG}	x^G
Value-added	$(v^1)'$	⋯	$(v^G)'$				
Total output	$(x^1)'$	⋯	$(x^G)'$				

Source: Own elaboration.

An element Z^{rs} within the intermediates use block is a $N \times N$ matrix of intermediate deliveries from country r to country s. In turn, its element z_{ij}^{rs} represents the sales from sector i located in country r to sector j located in country s. Similarly, an element f^{rs} within the final demand block is an $N \times 1$ vector of output sales for final uses (consumption, government spending and investment), and its element f_i^{rs} represents the final output produced by sector i in country r and consumed in country s. Finally, the vectors x^r and v^r display the total or gross output and the value-added by industry in country r.

Two key definitions are helpful for the analysis. Firstly, we consider an 'open' input-output model (otherwise known as the "open Leontief system"). The model has the following assumptions:

1. Intermediate inputs are endogenous to the activity levels (total output).
2. Returns to scale in production are constant.
3. Final demand or sales are exogenous.

This set of assumptions make it legitimate to compute the total output required for different values of final demand.

Let x, Z and F be the vector of total global output, the block of intermediate transactions and the block of final demand, respectively. In matrix notation, the global expenditure system is:

$$x = Zi_z + Fi_f \tag{1}$$

Given assumption no. 1, we can compute the matrix of technical coefficients as:

$$A = Z\hat{x}^{-1}.$$

Introducing this result on Equation (1) gives:

$$x = Ax + Fi_f \tag{2}$$

Given assumption no. 3, we have system of linear equations with $N \times G$ unknowns whose solution is:

$$x = (I - A)^{-1}Fi_f \tag{3}$$

The matrix $(I - A)^{-1}$ is known as Leontief's inverse or total input requirements matrix.

Secondly, we use the notion of subsystems from classical production theory[8] to operationalise the idea of a global value chain. A subsystem is a "smaller" productive system that considers the net output (final demand) of only one geo-localised industry (or a group of them).

We can split the final demand block into as many parts as possible. Then, following Equation (3), and based on assumption no. 2, we compute the total global output required to deliver each specific part. It is also possible to compute value-added and employment activated *in all countries and sectors* by a specific final demand value.

This report considers the final output of the automotive and garment sectors in five countries: Germany, Spain, Romania, Indonesia and Mexico. We analyse the trends in employment, value-added and functional income distribution of these ten supply chains.

The data source employed is the World Input-Output Database, Release 2016 (Timmer et al., 2015). This database presents global input-output tables for 2000-2014 with a dimension of 44 countries (43 plus an estimation of the Rest of the World) and 56 sectors (based on UN's ISIC rev. 4).

[8] See Pasinetti (1973).

▶ 3. A general overview

It is convenient to start our analysis by first providing an overview of the selected producer countries' final exports and output trends.

3.1 Automotive

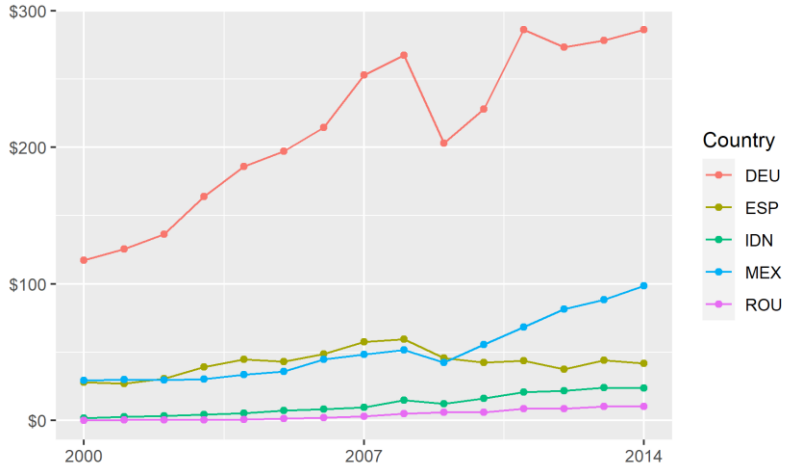
As Figure 2 shows, there are critical differences in the size of the selected countries' automotive industries in terms of output. Germany is the most important automotive producer and exporter. As Table 1 shows, Germany's automotive output rose to almost 17 per cent of global output in 2007. However, this share decreased to 12 per cent in 2014, mainly due to China's increasing relevance in the global automotive industry and Germany's growth moderation after the 2009 international crisis. Indeed, as Figure 2 shows, Germany's automotive output grows steadily until 2009, and following a fast recovery, it stagnates after 2011. As a result of internal demand slack,[9] exports increased from 55 per cent to almost 70 per cent of automotive manufacturing final output between 2000 and 2014 (Figure 3).

The same fate has experienced Spain, but with two differences. Firstly, Spain's automotive output declines after the 2009 crisis. Its share in world output decreased from almost 3.85 per cent in 2007 to 1.75 per cent (Table 1). Secondly, the process of increasing exports due to a lack of internal demand is more potent. Figure 3 displays that Spanish exports of automotive manufacturing increased from 55 per cent in 2000 to more than 80 per cent of final output in 2014. Note that most of this increase was after 2009.

Mexico's automotive output trend was similar to Spain's in 2000, but it reacted differently after the crisis and ended up being 2.3 times higher in 2014. In fact, Mexico increased its share in world output by almost one point percentage during this period. The difference in performance is related to Mexico's more robust domestic demand growth even after the 2009 crisis. After reaching a maximum of 61 per cent in 2007, exports decreased around 13 percentage points in final output between 2007 and 2014 (Figure 3).

Indonesia and Romania have far smaller automotive industries, but they expanded rapidly between 2000 and 2014. Final automotive output increased thirteenfold in Indonesia and by a factor of eighty in Romania. Such an increase follows from foreign investments by major carmakers (Renault Dacia and Ford in Romania and Japanese firms in Indonesia). As Figure 3 exhibits, automotive exports as a share of final output in these countries are considerably lower than in Germany, Spain and Mexico, so the domestic market absorbs most production. Nevertheless, after the 2009 crisis, there was a relative growth decay in both countries, and exports began to outpace output growth.

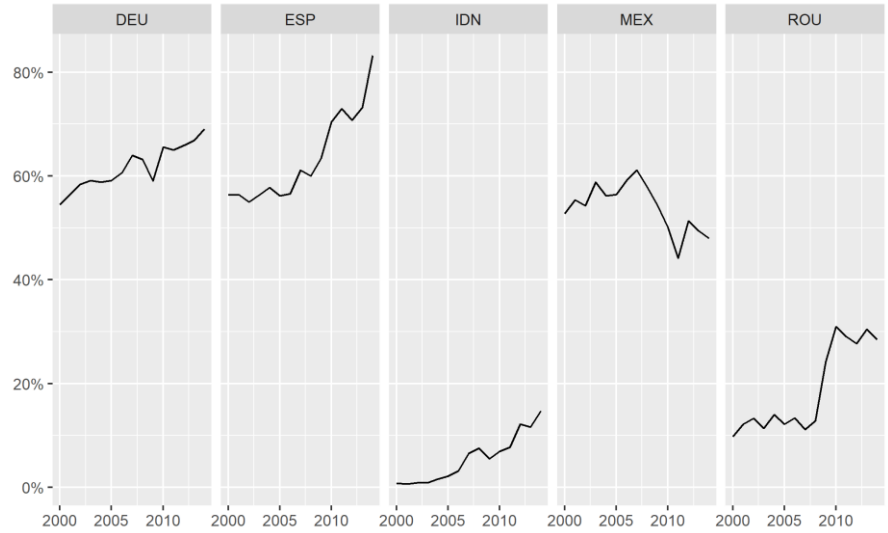
Figure 2. Final output in the automotive sector (billion constant 2010 US$)



Source: Own elaboration based on WIOD 2016.

Figure 3. Final exports of automotive (% of final output)

[9] Related to structural adjustment policies that led to regressive income distribution.



Source: Own elaboration based on WIOD 2016.

Table 1. Selected countries' final exports and output of automotive (% of total final exports and final output, respectively)

	2000		2007		2014	
	Exports	Output	Exports	Output	Exports	Output
DEU	19.76	13.27	23.61	16.95	23.84	12.01
ESP	4.83	3.15	5.12	3.85	4.18	1.75
IDN	0.00	0.20	0.09	0.63	0.42	0.99
MEX	4.76	3.30	4.29	3.23	5.69	4.13
ROU	0.00	0.01	0.05	0.20	0.35	0.43

Source: Own elaboration based on WIOD 2016.

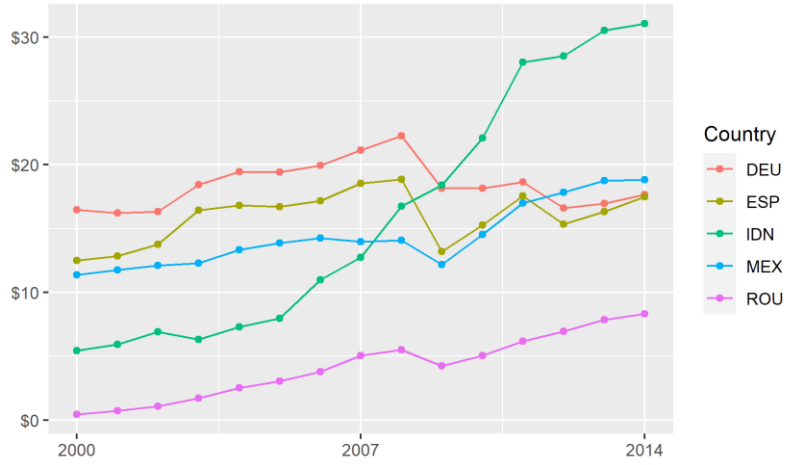
3.2 Garment

The output trends of the selected producer countries in Figure 4 show that the garment industry underwent crucial structural changes. What stands out the most is the dramatic expansion of Indonesia's output. During 2000-2014, it multiplied more than five times and was somewhat 65 per cent higher than Mexico's output in 2014. This remarkable expansion is due to the increasing participation of Indonesia in global garment production networks after export-oriented policy reforms during the 1980s (Dicken & Hassler, 2000). This trend in final output also shows that Indonesia's undoubtedly benefited from the phaseout of the MFA. Although Indonesia initially exported most of its garment output abroad, it gradually began to absorb it domestically, as shown in Figure 5.

The garment industries of Germany, Spain and Mexico are homogeneous in size. Figure 4 shows that Germany's output grew mildly in the years previous to the 2009 crisis and contracted after that. In Spain, instead, there was a growth decay but no contraction. Conversely, Mexico's output growth rate increased after the crisis. The three countries ended up in 2014 with a similar level of output of about 18 billion constant US$. A reasonable explanation for the slow long term output growth in these countries is that the demand for garment products has an income elasticity below one because of their higher income levels. By looking at Figure 5, there seem to be differences among these countries in the trend of output absorption, as was the case in the automotive industry. Germany and Spain reinforced a tendency of, so to speak, "exporting its surplus production". Mexico, on the other hand, progressively absorbed its production domestically.

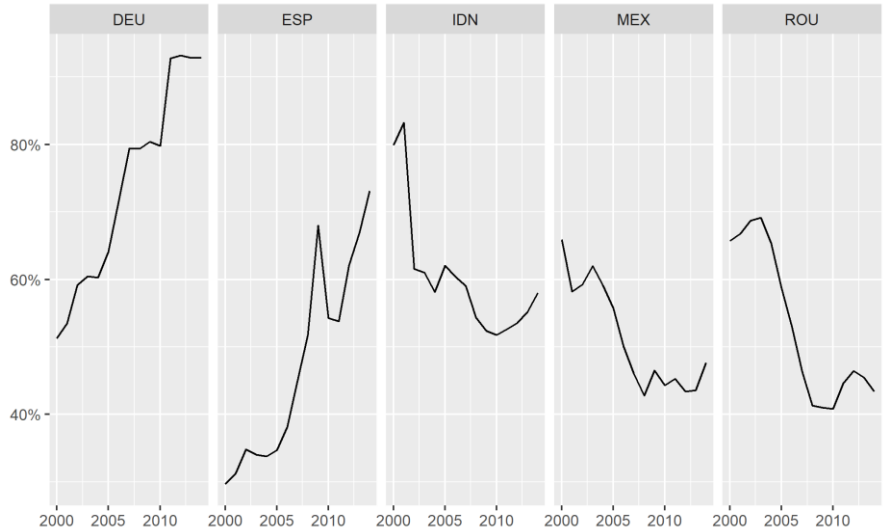
Finally, Romania's garment industry is the smallest, but it recorded the highest output growth rate, an average of 20 per cent per year, leading to substantial catch-up. The reasons behind this remarkable growth are lower costs and proximity to the main European markets attracted prominent textile brands (Serbanel, 2014).

Figure 4. Final output in the garment sector (billion constant 2010 US$)



Source: Own elaboration based on WIOD 2016.

Figure 5. Final exports of garment (% of final output)



Source: Own elaboration based on WIOD 2016.

Table 2. Selected countries' final exports and output of garment (% of total final exports and final output, respectively)

	2000		2007		2014	
	Exports	Output	Exports	Output	Exports	Output
DEU	3.87	3.45	3.86	2.64	2.53	1.40
ESP	1.70	2.62	1.92	2.32	1.97	1.38
IDN	2.00	1.14	1.73	1.59	2.77	2.46
MEX	3.43	2.38	1.48	1.75	1.38	1.49
ROU	0.14	0.10	0.54	0.63	0.56	0.66

Source: Own elaboration based on WIOD 2016.

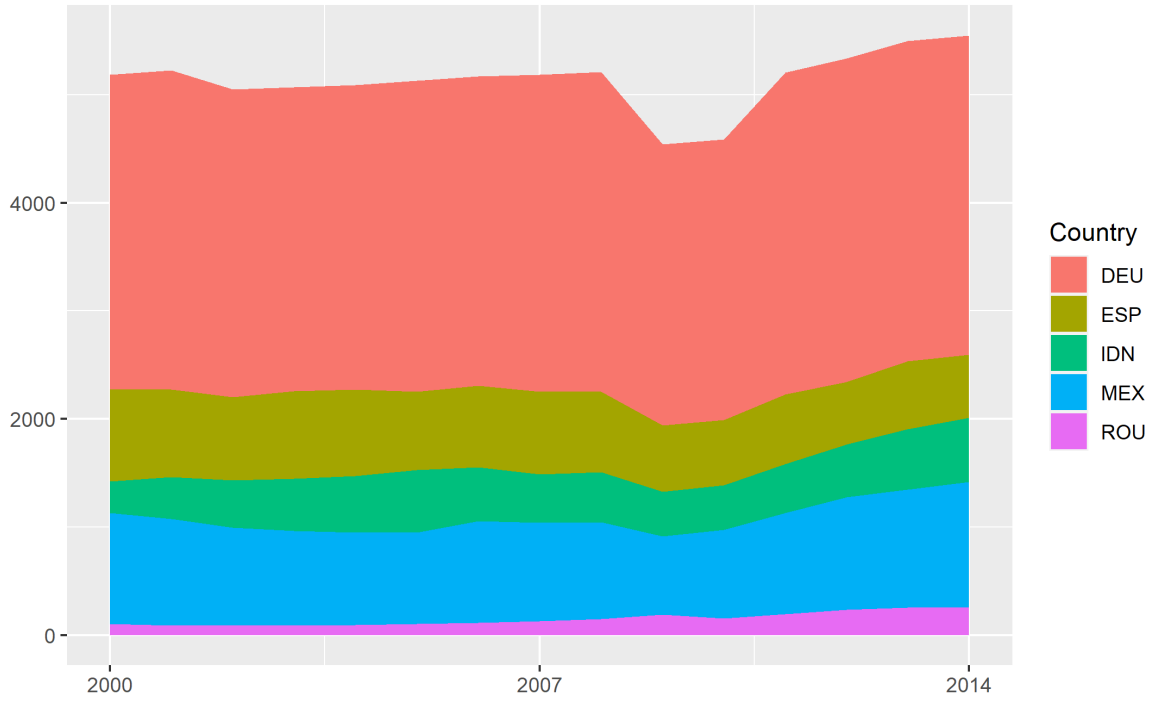
We now proceed to analyse the trends in total employment and value-added activated from the perspective of the subsystem. We examine the trends of these values in terms of their regional and sectoral composition. Finally, we study the trends in functional income distribution, also considering its regional composition.

▶ 4. The automotive sector

4.1 Trends in employment

Figure 6 shows the trend in total activated employment by the selected automotive industries between 2000 and 2014. In terms of total employment, the final automotive output of the selected producer countries created around 5 million jobs during 2000-2014. The overall employment level fell during 2009, but it recovered quickly. Since output increased (see Figure 2), the relatively stable employment levels mean that labour productivity grew more or less at the same pace as output. Because of its industry's size, Germany is the most relevant employment creator. However, as we said, employment levels depend also on labour productivity. Thus, although it has a far smaller size, Indonesia's contribution to employment creation is relevant because its domestic industries require more labour per output unit.[10]

Figure 6. Total (domestic plus foreign) employment activated by the automotive final output (thou. of persons engaged)



Source: Own elaboration based on WIOD 2016.

Table 3 shows the geographical distribution of employment activated by the final output of each industry. Because of their larger size and maturity, the automotive industry of Germany, Spain and Mexico are more 'internationalised' (i.e., have lower shares of domestic employment) than those of Romania and Indonesia.

Between 2000 and 2014, the internationalisation of the German and Spanish industries proceeds in two directions. On the one hand, there is a trend towards regionalisation, as seen from the increase in employment in Eastern and Southern Europe. On the other hand, there is a trend towards globalisation, primarily due to the greater participation of China in the production chain. These results confirm the results from studies reviewed in Section 1.

The Romanian industry has also started an internationalisation process led by foreign multinationals. Indeed, foreign employment increased by almost 14 percentage points. However, unlike Germany and Spain, a significant part of the increase was in other locations, like Central Europe and the rest of the world.

Interestingly, the Mexican case exhibits a "de-regionalisation" process. Employment in the NAFTA countries fell by 2.7 percentage points, almost the same increase in domestic employment. That does not necessarily imply that the ties

[10] That is the inverse of labour productivity.

between Mexico and the NAFTA countries, especially with the United States, have been weakened. Indeed, a large proportion of the carmakers that operate in Mexico are from the United States. The increase in domestic employment in the Mexican automotive chain is due to these firms' increase in foreign investment and the consequent development of a significant base of local suppliers (cf. Contreras et al., 2012). On the other hand, employment in China increased *pari passu* the reduction of employment in the rest of the world.

Finally, the Indonesian automotive industry increasingly tended to be organised within the geographical limits of the nation-state, especially after the 2009 crisis. The reason is that the industry orients primarily to its large domestic market, and the government sets local content targets for parts production (Kian Wie, 2012, Chapter 14). Hence, East Asian carmakers rely on a large base of local suppliers. The rest of the world in foreign employment is relevant in Indonesia because this bloc includes most East Asian countries, whose carmakers have the most significant market shares.

Table 3. Employment activated in the automotive sector by regions (% of total employment)

	2000	2008	2014
Germany			
Domestic	55.18	52.03	51.23
Central Europe	7.42	7.79	7.08
Southern Europe	2.58	3.10	3.33
Eastern Europe	7.95	9.90	11.79
China	2.25	4.70	4.55
NAFTA	1.35	1.55	1.48
Rest of World	23.27	20.93	20.53
Spain			
Domestic	49.70	49.56	38.94
Central Europe	16.03	13.08	15.18
Southern Europe	2.78	3.64	4.61
Eastern Europe	2.34	4.74	7.18
China	1.80	4.32	5.41
NAFTA	1.00	1.20	1.25
Rest of World	26.34	23.46	27.43
Mexico			
Domestic	53.51	58.97	56.87
Central Europe	3.29	2.81	2.58
Southern Europe	0.72	0.74	0.87
Eastern Europe	0.60	0.60	0.97
China	2.79	7.01	7.69
NAFTA	12.61	9.63	9.90
Rest of World	26.47	20.23	21.11
Indonesia			
Domestic	80.94	78.74	87.48
Central Europe	0.50	0.58	0.39
Southern Europe	0.10	0.16	0.09
Eastern Europe	0.10	0.16	0.11
China	1.49	3.07	2.01
NAFTA	0.30	0.35	0.20
Rest of World	16.57	16.94	9.73
Romania			
Domestic	90.75	82.28	73.97
Central Europe	1.29	2.75	4.64
Southern Europe	0.49	1.16	1.98

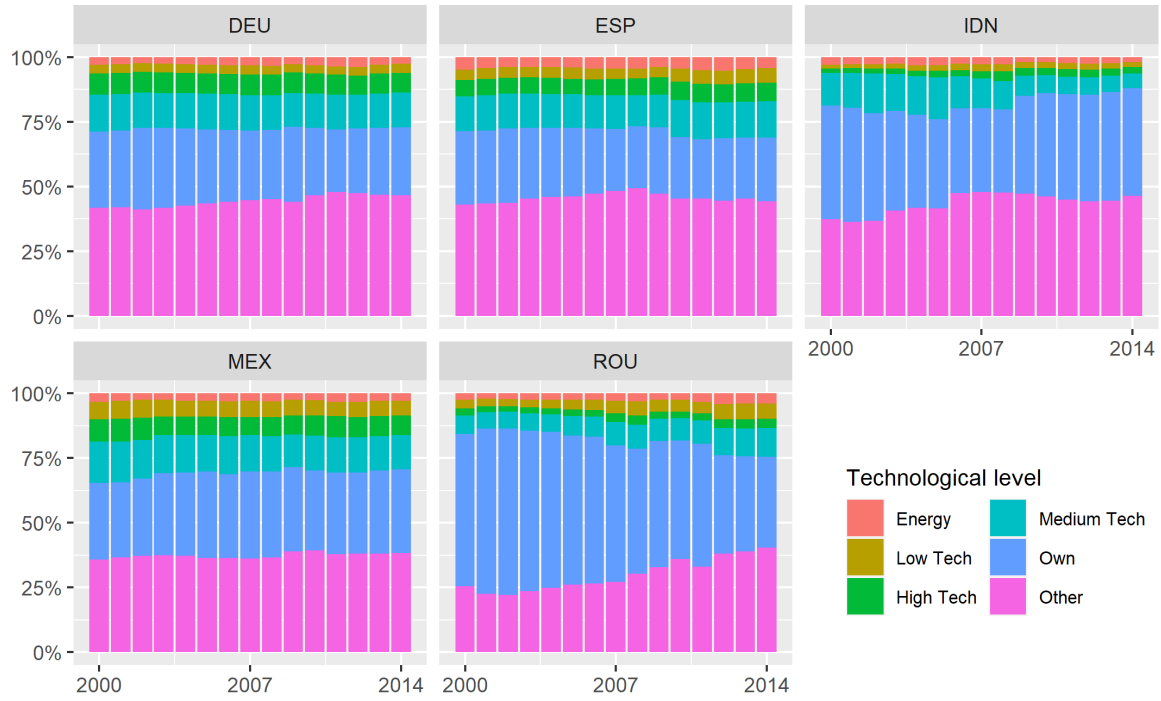
	2000	2008	2014
Eastern Europe	0.94	2.60	3.93
China	0.31	1.28	1.81
NAFTA	0.11	0.25	0.43
Rest of World	6.10	9.68	13.25

Source: Own elaboration based on WIOD 2016.

Figure 7 displays the composition of employment in the automotive industry by sector. As seen in the figure, there are no relevant differences among Germany, Spain and Mexico. Also, the shares are relatively stable over the period. In these countries, manufacturing industries other than automotive manufacturing account for 25 per cent of employment. That possibly reflects carmakers' increasing degree of detachment from various production functions and the recurrence to large suppliers (Wong, 2018). The contrast with Indonesia may be illustrative. There, employment from the industry itself represents 40 per cent, while the rest of the manufacturing industries barely 10 per cent. Policies established in Indonesia to promote the industry are likely to induce East Asian carmakers to integrate functions within production units (Natsuda et al., 2015).

Instead, the employment structure of the Romanian automotive chain goes through some notable changes. Employment attributed to the automotive sector decreases by more than 20 percentage points. Increased employment in medium technology and other[11] sectors offset most of this decline. These shifts are due to the increasing "internationalisation" process of Romania's automotive industry. Admittedly, the sectoral employment proportions converged towards Mexico's, which has a similar production scheme but on a larger scale.

Figure 7. Employment activated by the automotive final output by sectors (% of total employment)



Source: Own elaboration based on WIOD 2016.

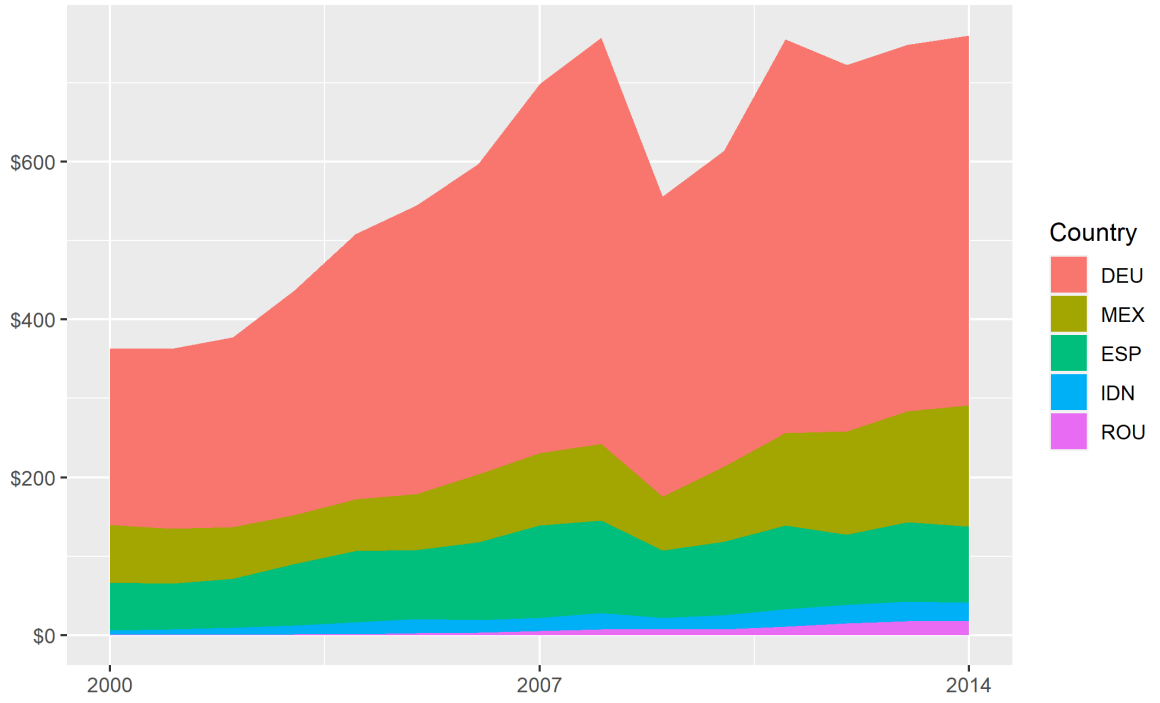
[11] The category "other" includes non-mining primary activities and all the services.

4.2 Trends in value-added

Figure 8 shows the trend in total value-added by the automotive industries of the selected countries between 2000 and 2014. Value-added[12] has more than doubled between 2000 and 2014. Germany is the most significant contributor (more than 60 per cent throughout the period). Its share increased until before the 2009 crisis and then retracted to its initial value in 2000. It is noteworthy that this trend mirrors precisely that of Mexico. Finally, the increase in Romania's and Indonesia's shares compensated for the fall of Spain's.

As hinted in Section 3.1, the relatively poor performance of Germany and especially Spain after the 2009 crisis might be related to structural adjustment policies promoted within the European Union. Most peripheral European governments reacted to their sovereign debt crisis by applying fiscal adjustment measures (Klein & Pettis, 2020). Governments attempted to close their budget deficit, and, as a part of this strategy, many also promoted labour market reforms. The measures were presented under the rhetoric of regaining European competitiveness. However, as Figure 2 shows, the total value-added activated by final automotive output stalls in Germany and Spain after 2010. Thus, the increase in exports shown in Figure 3 seems to result not from an increase in the growth rate of sales abroad but a relative decrease in domestic consumption growth.

Figure 8. Total (domestic plus foreign) value-added activated by the automotive final output (billion US$)



Source: Own elaboration based on WIOD 2016.

Table 4 exhibits the geographical distribution of value-added activated by each automotive industry. The change of the variable under analysis does not substantially modify the two internationalisation trends discussed in Section 3.1. However, in the case of value-added shares, the increase in foreign value-added may also reflect an increase in the relative price of imported inputs.

The comparison of Table 3 with Table 4 shows that the proportion of domestic value-added is higher than domestic employment in Germany, Spain and Mexico, and lower in Indonesia and Romania. That means that the average value-added per unit of labour in all domestic stages of production is higher than the average value-added per unit of labour in the entire production chain and vice versa.[13]

[12] It is worth recalling that total value-added is the sum of domestic and foreign value-added activated by the final output of a geo-localised industry.

[13] Formally, let DE represent domestic employment, TE total employment, DV domestic value-added and TV total value-added. If

$$\frac{DV}{TV} > \frac{DE}{TE},$$

Then

In the case of Germany, the difference between the two proportions shortens over time which, as stated above, suggests a relative increase in imported inputs costs. Instead, in Spain the difference widens. From this, one could infer that the relative increase in the costs of domestic factors stimulated a more robust internationalisation process.

In the case of Mexico, the share of domestic employment increases *pari passu* the reduction in domestic value-added. That means that one of the causes of "de-regionalization" was the lower cost of domestic production factors relative to that of the NAFTA countries.

Finally, the only case where domestic value-added increases is Indonesia's, around four percentage points. The trend is somewhat erratic despite increasing, primarily due to abrupt changes in activated foreign value-added.

Table 4. Value-added activated in the automotive sector by regions (% of total value-added)

	2000	2008	2014
Germany			
Domestic	77.64	72.08	67.06
Central Europe	9.60	9.95	9.66
Southern Europe	3.27	3.82	4.21
Eastern Europe	2.89	5.41	6.92
China	0.48	1.70	3.16
NAFTA	1.62	1.23	1.36
Rest of World	4.51	5.81	7.63
Spain			
Domestic	66.12	66.63	57.72
Central Europe	22.24	17.00	18.15
Southern Europe	4.00	4.68	5.07
Eastern Europe	0.83	2.75	4.10
China	0.41	1.72	3.60
NAFTA	1.27	1.02	1.17
Rest of World	5.13	6.21	10.18
Mexico			
Domestic	64.01	59.90	59.37
Central Europe	4.21	5.31	3.55
Southern Europe	0.90	1.45	1.25
Eastern Europe	0.17	0.48	0.62
China	0.60	3.96	6.54
NAFTA	21.26	16.88	16.30
Rest of World	8.85	12.03	12.37
Indonesia			
Domestic	64.46	64.59	68.60
Central Europe	2.58	2.44	1.83
Southern Europe	0.50	0.69	0.43
Eastern Europe	0.11	0.25	0.20
China	1.35	4.35	5.95
NAFTA	1.69	1.16	0.85
Rest of World	29.31	26.52	22.15
Romania			
Domestic	67.04	67.43	63.33

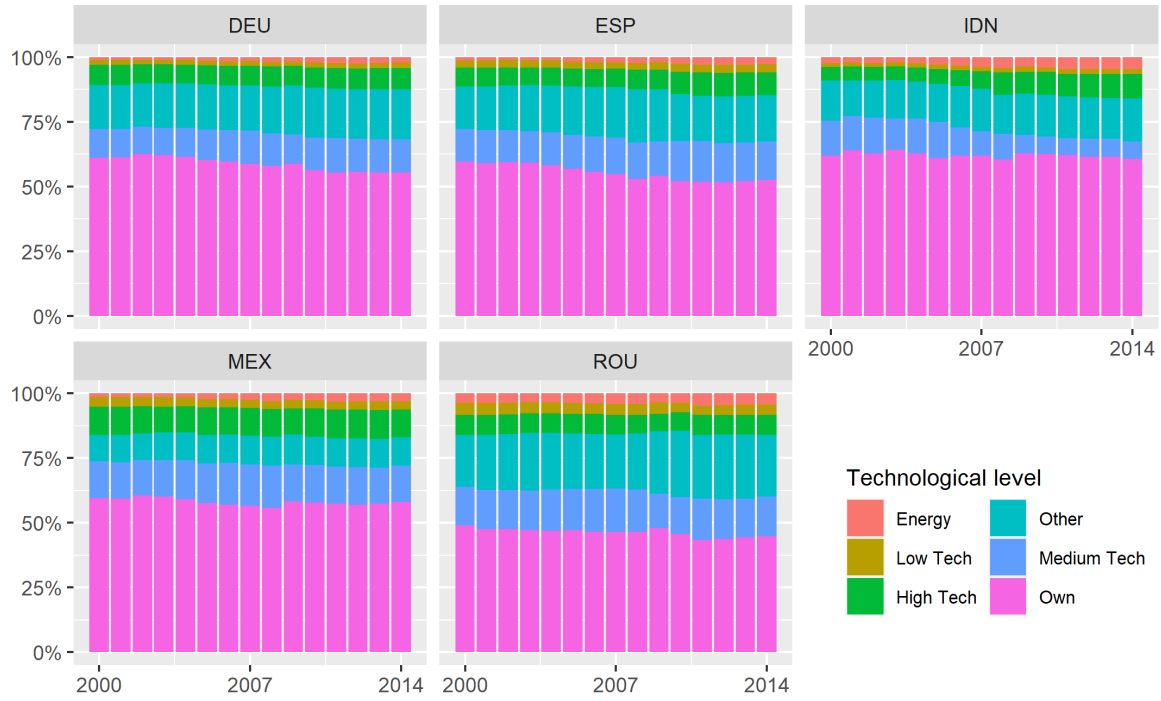
$\frac{DV}{DE} > \frac{TV}{TE}$.

	2000	2008	2014
Central Europe	12.90	10.87	11.83
Southern Europe	5.81	5.16	5.55
Eastern Europe	2.78	4.58	4.67
China	0.52	1.56	2.68
NAFTA	1.08	0.71	0.89
Rest of World	9.88	9.69	11.07

Source: Own elaboration based on WIOD 2016.

Figure 9 displays the distribution of value-added by sector. In all cases, the automotive sector obtains more than 50 per cent of the value-added. A reasonable explanation is that lead firms capture most of the chain's added value, and their profit is accounted for in the automotive sector. The decomposition of the final output into the value-added accrued to each sector is an alternative way to analyse the cost structure of a subsystem. Changes in a subsystems' value-added composition are due to a change in the purchases of intermediate inputs produced in that subsystem or a relative price change of these inputs. As we saw in Section 1, the innovations in transportation, communication and manufacturing technologies that enabled production fragmentation led to a convergence of best-practice standards (i.e., production techniques). That may explain why the distribution of value-added by sector is similar among the selected producer countries. The differences evidenced in Indonesia, where the medium-tech sector halves during 2000-2014, and Romania, which has the highest share of other sectors (primarily services), are probably due to differences, and changes, in the relative prices paid for those inputs.

Figure 9. Value-added activated by the automotive final output by sectors (% of total value-added)



Note: "Own" stands for Automotive.
Source: Own elaboration based on WIOD 2016.

4.3 Trends in functional income distribution

Table 5 decomposes the value-added activated by the final output of automotive into domestic and foreign labour and capital compensations. It is essential to clarify that the value-added data compilation in the input-output tables is at the domestic level. Therefore, the tables do not distinguish the nationality of the factors but their location.[14] Figure 10

[14] Nationality and location does not always coincide, especially in the case of capital.

complements the analysis by showing the trend of average unit wages in the domestic and foreign stages of automotive production.

Table 5. Income shares in the automotive sector

	2000		2008		2014	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
Germany						
Labour	57.59	12.53	45.47	14.99	38.85	18.09
Capital	20.04	9.83	26.61	12.93	28.21	14.85
Spain						
Labour	43.67	20.77	42.12	19.12	38.71	23.97
Capital	22.45	13.11	24.51	14.25	19.01	18.31
Mexico						
Labour	19.65	21.50	16.18	22.11	11.27	21.53
Capital	44.36	14.50	43.72	17.99	48.10	19.10
Indonesia						
Labour	25.84	19.80	27.50	17.42	29.69	15.98
Capital	38.62	15.74	37.09	17.99	38.90	15.43
Romania						
Labour	47.67	18.25	25.54	16.80	32.80	19.93
Capital	19.37	14.71	41.89	15.77	30.52	16.74

Source: Own elaboration based on WIOD 2016.

The aggregate capital compensation in Germany increased by more than 13 percentage points. The primary beneficiaries of the internationalisation process of the German automotive chain are, naturally, the German carmakers (lead firms). The decrease in domestic labour compensation is mainly due to a reduction in employment, possibly triggered by the offshoring of several production stages.[15] However, the average unit wage reduction after the 2009 crisis—and its stagnation after that—also contributed (Figure 10). Several factors might have contributed to the stagnation of domestic wages: firstly, changes in the domestic occupations mix (Fana & Villani, 2021); secondly, the threat to relocate jobs abroad limited the bargaining power of unions; finally, related to the latter, tight fiscal policies and labour market reforms lead to overall wage moderation. The stabilisation of the foreign average unit wage as of 2009 suggests that much of the increase in foreign labour compensation was due to increased employment levels, as we previously indicated. This result reinforces the hypothesis of offshoring as the leading cause of the drop in domestic employment.

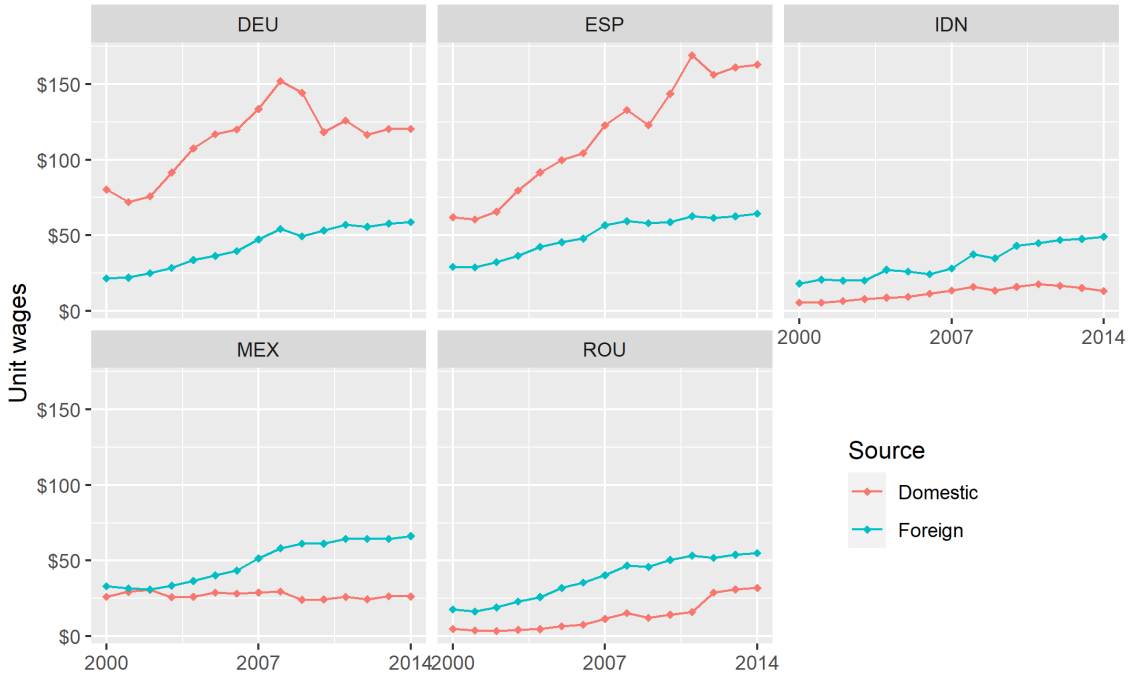
The other cases where the aggregate capital compensation increases substantially are Mexico and Romania. In both cases, most of the increase corresponds to domestic capital. Much of the compensation corresponds to foreign firms that make investments and operate in these countries. The drop in the domestic labour compensation in Mexico is due to the relative stagnation of the average unit wage as shown in Figure 10. Instead, the fall in employment levels in Romania also has a role since the average unit wage shows an increasing trend throughout the period.

In the case of Spain, the major transformations in the distribution of added value occurred after the crisis of 2009. There are no substantial changes in labour and capital aggregate compensations, but each one has significant transformations. The greater relevance of foreign capital compensation suggests that Spanish carmakers increasingly benefit from foreign direct investment rather than domestic investment. As the increase of unit wages in Spain shows (Figure 10), domestic and foreign labour compensation changes are mainly due to changes in employment levels, respectively.

Factor shares remained relatively stable in Indonesia. As discussed previously, Indonesia is the only country where domestic value-added increased. Most of this increase accrued to domestic labour compensation. In turn, the increase in this compensation was strictly due to an increase in domestic employment levels. Indeed, the average domestic unit wage remained stable after 2008 and even decreased in the last years as can been in Figure 10.

[15] As Fernández-Macías et al. (2021) show, there is still no evidence that automation has led to jobs losses in manufacturing. However, we are considering employment in all stages of production, so we should not rule out the role of increases in labour productivity, not necessarily due to automation, in other sectors.

Figure 10. Average unit wages in the domestic and foreign stages of automotive production (in thou. of US$)



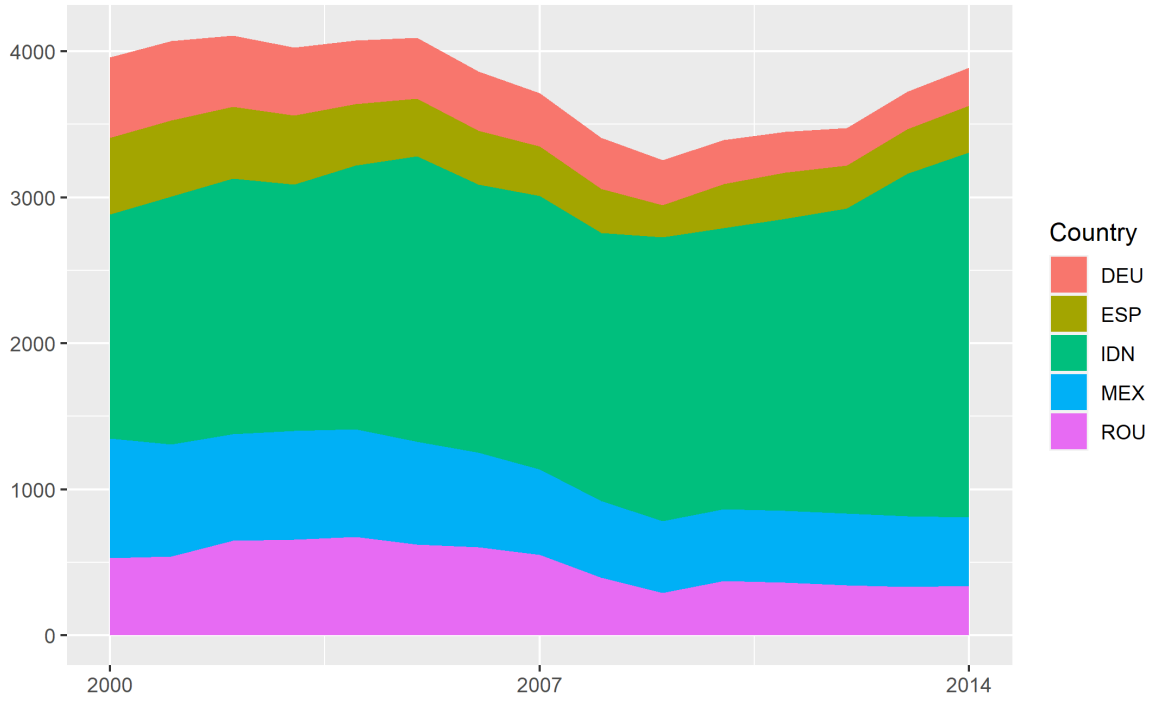
Source: Own elaboration based on WIOD 2016.

▶ 5. The garment sector

5.1 Trends in employment

Figure 11 shows the trend in total employment induced by the final production of the selected garment subsystems between 2000 and 2014. Throughout the period, the employment activated fell in all countries, except in Indonesia. As we have discussed, Indonesia is one of the most relevant garment producers in the world. The substantial expansion of production and employment made the Indonesian garment subsystem the most relevant creator of employment of our sample. As discussed in Section 3.2, final production at constant prices expanded in all countries, at low rates in Germany, Spain and Mexico and high rates in Romania. Then, the drop in employment levels is fundamentally due to an improvement in the average labour productivity considering all the production stages.

Figure 11. Total (domestic plus foreign) employment activated by the garment final output (thousand persons engaged)



Source: Own elaboration based on WIOD 2016.

Table 6 shows the geographical distribution of employment in each garment subsystem. The ubiquitous feature is the increase of employment located in China. China's entry into the WTO in 2001 and the phaseout of the MFA are the primary reasons behind its increasing relevance. As reviewed in Section 1, the sector has relatively low entry barriers, meaning that it is reasonably easy to set up several segments of the industry and begin to produce. The abovementioned institutional changes allowed China to unleash its productive powers, take advantage of its lower labour costs and increase its participation in most global garment value chains.

Germany's domestic employment is lower than in the rest of the countries. The geographical employment distribution is relatively stable throughout the period. The most relevant structural change is the increase in employment located in China. Instead, regional employment contracts, especially in Central and Southern Europe.

In Spain, domestic employment contracted severely by more than 16 percentage points. In line with the sector's trend, Spanish retailers and brand marketers have increasingly recurred to overseas suppliers and manufacturers, mainly from East Asia, as most of the decrease accrues to the increase in employment from China and the rest of the world (possibly from other Asian countries). Although regional employment increased, there was a geographical reorganisation: employment increased in Southern and Eastern Europe and decreased in Central Europe.

Similar to the automotive value chain, domestic employment in Mexico increased, but NAFTA countries employment decreased. The reason is that the logic of North American lead firms is to increase investment production levels in Mexico and the Caribbean or subcontract local firms as OEM (Bair & Gereffi, 2003). After NAFTA, Mexico's garment industry transitioned to the "full-package production" model. Local manufacturers commanded by big buyers are responsible for purchasing raw materials and coordinating the different parts of the production process. This model is more likely to develop backward linkages with local suppliers than the simply export-oriented assembly model.

Indonesia showed a tendency toward higher "nationalisation" of the industry. The share of domestic employment is exceptionally high and increased throughout the period while employment in the rest of the world decreased. These changes are in line with the expected effects of the MFA phaseout mentioned in Section 1.

Finally, Romania's industry did not present substantial changes in its geographical employment composition. The industry is largely national but tended toward regionalisation. Domestic employment decreased while employment in all areas of Europe increased.

Table 6. Employment activated in the garment sector by regions (% of total employment)

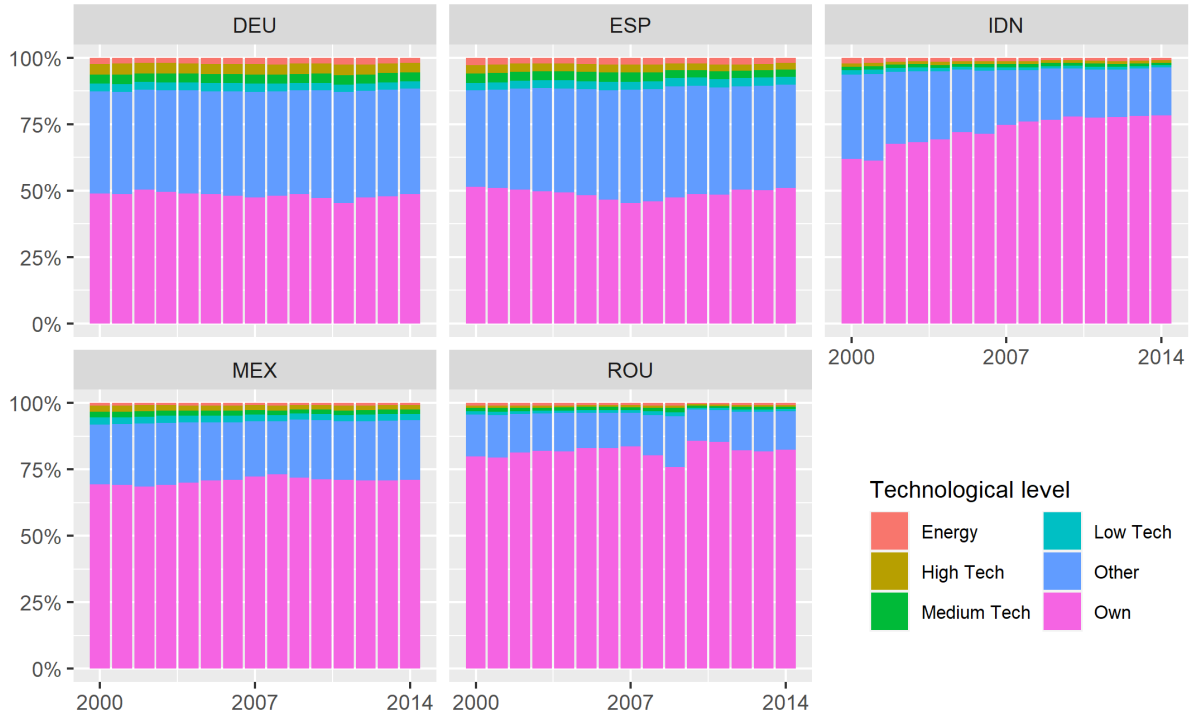
	2000	2008	2014
Germany			
Domestic	51.30	53.06	51.05
Central Europe	6.49	5.58	5.01
Southern Europe	4.00	3.37	3.44
Eastern Europe	6.90	6.55	6.11
China	1.83	4.61	4.64
NAFTA	0.92	1.15	1.06
Rest of World	28.56	25.67	28.69
Spain			
Domestic	66.20	69.03	49.50
Central Europe	5.23	4.46	4.13
Southern Europe	2.11	2.12	4.01
Eastern Europe	0.98	1.13	1.56
China	1.04	2.69	5.01
NAFTA	0.56	0.74	0.54
Rest of World	23.88	19.83	35.25
Mexico			
Domestic	80.58	83.94	82.89
Central Europe	0.73	0.54	0.55
Southern Europe	0.40	0.32	0.29
Eastern Europe	0.13	0.11	0.15
China	1.13	2.71	2.78
NAFTA	5.15	3.42	3.29
Rest of World	11.88	8.96	10.05
Indonesia			
Domestic	87.94	89.66	92.06
Central Europe	0.28	0.18	0.13
Southern Europe	0.07	0.05	0.05
Eastern Europe	0.05	0.04	0.04
China	0.90	1.81	1.73
NAFTA	0.17	0.13	0.09
Rest of World	10.60	8.11	5.90
Romania			
Domestic	95.27	91.83	92.91

	2000	2008	2014
Central Europe	0.80	1.40	1.08
Southern Europe	0.47	1.01	1.03
Eastern Europe	0.38	1.06	0.85
China	0.12	0.52	0.40
NAFTA	0.05	0.10	0.09
Rest of World	2.91	4.08	3.63

Source: Own elaboration based on WIOD 2016.

Figure 12 decomposes the employment activated by the final output of garments according to sectors. The comparison shows specific structural differences between the selected industries. Employment in garment manufacturing is lower in Germany and Spain, representing around 50 per cent of the total employment induced. Conversely, it exceeds 70 per cent in Mexico, 80 per cent in Romania, and 60 to 78 per cent in Indonesia between 2001 and 2014. According to the global value chain literature, a sensible explanation for these differences is that the latter three countries have more factories and subcontractors that focus mainly on production activities. Also, the labour productivity in the production of garments in Germany and Spain is undoubtedly higher. Admittedly, to compete with low-wage countries, these industries must offset this cost disadvantage by applying more automated production processes.

Figure 12. Employment activated by the garment final output by sectors (% of total employment)



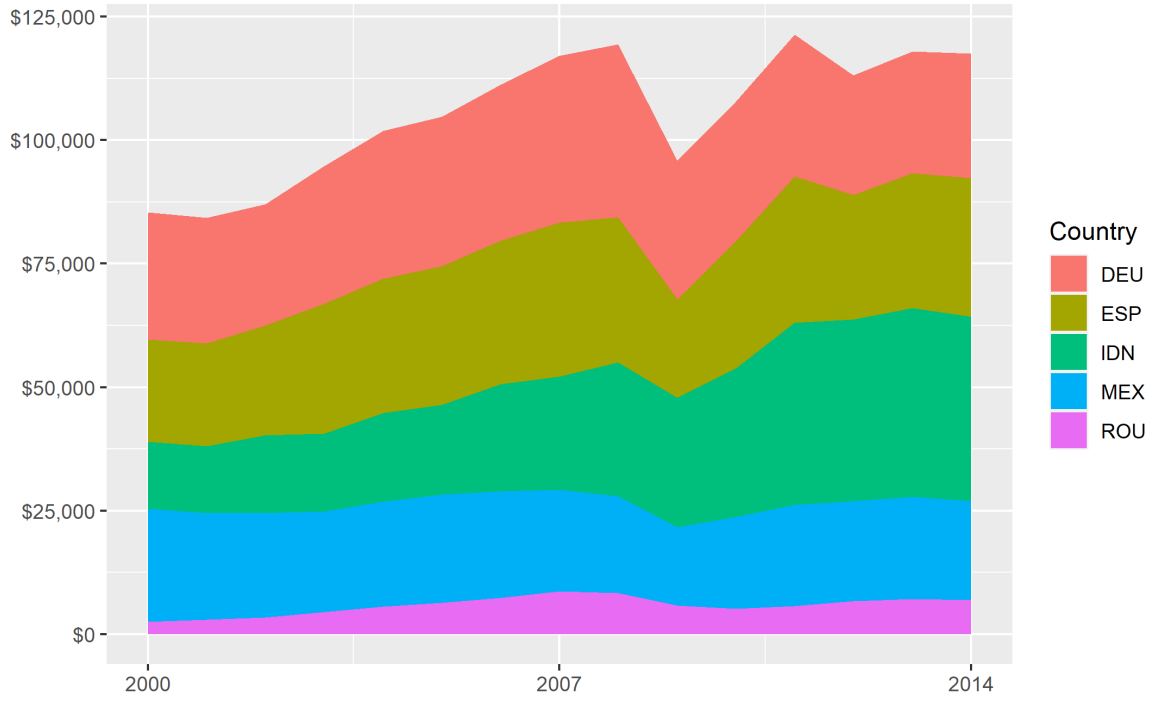
Source: Own elaboration based on WIOD 2016.

5.2 Trends in value-added

Figure 13 displays the trend in value-added activated by the final output of garments between 2000 and 2014. The contribution to value-added appears to be more equitable than the contribution to employment. Except for the Indonesian subsystems, all industries took a hard hit in the international 2009 crisis and did not recover. The countries most affected by the crisis were Mexico and Germany.[16] The value-added activated by the final production of garments in these countries declined after the crisis and ended at levels lower than 2000. As we have seen in Section 3.2, output at constant prices grew nonetheless, so the supply price in these countries must have fallen on average.

[16] As we have discussed, the macroeconomic environment of the European Union after the crisis might have played a large part in this trend.

Figure 13. Total (domestic plus foreign) value-added activated by the garment final output (million US$)



Source: Own elaboration based on WIOD 2016.

Table 7 shows the geographical distribution of the value-added activated by the garment subsystem. Overall, domestic value-added decreased in all subsystems, except the Romanian. As before, China and the rest of the world (primarily Asian countries) increased their share of value-added. What is remarkable is that the latter share grew faster than the employment's share. As discussed in Section 4.2, this indicates that the value-added per unit of labour in the stages of production carried out in China and the rest of the world increased relative to the overall value-added per unit of labour.

In Spain and Germany, the domestic value-added share was higher than the domestic employment share, which suggests that domestic factor costs are relatively higher than foreign factor costs in these countries (Figure 15 confirms this intuition for the case of labour costs).

Finally, the increase in domestic employment and the fall in domestic value-added in Mexico and Indonesia imply that the lower relative factor costs per unit of labour were the reasons behind these countries' increased employment. The evidence presented in the next subsection suggests that the main driver of lower factor costs are stagnant and low unit wages.

Table 7. Value-added activated in the garment sector by regions (% of total value-added)

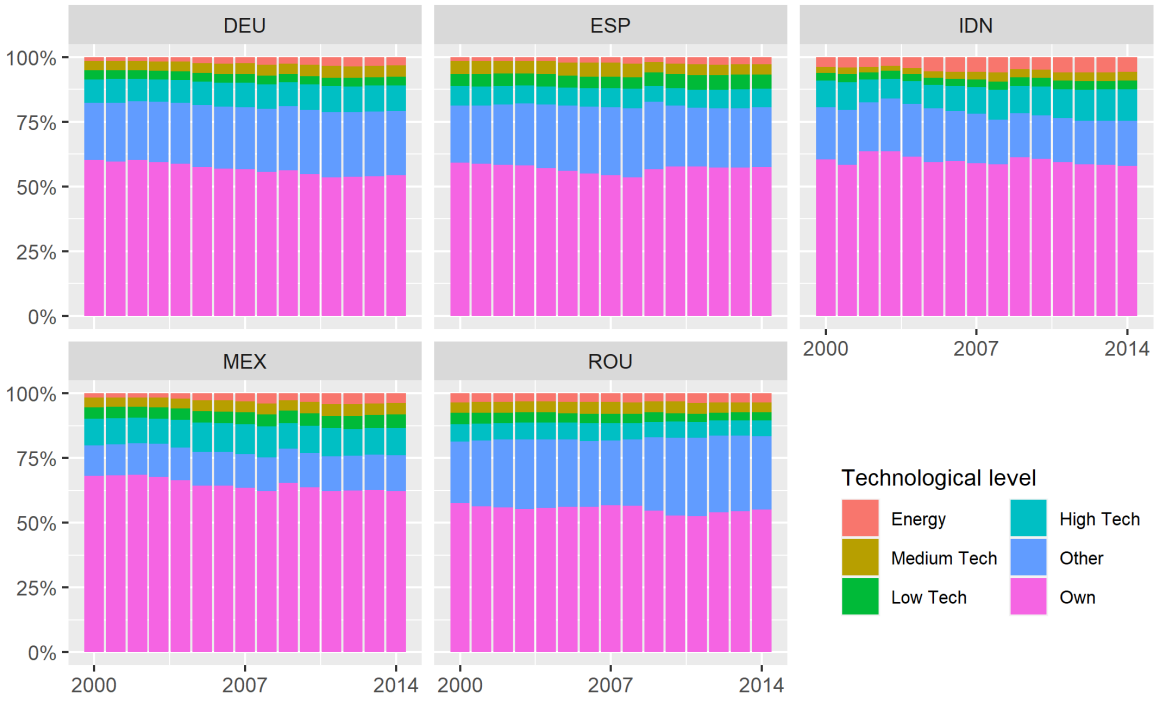
	2000	2008	2014
Germany			
Domestic	70.15	67.94	62.65
Central Europe	11.93	11.09	10.30
Southern Europe	6.58	5.27	5.67
Eastern Europe	1.84	2.91	3.12
China	0.83	3.05	5.44
NAFTA	1.62	1.50	1.58
Rest of World	7.05	8.24	11.23
Spain			
Domestic	78.09	80.65	65.34
Central Europe	10.00	7.30	7.41
Southern Europe	4.23	3.28	5.63

	2000	2008	2014
Eastern Europe	0.35	0.59	0.83
China	0.51	1.75	6.67
NAFTA	1.15	0.91	0.84
Rest of World	5.67	5.53	13.28
Mexico			
Domestic	71.64	68.82	65.94
Central Europe	2.09	2.71	2.23
Southern Europe	1.03	1.36	1.05
Eastern Europe	0.08	0.18	0.21
China	0.83	4.75	7.47
NAFTA	17.23	13.45	13.66
Rest of World	7.10	8.74	9.44
Indonesia			
Domestic	71.57	63.20	58.51
Central Europe	2.65	2.24	1.62
Southern Europe	0.67	0.63	0.55
Eastern Europe	0.09	0.16	0.15
China	1.94	8.22	13.84
NAFTA	1.85	1.35	1.02
Rest of World	21.24	24.20	24.32
Romania			
Domestic	69.47	69.03	69.34
Central Europe	12.10	10.34	8.41
Southern Europe	8.72	7.95	8.18
Eastern Europe	1.65	2.96	2.65
China	0.44	1.55	2.19
NAFTA	0.92	0.65	0.64
Rest of World	6.71	7.52	8.59

Source: Own elaboration based on WIOD 2016.

Figure 14 decomposes the value-added activated in the garment industry according to sectors. Unlike in the case of employment, the distribution of value-added by sector is similar across countries. Garment manufacturing represents between 60 and 65 of the added value. Naturally, the value-added shares are similar because the cost of domestic factors (especially labour as shown below) in Spain and Germany is relatively higher, compensating for the differences in labour productivity.

Figure 14. Value-added activated by the garment final output by sectors (% of total value-added)



Source: Own elaboration based on WIOD 2016.

5.3 Trends in functional income distribution

Table 8 decomposes the value-added activated by the final output of garments into domestic and foreign labour and capital compensations. Additionally, Figure 15 shows the trend of average unit wages in the domestic and foreign stages of garment production.

The general trend in all producer countries is an increase in aggregate capital compensation. In Germany, Spain and Mexico, the domestic capital compensation was relatively stable, so the increase accrued to foreign capital compensation. Conversely, it was the domestic capital compensation that increased in Romania. In Indonesia, it remains stable because the increase in foreign capital compensation offsets domestic capital compensation.

To maintain or increase production levels, Mexico, Romania and Indonesia appeared to keep the average unit wage of the domestic stages of production stable (Figure 15). Future research should focus on the extent to which labour market reforms in these countries are linked with the export strategies of these countries (e.g., Bensusán, 2020).

The reduction in domestic labour compensation in these countries was mainly due to a reduction in the average labour in domestic stages of production per unit of output, possibly due to increasing productivity levels. However, the increase in production led to higher domestic employment in these countries, thereby offsetting the potential job losses from higher productivity (except in Romania).

In Spain and Germany, the share of domestic labour compensation drops, even though domestic unit wage had an increasing trend (it increases until 2009 and then stabilizes). Therefore, the fall may be due to lower labour per unit of output. This fall was the combined effect of increasing offshoring and automation. However, let us recall that garment manufacturing output stagnated in these countries after the 2009 crisis, and output slowdowns usually lead to lower productivity growth (Jeon & Vernengo, 2008).

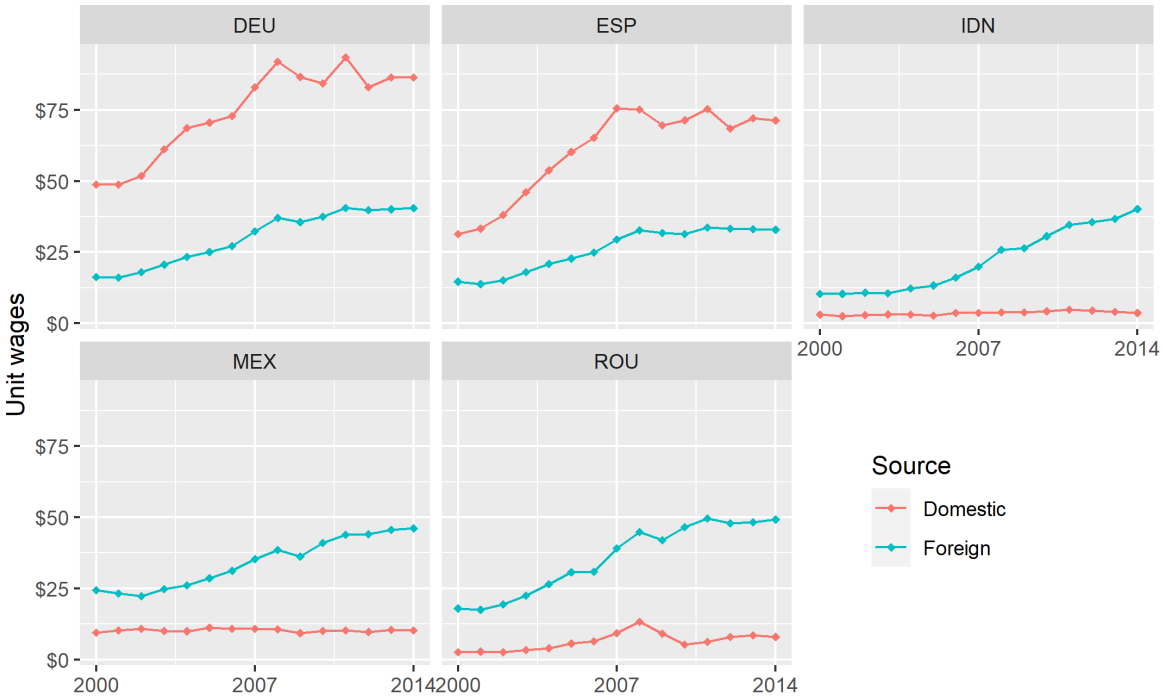
In all countries, the foreign labour compensation increased, except in Romania, where it was steady. The increase was due to the rise in the average unit wage in foreign stages of production, which increases the value of imported inputs. The increase in offshoring labour-intensive production stages by Spain and Germany may have also contributed to the rise of the foreign labour compensation in their subsystems.

Table 8. Income shares in the garment sector

	2000		2008		2014	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
Germany						
Labour	53.75	17.01	48.78	17.37	45.65	20.50
Capital	16.40	12.84	19.16	14.69	17.00	16.85
Spain						
Labour	52.99	12.62	53.35	10.43	40.51	19.06
Capital	25.10	9.29	27.30	8.92	24.82	15.60
Mexico						
Labour	27.51	16.99	24.09	16.70	19.80	18.39
Capital	44.13	11.36	44.72	14.48	46.13	15.67
Indonesia						
Labour	30.09	14.17	23.89	18.06	22.20	21.40
Capital	41.47	14.26	39.31	18.75	36.30	20.09
Romania						
Labour	50.31	17.71	57.16	17.22	36.62	17.13
Capital	19.16	12.83	11.87	13.75	32.72	13.53

Source: Own elaboration based on WIOD 2016.

Figure 15. Average unit wages in the domestic and foreign stages of garment production (in thou. of US$)



Source: Own elaboration based on WIOD 2016.

▶ Concluding remarks

This report has analysed the value chain of two of the most globalised sectors, automotive and garment. We have focused on a set of heterogeneous producer countries. The selection has allowed us to provide a rich picture of the alternative organisations of value chains across different regions.

Multinational enterprises are the main drivers of production fragmentation. These firms follow a cost minimisation strategy that is driven mainly by improvements in transportation, information and communication technologies, innovation in production processes and institutional changes, such as trade liberalisation and labour market reforms. Such factors lead to alternative geographical distributions of labour within global value chains.

Our empirical analysis confirms that the automotive value chains are strongly regionalised but have become more internationalised (Los et al., 2015). Germany and Spain are the archetypes of this case. In these countries, there is a trend toward regionalisation due to increased employment and value-added in Eastern and Southern Europe, but also toward globalisation based on greater participation of mainly China in the production chain. However, our results show that one should also consider countries' income levels. As the case of Mexico, Indonesia and Romania shows, lead firms also tend to invest and set up production plants in countries with lower costs and potential growth prospects because of a large internal market (Indonesia) or proximity to larger markets (Romania and Mexico).

As the analysis shows, the alternative strategies significantly affect functional income distribution. The reason behind changes in domestic labour compensation might differ in each strategy. In Germany and Spain, the driving factor is increasing offshoring, while in the other selected producer countries, it is a faster rise in domestic productivity versus the wage rate.

In the case of the garment value chain, institutional changes are of utmost relevance. Specifically, China's entry into the WTO and the phaseout of the MFA has led to an increasing concentration of production in East and South Asia. Indeed, a prominent feature is the increase of Chinese employment in all selected industries, except in Indonesia. The latter is one of the leading countries in garment production and has a strongly localised industry. The basis of its competitive advantage is low wages. However, the evidence suggests that there might have been an increase in labour productivity through automation. A similar trend happens in the Mexican and Romanian industries.

Instead, Germany and Spain have decaying domestic garment industries. In order to cope with increasing international competition, these countries have appealed to increasing offshoring. Domestic labour was affected more than any other factor, as wages stagnated after 2009 and domestic employment fell. As specialised scholars claim, it is still early to know if there will be a reversion of offshoring toward reshoring by adopting new automated technologies.

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