Knowledge Transfer and Service Embedding for Upgrading in Global Value Chains

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Abstract

A global value chain (GVC) comprises the whole sequence of production stages and business processes that are organized across different countries. Upgrading in GVCs is the process of shifting to activities, products or economic sectors, which generate a higher level of value-added. In the light of selected bibliographic sources, improved competitiveness is viewed as the result of upgrading and we begin with the assumption that a growth in market share is a gauge of both competitiveness and upgrading. The primary goal of this paper is to evaluate the proposition that upgrading in global value chains is a result of increasing GVC participation and of a rise in the share of domestic services value-added included in gross exports. A random effect regression model of panel data was the research method applied to verify this hypothesis in the manufacturing sector in Central and Eastern EU member states. The main results lead to a positive impact of both GVC participation and share of domestic services value-added in gross exports on GVC upgrading. This allowed for the option of making a few recommendations for a more widespread and intense involvement in GVCs, where the knowledge transmission can be exploited. The possible practical implications of the paper are that the learning effects coming from other partners in GVC should be nurtured and used to improve market share or evolve to higher value-added activities. Servicification of manufacturing can lead to a more competitive position along the GVC, especially if the included services lead to innovation and increased productivity. The investigation of the interaction between GVC participation and service inclusion in production and their effects on upgrading and competitiveness constitutes the paper's novel contribution.

Keywords

Global value chains, upgrading, servicification, value-added creation, knowledge transfer, competitiveness.

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Introduction

"International production, trade and investments are increasingly organized within so-called global value chains (GVCs) where the different stages of the production process are located across different countries" (OECD, 2019). Gereffi and Fernandez-Stark (2016)[1]: The value chain describes the entire spectrum of tasks that businesses and employees carry out to get a product from its inception to its ultimate use and beyond. Research and development (R&D), design, production, marketing, distribution, and customer service are all included in this. A value chain's components can either be confined within a single firm or distributed among several firms. In order to be called *global,* the condition is that these activities are located in different countries. Participating in GVCs is seen as a benefit of globalization, giving firms the opportunity to segment their production in several processes and either offshore or outsource these processes across

[1] Gereffi is a prominent author in the area, establishing the GVC framework and the Duke University Global Value Chain Center (Duke GVCC, 2019).

different locations in different countries in search for specific advantages that confer an optimum configuration of activities.

The issue sets new challenges and opportunities for policies aimed, first, at supporting the inclusion of the national economies in global value chains and secondly, within a more thorough approach, their promotion on better positions within the global value chain, from where they are capable to obtain higher benefits, mainly through business processes which are richer in value-added, a process which is widely known as upgrading. The ultimate goal is to improve economic development and employment in a collaborative international environment in which diminishing trade barriers is a must (OECD, 2019). The implications, from an economic perspective, of participation in global value chains and the knowledge transfer is the redistribution of jobs, skills and incomes between the countries involved, usually towards countries that are more active in GVCs, due to the increase in value-added that these knowledge transfers create into the host economy (Taglioni and Winkler, 2016).

A special role in this complex process is held by services, which are channels of information transmission within the value chain. It is the products that have more services embedded in them which are the most likely to transmit knowledge to partner companies. For instance, technical services that accompany a product when it is delivered to the client, or the technical information (within design and engineering) which is exchanged between a car manufacturer and its gearbox supplier is an important incentive for product upgrading.

The main objective of this paper is to test the hypothesis that a higher participation in GVCs and an increased domestic services value-added share of gross exports in the manufacturing sector have determined an upgrade in GVCs in Central and Eastern EU members. For testing this hypothesis, a panel data analysis was performed, and a positive relationship was obtained between the dependent and independent variables, giving the possibility to make a few recommendations for a more extensive and intensive participation in GVCs. The original contribution of this paper consists in the analysis of participation in GVCs and the inclusion of services combined.

The remaining of the paper is organized as follows: the second section is a literature review of the evolution of the upgrading concept and the upgrading determinants, while the third section discusses the results of the panel data analysis for the upgrading in GVCs in the manufacturing sector of the newest EU members in Central and Eastern Europe.

1. Literature review

The review of the literature will be focused on explaining the phenomenon of upgrading in GVC and the two factors that will be tested in the panel data analysis as having an impact on the upgrading process: the participation itself, which determines knowledge transfer from other companies, and the services embedded in manufactured products.

1.1. Knowledge transfer and upgrading in global value chains

Upgrading in GVCs is an evolution, attained by a company involved in GVCs, towards activities with higher value-added. Kaplinsky and Morris (2000) define upgrading as: the development of technological skills and market connections that help businesses become more competitive and transition into higher-value operations. Giuliani et al. (2005) condition the increase in value-added to innovation. This particular type of evolution of firms and markets, acting in the international environment, is analyzed in the literature of economic and social studies due to the benefits it has proved to bring for companies, employees and economies, and eventually on the society as a whole. In the following rows, the economic benefits are shortly described.

The benefits of upgrading for a company may consist in higher productivity, gaining more advanced knowledge and accessing new markets or new distribution channels. These benefits arise from the type of upgrading that a company is pursuing (Dunn, et al. 2006). For example, Blažek (2016) identified: process, product, functional, inter-sectoral, inter-chain upgrading, chain upgrading, etc. and explained the different level at which benefits from learning effects may take place. Epede and Wang (2022), Gereffi (2011) consider that there is a strong connection between upgrading and competitiveness and they measure competitiveness using the market share. In this paper, increased competitiveness will be understood as a result of upgrading and we start from the supposition that market share is a measure of upgrading as well as of competitiveness.

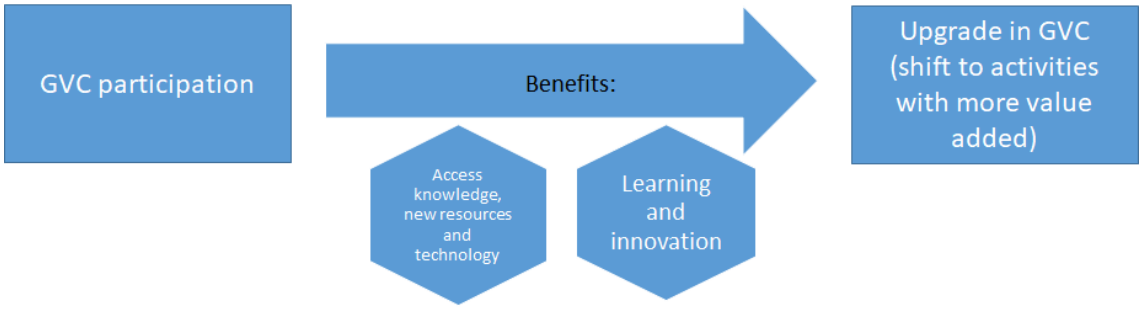

Figure no. 1. The mechanism of upgrading in GVCs
Source: author's work

Knowledge transmission channels are important to follow at both company and country level. Whereas companies should search for opportunities, governments should let these opportunities unhindered. Figure 1 presents the mechanism through which firms can upgrade in GVCs as a result of their participation and capitalize the access to resources and technology to learn and innovate.

The macroeconomic perspective gained much attention and several policies were implemented to improve upgrading (De Marchi and Alford, 2022). The common aim of policies supporting upgrading in the value chain, is to obtain a growth of value-added and aggregate productivity (Stolzenburg, Taglioni and Winkler, 2019). This results from the evolution from a sector with low productivity to a sector with a superior one and was called in the literature a structural change bonus (Timmer and Szirmai, 2000). So, upgrading in the GVC translates into structural upgrading. Structural upgrading is possible due to the effect of learning from upstream and downstream production stages: a more profound participation to GVCs brings more knowledge spillovers which lead to structural upgrading (WTO, 2014).

The link between participation in GVCs and upgrading was acknowledged by several authors: Ndubuisi and Owusu (2021), Wiryawan, Aginta and Fazaalloh (2022) and Tian, Dietzenbacher and Jong-A-Pin (2022), etc. However, the conditions under which this process works are various.

The original approach of the present paper consists in an analysis of the benefits of participation in GVCs together with increased inputs of services along the chains.

1.2. Service embedding in global value chains and their role in upgrading

Due to technological development, services themselves can also be fragmented (after they are standardized) into small activities and transported across borders, meaning that they can be produced within global value chains: information and communication technologies, business services, financial services, etc. (Pietrobelli, and Rasiah, 2012). Kan et al (2022) study upgrading in GVCs in the service sector. But more often products and product parts come along the value chain with several services embedded (Miroudot, 2017; Du and Agbola, 2022), for example technical assistance, assembly instructions, working procedures, patterns and templates, quality standards and so on. The embedding of services into products is known as *servicification* (Bombińska, 2019 and Thangavelu, Wang and Oum, 2018). Moreover, there are services that support goods and intermediates to move along the value chain (De Backer and Miroudot, 2014; Stare, Jaklič and Knez, 2019). Among these, we mention transportation, insurance, business services, financial services, communication, marketing, etc. Among the studies that recognize the role of services as inputs in the value chains of goods production are: Criscuolo and Timmis (2017), Du and Agbola (2022) and many others.

Servicification of manufacturing led to a new business strategy focused on improving customer satisfaction. More precisely, mass customization means keeping the mass production efficiency, but customizing products (Anderson, 2011). This assumes a change in the last stages of production, which makes the product look different or even changes its utility, or/and adding more customized services in distribution, sales or after sales processes. Mass customization needs a high input of services, such as market research, design and engineering, but certain service inputs can be used in common among the family of products thereby reducing the costs for each product item (Jiao, Ma and Tseng, 2003). The mass customization strategy addresses both the producer's requirement for mass production, which lowers costs through economies of scale, and the customer's need to purchase products that are tailored to their unique needs and better meet those demands (Moon et al. 2011). Extending services in a manufacturing company is not only determined by the need of customization and differentiation but is also a mean of extending productivity, for example in logistics, engineering, management, procurement and obtain a better coordination of activities (Nordås,

2010). The positive effects of services on the overall productivity in manufacturing are also assessed by: Goldar (2019), Yang, Yeh and Wang (2018), Qi et al. (2018).

The positive role of service inputs in upgrading in GVCs has been confirmed so far in several studies: Reddy, Sasidharan and Thangavelu (2023), De Marchi and Alford (2022), Lall, Sturgeon and Gereffi (2009). In addition, according to Lanz and Maurer (2015), the foreign inputs of services to goods which are produced domestically spur the country's export capacity. So, integration in GVCs through foreign subsidiaries that produce domestically enhances the access to foreign markets. Lanz and Maurer (2015) finally recommend an adjustment of trade policies and investments to be done in order to improve the capacity of domestic value-added creation. The TiVA Database (OECD, 2021) provides increased opportunities by including important data, based on which the multifaceted role of services in GVCs can be further explored.

2. Research methodology and results

The objective was to test the hypothesis whether global value chain participation and service embedding have a positive impact on the upgrading process in the manufacturing sector in Central and Eastern European countries. To measure the upgrading phenomenon, we partially leaned on UNIDO (2015) methodology, which specifies that upgrading in GVCs occurs when market share (expressed as a percentage of the country's sales in world sales) together with a unit value increase. We choose the market share to represent upgrading in the empirical model because market share is a measure of competiveness, which is strongly connected to upgrading (Epede and Wang, 2022; Gereffi, 2011).

The first question is if GVC integration is an opportunity for businesses to learn and enhance their goods and/or manufacturing methods in order to increase market share. The second query is if the possibility of selling more goods and gaining a larger market share grows with the addition of more services along the GVC.

To set the framework, we first must see the evolution of the upgrading process. Figure 2 shows that, over the analyzed period (1996-2018), market share for manufacturing products has generally grown for all countries in Central and Eastern Europe, especially Poland, which has had the relatively highest market share in the whole period (1.51% in 2018). With a market share of 1.1% in 2018, the Czech Republic comes in second. Its growth was sharp in the early years, but over the past ten years, it has fluctuated around the same levels. Romania ranks fifth, but it has grown since 2002 with little fluctuations. The only countries which in 2018 had approximately the same market share as in 1995 are Croatia and Slovenia.

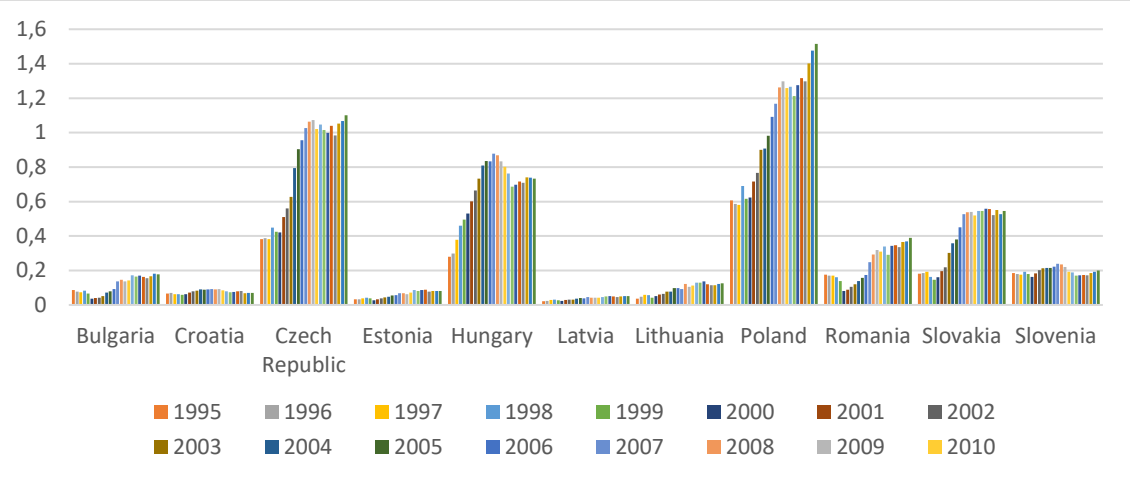

Figure no. 2. The market share evolution as an expression of upgrading in GVCs (1995-2018)
Source: author's work based on OECD (2021) data

An empirical model based on panel data was estimated applying the following equation:

$$Market\_share_{i,t} = a + \beta_1 * \left(GVC_{i,t}\right) + \beta_2 * \left(DVA\_SERV\_SH_{i,t}\right) + u_{i,t} \qquad (1)$$

t expresses the year and *i* the country. The analysis was run for a 24 years period between 1998 and 2018 for the following countries in Central and Eastern Europe (the most recent EU members): Bulgaria, Croatia,

Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The total panel includes 264 observations.

The variables are the following:

- Market share (dependent variable): it is represented by country *i*'s share in world's total exports of goods, expressed in percentage, based on data collected from the TiVA (OECD, 2021), as presented in figure 2. This indicator was selected to represent the degree of upgrading at a particular time because it reflects the success that European goods enjoyed on the world market. Market share growth indicates that the goods were either better, more affordable, better marketed or distributed internationally.

- Global value chain participation (independent variable): the indicator based on data collected from TiVA (OECD, 2021). GVC participation index is composed by Ahmad et al. (2017) to measure the overall participation composed of backward and forward linkages. This variable is obtained by summing up the two data series that are available in the TiVA Database:

$$\text{GVC\_participation index}_{i,t} = \text{EXGR\_FVASH}_{i,t} + \text{EXGR\_DVAFXSH}_{i,t}, \quad (2)$$

where:

$\text{EXGR\_FVASH}_{i,t}$ – measures foreign value-added incorporated in country *i* s exports in the manufacturing sector, as a share in total gross exports by country *i* (to express backward linkages).

$\text{EXGR\_DVAFXSH}_{i,t}$ – measures domestic value-added included in the gross exports of country *i* s in the manufacturing sector, as a percentage of total gross exports by country *i* (to express forward linkages).

The upstream integration (backward linkages) is closer to the beginning of the production chain, while the downstream integration is closer to the consumer (forward linkages). Therefore, the GVC participation index expresses both the backward and forward linkages within the global value chain and it is expected to influence positively the upgrading process through the knowledge transfer that might take place between interconnected companies.

- DVA_SERV_SH - Domestic services value-added share of gross exports (independent variable): represents the share of value-added originating from all domestic service industries in total gross exports" (OECD, 2021). Data was collected from the TiVA database. Among the service industries statistics include: wholesale and retail, transport, constructions, business services, communications, finance, hotels and restaurants, real estate and public services. Because services are considered to enhance the unit value of a product, we test the influence of embedding a higher amount of services in the exported products and we expect this to have a positive influence.

The Levin, Lin, and Chu (2002) unit root test was used to check the stationarity of panel data for all the factors. In order to perform this test, we assumed that the data is not stationary, having a unit root (the null hypothesis). First, the stationarity was evaluated with an individual intercept and trend and it resulted that GVC and DVA_SERV_SH do not have a unit root and is stationary as the null hypothesis was rejected (Prob.<5%). The stationarity for market share series was confirmed at level with individual intercept, after accepting the null hypothesis at level with individual intercept and trend. Therefore, the analysis could be performed based on the selected data.

Panel data regression analysis was performed in three versions: (a) independently Pooled OLS regression, (b) Fixed effect model and (c) Random effect model. Further tests were employed to select the appropriate model. First, for the Chow test, the null hypothesis was rejected indicating that the Fixed effect model is preferred to Pooled OLS regression model (the cross-section Chi-square probability was 0.0000). Secondly, to choose between the results of the Fixed effects model and Random effects model, the Hausman test was ran. The results concluded with the selection of Random effects model (prob. 0.8363 – accept the null hypothesis when probability exceeds 0.05), which was finally retained. This model was probably preferred because heteroscedasticity was present and has the advantage that it eliminates its presence. The assumption that variation between entities is random and uncorrelated to the model's predictor or independent variables is the basis for random effects model, unlike for the fixed effect model. So, we can assume that there are differences across countries that exert certain influence on the dependent variable.

The final results of the estimated generalized least squared technique (cross-section random effects) are displayed in table 1. The coefficient of determination R square is above 0.5 meaning that model explains the dependent variable at a satisfactory level.

Table no. 1. Panel data analysis results (Random effect model)

Dependent variable: market share				
Method: Panel EGLS (Cross-section random effects)				
Variable	**Coefficient**	**Standard Error**	**t-Statistic**	**Prob.**
GVC	2.800019	0.133692	20.94385	0.0000
DVA_SERV_SH	0.488965	0.131925	3.706379	0.0003
R squared:	*0.635257*			
Adjusted R-Squared	*0.632462*			
Prob (F-statistic)	*0.000000*			
Durbin – Watson stat	*0.447882*			

Source: Author s calculation using EViews

• *Global value chain participation* has a positive impact on the selected countries' market share, as it was anticipated, and its coefficient is the highest among the two. This shows that the integration of Central and Eastern European exporting firms in global value chains has contributed to the growth of market share. The phenomenon has several explanations:

- Firstly, there are new business opportunities through GVC integration. As production disintegration advanced globally, new orders appeared from companies which wanted supplies of parts and subassemblies from these countries and further add value to the products in other locations to eventually distribute them worldwide. The consequence is the exports' growth and an increase in market share.

- Secondly, it is through participation to these networks, companies had the possibility to access foreign knowledge and technology, which eventually lead to implanting new business practices, acquiring skills and implementing procedures which proved to be more productive or to lead to more appreciated products on the international markets.

- Thirdly, Central and Eastern European exporters could access new distribution networks, new information on the markets, benefit from the marketing activities done by other companies in the chain.

- Fourthly, a growth in GVC integration hides inward foreign direct investments that have the purpose to serve the demand in GVCs and benefit from the local advantages at the same time.

• *Domestic services value-added share of gross exports* had a positive impact on the market share growth of Central and Eastern European exports, with a statistically significant coefficient. The more services are embedded in exports, the greater the market share. The explanation is that services are an important element in value-added because they increase productivity, improve the product's utility or they make it more available to customers, they ensure connectivity with markets: transportation, communication, finance and business services, etc.

Conclusions

The international disintegration of production and service supply is not only present at the level of classical activities: market research, design and engineering, resource planning, procurement, manufacturing, financial management, human resource management, information technology, distribution, sales, customer relationship management, etc. It is more and more the subject to fine slicing these activities in very small pieces as information can be codified and transmitted by large distances and even managed and controlled from large distances.

This paper's objective is to estimate the impact of GVC participation and services domestic value-added share of in gross exports on upgrading in GVC, in the manufacturing sector for Central and Eastern EU members between 1995 and 2018. We measured the upgrading phenomenon by a country's market share

in world exports and applied a panel data analysis that resulted into a positive impact of both independent variables.

Participation to global value chains would be difficult to increase in Central and Eastern European countries in times when the world level of production disintegration is not growing anymore after it reached a stable level. However, it is important to realize that integration has brought benefits to enhance the way in which companies participate in GVCs and interact with other companies among the chain. From this moment on the evolution should be more intensive rather than extensive. Companies will have to find new ways in which they can work within GVCs to build new kind of relationships with their trade partners on both backward and forward linkages. They should seek to occupy better positions within value chains or try to specialize on activities that provide better access to information, technology and business knowledge or directly on activities which allow obtaining a higher level of unit value added. How much have companies learned to be able to get critical knowledge from their trading partners, absorb that knowledge, and innovate or simply use this knowledge and turn it into advantages like market share growth on global marketplaces or value-added growth is the question. Companies will have to reassess their strengths and analyze new opportunities in order to rethink their strategies.

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