

The drivers of global value chain (GVC) participation in EU member states

Ines Kersan-Škabić

To cite this article: Ines Kersan-Škabić (2019) The drivers of global value chain (GVC) participation in EU member states, Economic Research-Ekonomska Istraživanja, 32:1, 1204-1218, DOI: [10.1080/1331677X.2019.1629978](https://doi.org/10.1080/1331677X.2019.1629978)

To link to this article: <https://doi.org/10.1080/1331677X.2019.1629978>



© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 05 Jul 2019.



Submit your article to this journal [↗](#)



Article views: 699



View related articles [↗](#)



View Crossmark data [↗](#)

The drivers of global value chain (GVC) participation in EU member states

Ines Kersan-Škabić

Faculty of Economics and Tourism “Dr. Mijo Mirković”, Juraj Dobrila University of Pula, Pula, Croatia

ABSTRACT

Integration within the EU single market increases the interconnection and interdependence of the EU economies. Global value chain (GVC) participation has become one of the most widely used indicators to measure the dispersion of the production process among different countries. The EU member states rate differently in the GVC participation index. The highest participation is in Luxembourg and Slovakia and the lowest is in Croatia. The aim of this paper is to identify the most important variables that influence the GVC participation index in the EU member states (EU-15 and EU new member states). The research employs dynamic panel data (GMM) methodology. The obtained results are very similar for the EU-15 and EU-NMS indicating that the most important drivers of GVC participation are: GDP growth, lag GVC participation, FDI, development of financial sector, share of services in GDP and share of high-tech products in export, and level of wages. However, the indicators and strength of the influence of some of these variables differ between the two groups of countries.

ARTICLE HISTORY

Received 19 June 2018

Accepted 15 February 2019

KEYWORDS

global value chains; EU; trade in value added; GVC participation; backward linkages; forward linkages

JEL CLASSIFICATION

F12; F14; F23

1. Introduction

Global value chains (GVCs) are the result of the fragmentation of production and processing segmentation in many phases or processes that take place in numerous locations in different countries. In this way, they have contributed to the increasing interconnection between nations. Multinational companies have greatly contributed to the dispersion of production and, as a result, the shares of intermediates' export and import have increased in gross trade and this trade distorts or shades the real contribution of each individual country to the export. As a consequence, the concept of “trade in value added” was developed to indicate the domestic and foreign value added components in gross export. Gereffi and Fernandez-Stark (2011) provide an overview of GVC development and its name change, Taglioni and Winkler (2016) provide a comprehensive study about the role of GVCs in economic development

CONTACT Ines Kersan-Škabić  ikersan@unipu.hr

© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

and Hernández and Pedersen (2017) provide a review of the concepts, activities, configuration, geographical scope, coordination and implication of GVCs.

The most well-known measure of a country's position in GVCs was created by Koopman et al. (2010) who introduced the GVC participation index. This index is calculated by summarising the domestic value added in foreign export (forward participation) and foreign value added in domestic export (backward participation). The value goes from 0 to 100. The higher the value, the higher the country's participation in GVC, i.e., trade in intermediate products is more prevalent in total trade and the production process is more fragmented.

The EU member states have different values of GVC participation. Luxembourg and Slovakia have the highest participation, and Croatia has the lowest. The values range from 35 to 70. Some of the EU new member states have achieved very good interconnection with foreign partners, i.e., Slovakia, Hungary, Czech Republic, and they have GVC participation in line with, or even higher than, the EU-15. On the other hand, there are countries with weak performances in GVC participation, i.e., Croatia and Cyprus that have not reached high values of GVC participation and are lagging behind (OECD-TiVA, 2017). In this paper, we will try to find out the causes of different values of GVC participation.

While there are papers that deal with the level of GVC participation of different countries and groups of countries, the motivation for doing this research derived from the fact that there is a lack of studies that examine the most influential factors concerning the different levels of GVC participation among countries. The determinants of GVC participation or origins of value added in export arise from those which explain the trade and investments flows. It is known that reducing tariffs and other trade barriers, the level of economic freedom, macroeconomic stability, a favourable business environment (level of wages, tax burden), technological development, and enlargement of the EU all have an influence on the mentioned variables.

In this paper, we will perform an analysis with the aim of finding the main determinants/drivers of the different levels of GVC participation of EU member states. We will perform analysis applying econometric tools and covering the EU as a whole, but also with the EU divided into two groups: EU-15 and EU-new member states (EU-NMS). The models include the following variables: GDP per capita; GDP growth rates; institutional development (economic freedom variables); wages; investment in research and development; financial development; shares of services in GDP; share of high-technology export in total export; and FDI intensity (market integration). The data are from Eurostat, the World Bank and the OECD- TiVA database.

The novelty of this paper is in the extension of existing researches by focusing not just on the presentation and discussion of the GVC participation index (or total or industrial level), but also on the quantitative analysis of possible variables that influence it. While research carried out by Orlić (2017) includes determinants of GVC participation on the micro (firm) level, the idea here is to include the variables of the national economy (macroeconomic data). Additionally, the analysis in this paper is oriented to finding out differences in the determinants of GVC participation among the EU member states (with separate analysis for the EU-15 and EU new member states).

The results could be useful for countries' future activities in terms of where they see their position in GVCs with the aim of better exploiting the benefits of production fragmentation.

The paper is structured in the following way: the second chapter comprises the overview of the literature, the third chapter includes methodology, data and results of the analysis, and the fourth chapter presents the conclusion.

2. Literature review

The GVC literature is mainly focused on the level of countries' participation or position in GVCs. This analysis is made through the research of trade in value added (TiVA) that refers not to the gross trade but to the contribution of every particular country (value added) to domestic (or foreign) exports. Although the concept of global value chain activities should refer to the global dispersion of production, the fact is that there are three regional hubs of GVC activities: Asia, North America and Europe.

Koopman et al. (2010), Johnson and Noguera (2012) and Stehrer et al. (2012) suggested the measures of GVC participation and GVC position. It is necessary to differentiate between backward and forward participation, where the former refers to the share of foreign value added in domestic export and the latter refers to the domestic value added in partners' exports. The value created by a GVC is unevenly distributed among participants/countries and depends on their ability to supply sophisticated and hard-to-imitate products or services to GVCs. The existing literature is focused on the analysis of GVC participation or position. The EU as a whole, or selected EU members, are analysed, among others, by Amador, Cappariello and Stehrer (2015), Leitner and Stehrer (2014), Cieslik, Bieganska and Sroda-Murawska (2016), Grodzicki and Geodecki (2016), Timmer et al. (2013), Timmer et al. (2016).

Amador, Cappariello and Stehrer (2015) found that in 2011 GVCs for the euro-area members (taken as a whole) were very important (as important as in China and more important than in the U.S. and Japan). The high relevance of GVCs in the euro area, measured by the share of foreign value added in exports, is accompanied by their comparatively stronger resilience in the face of trade collapse. Also, they found substantial heterogeneity between countries in the evolution of GVCs from 2000 to 2011.

Leitner & Stehrer (2014) found that vertical specialisation intensified in most of the EU new member states and that stronger participation in global production processes is performance enhancing. Their results indicate that export growth and the degree of vertical specialisation tend to reinforce each other. Cieslik, Bieganska and Sroda-Murawska (2016) have applied complex methods to get the position of a country in the downstream or upstream part of GVCs. They found mixed results for the EU new member states (post-socialist countries) – countries that have stronger links with Western European countries are more integrated, and most of the exporters from Central and Eastern Europe are positioned in the downstream part of the production process. In addition, they found the highest internationalisation in transport equipment and electronics where some of the countries were among the global

leaders in the upstream segment. Grodzicki and Geodecki (2016) explain the core-periphery model in Europe based on the contribution of particular groups of countries to the value chain. They warn that GVC participation accelerates deindustrialisation processes and that the CEE countries are in a better position than the Southern countries, but this is due their continued dependence on foreign capital and technologies.

Baldwin and Lopez-Gonzalez (2015) provide statistical analysis of some features of GVCs: importing-to-produce (I2P), importing to export (I2E) and value added trade (VAT). I2P includes intermediate imports used in all sectors and I2E which captures the content of imported inputs in exported goods and services. An important refinement of the I2E concept is value-added trade that eliminates the double counting of intermediate trade flows.

Regarding the determinants of GVC participation, Amador and Cabral (2016) summarise general drivers (and measuring) of GVC participation such as: lowering the trade and investments costs, trade and investment liberalisation, regional trade blocs (integration), EU enlargement, and technological development.

Hillberry (2011) emphasised the integration in the world economy of new countries in Eastern Europe and East Asia as important sources of growth in the international production fragmentation. Technological development played an inevitable role in the dispersion of production process, where it includes: reducing transportation costs, increasing use of ICT technology, internet users, availability and trade in services (Blinder, 2006; Amiti and Wei, 2005, Abramovsky and Griffith, 2006; DFAIT, 2011; Hillberry, 2011). Kowalski et al. (2015) have researched the determinants of backward and forward participation and they have included structural and institutional variables that include: market size (GDP), the share of trade covered by regional/preferential trade agreements, FDI openness, share of manufacturing in GDP, distance to closest manufacturing hub, distance to economic activity, population and also policy variables (tariffs, intellectual property protection). They found mixed results of share of manufacturing in GDP and GDP-negative influence in the case of backward participation and positive impact in the case of forward participation; population has negative impact in both cases and FDI openness has a positive impact but just for backward participation. Van der Marel (2015) has also researched the variables that have an influence on GVC participation, grouping them in three groups: structural forces and endowments (market size, GDP, GDP per capita, population, availability of capital); traditional trade and regulatory barriers (trading across borders, doing business, trade enabling, barriers to entrepreneurship, barriers to investments, etc.); and new issue areas (FDI restrictions, financial credit availability, labour market efficiency, innovation climate, R&D investments, etc.). He found the positive impact of GDP per capita and the negative impact of market size (population), FDI restrictions, trading across borders on backward participation.

The relationship between preferential trade agreements and GVCs is discussed by Antràs and Staiger (2012), Baldwin (2008), and WTO (2011). Baldwin (2012) explains the development of supply-chain trade and found it very regionalised, supported by a combination of deep regional trade agreements (RTAs), bilateral investment treaties (BITs) and unilateral reforms by developing countries, mostly accomplished outside the World Trade Organisation (WTO). Osnago, Rocha, and Ruta (2015) found that

the coefficient of the interaction term between depth of preferential trade agreement and participation in GVCs is consistently positive and significant across specifications and using different variables of depth and provisions. They conclude that deep preferential trade agreements have a larger impact on GVC-intensive sectors. Ruta (2017) introduced a trust dilemma (or a coordination game) that characterises the relationship between preferential trade agreements and GVCs where countries can choose between four different strategies that go from a situation of no preferential trade agreement and no participation in GVCs (national production and no agreements) to GVCs and deep integration.

Hoekman (2014) indicates the heterogeneity in GVC participation is largely caused by persistent heterogeneity in trade costs, which are determined by a country's connectivity among domestic markets and with international markets. He also found that determinants of a country's extent of GVC participation are its skills and technological capacity and the protection of foreign assets.

Kaminski and Ng (2005) focused their research on the network trade in Central and Eastern European countries and found it underwent important changes (from 2002): there is a shift from simple assembly operations to processing and local production of parts and an expansion beyond EU markets.

The OECD (2013) showed that the highest level of value creation in a GVC is often found in upstream activities such as new concept development, R&D or the manufacture of key parts and components and in downstream activities such as marketing, branding or customer service. It found that a larger stock of knowledge based capital stimulates larger value-added in exports, but it is also found that the coefficient for economic competencies appears to be the largest and most significant among all three subgroups. Countries with higher investment in R&D and rich with knowledge-based capital can be expected to achieve significantly more value added in industries with high knowledge intensity than in those with low knowledge intensity and consequently high GVC participation.

Nunn (2007) also found that countries with higher intangible capital investment have relatively higher DVA in knowledge intensive industries. Corrado, et al. (2012) explain the coverage of intangible assets. It includes: computerised information; software and databases; innovative property; R&D; design; product development in financial services; mineral exploration and spending on the production of artistic originals and economic competencies; market research; advertising; training; organisational capital (own account and purchased). Vrh (2016) focused on the drivers of domestic value added in export in EU member states and found different determinants where she pointed out intangible capital investments in high knowledge intensive sectors (especially investments in economic competencies).

From this review, we can summarise that there are different determinants of GVC participation, some authors pointed out trade costs which in the case of the EU-15 are of less importance because there are no trade costs for intra-EU trade but can be of importance for the countries that became EU members in the last decade (2004 or 2007). Some authors indicated the relevance of investment in research and development, innovation, and a skilled and highly-educated workforce, so the intention is to include indicators in our analysis that reflect the mentioned determinants.

3. Research

3.1. Data and methodology

The above discussion indicates that there are many possible determinants of a country's integration in GVCs. We decided to calculate drivers for GVC participation for EU-28, EU-15 and EU-NMS separately. The variables that are included in the analysis are:

The dependent variable is the GVC participation index. It is calculated from the OECD TiVA database using the following model proposed by Koopman et.al (2010).

The GVC participation index is a sum from backward and forward linkages in GVC.

$$\text{GVC participation} = \text{DVA}/\text{EXP} + \text{FVA}/\text{EXP} \quad (1)$$

where DVA is the share of domestic value added (intermediate export) in foreign export, EXP is gross export, FVA is the share of foreign value added (intermediate import) in domestic exports. The data for DVA and FVA are taken from OECD (2017) and GVC participation is calculated by the authors following the formula (1).

Independent variables are:

- GDP growth and GDP per capita as indicators of level of development and economic potential. GDP growth rates are annual growth rates (in %), and GDP per capita is in constant prices in EUR. The expected influence of these two variables is positive.
- Investment in R&D (as % of GDP) is an indicator of innovation. The source of data is Eurostat. We expect the positive impact of this variable on GVC participation. The assumption is that with the higher level of investment in R&D more sophisticated production will arise and increase, and from the existing research such sectors are more involved in GVCs (Javorsek and Camacho, 2015; Cieslik, Bieganska and Sroda-Murawska, 2016; Taglioni, and Winkler, 2016, Hernández and Pedersen, 2017).
- Nominal wages are important as a location advantage for the attraction of foreign direct investments. Their influence can be negative (higher wages – low GVC participation) in the case of EU new member states, but also positive for most developed EU member states that are specialised in high-technology production that depends on specific knowledge and skills and where the wages are high.
- Liberalisation of trade and a business-friendly environment are crucial for increasing GVC participation. We have included the variable property rights freedom (PRF, as an indicator of guarantee of a foreign investor's rights/assets), and tax burden (TB) as an indicator of tax costs.¹ Here we also wanted to include data on the FDI restrictiveness index but the data were not available for the entire period. The data for PRF and TB are from the Heritage Foundation (2017) and they are part of the group indicator Economic Freedom.
- Profit tax rates are important as a determinant of FDI attractiveness. We included the data for 2003–2011 due to their availability. The data are from the World Bank database (World Bank, 2017).

- Financial development is important as the financial system is a provider of capital for businesses and we have included the variable domestic credit provided by the financial sector (% GDP) from the World Bank Global Financial Development Database. We expect the positive impact of this variable.
- The existing literature indicates that the production process is not fragmented to the same extent in all sectors and some authors find the highest value of GVC participation for optical products, transport equipment and electronic devices. To cover such kinds of products, we included the variable share of high-tech products in gross export and the expected impact is positive.
- The level of GVC participation is different for manufacturing and the service sector, where the service sector is less integrated in GVCs. We included the data for share of services value added in GDP; the data are from Eurostat. The expected impact is negative.
- Foreign direct investments (FDI) should also contribute to GVC participation and we included different variables to measure its influence: FDI inward stock; FDI outward stock (in GDP); FDI inflows; FDI outflows (in GDP); and the variable FDI intensity (average shares of inward and outward FDI in GDP). The source for the variables is UNCTAD (2018), and the data for FDI intensity is from Eurostat.

The panel data method will be used as the sample has a cross-sectional dimension, represented by countries ($i = 1; \dots; N$), and a longitudinal dimension, represented by a time series ($t = 1; \dots; T$ periods) (Hsiao, 2003). The sample comprises unbalanced panel data, i.e., there are some periods missing from some units in the population of interest. In this paper, we chose to perform dynamic panel data to overcome the limitations of static panel analysis. The application of dynamic models is driven by the nature of the relation that we are investigating and the dynamic aspects of their adjustment. Estimation with the dynamic model allows the dynamics of the underlying processes, which can be crucial in obtaining consistent estimates of the remaining parameters (Bond, 2002). The model is estimated using System GMM developed by Arellano and Bover (1995) and Blundell and Bond (1998) and implemented the *xtabond2* user written command in STATA 14 (Roodman, 2009).

Turning the lagged dependent variable, except that which alleviates rigidity in the adjustment, also reduces the problem of omitted variables. The dynamic model is defined in the following form:

$$\begin{aligned} Y_{it} &= \delta Y_{it-1} + \lambda X_{it} + \varepsilon_{it} \\ \varepsilon_{it} &= \eta_i + \gamma_t + u_{it} \end{aligned} \quad (1)$$

Y_{it} refers to the dependent variable that is also included with time lags (GVC participation index), X_{it} is the vector of independent variables for country i at time t , and ε_{it} is the error term that includes country- and time-specific attributes.

The endogeneity problem that can appear in the static analysis is overcome by applying the generalised method of moments (GMM) estimation using instrumental variables. Considering other characteristics and advantages of the GMM estimators, the Blundell and Bond (1998) system GMM estimator is used in this research. To check the validity of the set of instruments used in the GMM estimation, we applied

the Arellano and Bond autocorrelation test (Arellano and Bond, 1991). Another specification test is the over-identification that may be caused by the number of instruments that exceeds the number of parameters to be estimated. The Sargan (1958) test of restrictions is applied to check the validity of the set of instruments.

3.2. Results

Quantitative analysis is presented in Tables 1-3. We performed analysis for the EU28, EU-15 and EU-new member states (EU-NMS). The data cover the period 1995–2011, because the last available data for trade in value-added are for 2011.

We include one lag of the dependent (predetermined) variable and two lags for independent (endogenous) variables.² The diagnostic test of the majority of models reported at the end of the table pointed in favour of the hypothesis of proper identification: m1 statistics, which measure the first order autocorrelation, are negative and

Table 1. Panel data analysis –gmm estimation (GVC participation = dependent variable), EU-28.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
L1.GVC participation	0.2431849 (0.0766375)***	0.4546572 (0.0675618)***	0.1810165 (0.0630211)***	0.1988485 (0.061644)***	0.6634699 (0.0378607)***	0.63665286 (0.0377303)***
logGDPpc	4.247529 (1.119314)***	2.878025 (1.284962)***	25.94113 (2.817532)***	21.6381 (2.853842)***		
GDP growth					0.39616615 (0.0365166)***	0.3911212 (0.0361643)***
logwages			−12.90779 (1.543534)***		0.1309715 (0.4811683)	0.24774 (0.5362118)
invR&D	−0.2350731 (0.693891)	0.5745487 (0.7627527)				
propertyrights						−0.0122983 (0.0228151)
taxburden					0.0179727 (0.0207149)	
profittax	−0.4398402 (0.0818821)***	−0.1767172 (0.0661886)*	−0.1637094 (0.0468079)***	−0.2309669 (0.0494381)***		
FDlinflows	0.855196 (0.2122491)***					
fdiintensity		0.0155576 (0.0044029)***	0.0000493 (0.003375)	0.0087869 (0.0042873)*	0.0111836 (0.0026288)***	0.0132066 (0.0026971)***
ulc						
privatecredit					0.014372 (0.0053381)**	0.0126597 (0.0048012)**
sharehightech					−0.0245908 (0.0453798)	
shareofservices				−0.1541687 (0.0540562)***		
No of instruments	74	74	74	90	106	106
No of observations	209	223	223	223	339	339
AR(1)	−2.34 (0.000)	−3.25 (0.001)	−3.22 (0.000)	−3.53 (0.000)	−3.52 (0.000)	−3.58 (0.000)
AR(2)	−0.27 (0.790)	−0.00 (0.996)	−1.32 (0.187)	−0.96 (0.339)	−0.79 (0.430)	−0.067 (0.501)
Sargan test	158.13 (0.23)	175.41 (0.32)	201.83 (0.18)	206.81 (0.122)	270.25 (0.13)	277.78 (0.108)
Wald test	121.73 (0.000)	353.38 (0.000)	609.26 (0.000)	666.53 (0.000)	1045.72 (0.000)	1014.63 (0.000)

All models include constant variable. Standard errors are in parenthesis. ***P statistically significant at 1%.

**P statistically significant at 5%.

*P statistically significant at 10%.

Source: Author's calculation.

Table 2. Panel data analysis –GMM estimation (GVC participation = dependent variable), EU-15.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
L1.GVC participation	0.5328088 (0.0760557)***	0.4075882 (0.0822656)***	0.8395115 (0.0425629)***	0.7571095 (0.0423423)***	0.7931584 (0.0413531)***	0.3986708 (0.0728612)***
logGDPpc	7.385259 (1.976585)***	11.37303 (2.576496)***				13.30025 (1.996057)***
GDP growth			0.5883929 (0.0638411)***	0.5851038 (0.0547327)***	0.5860984 (0.0532205)***	
logwages		−3.778947 (1.458225)*	0.1839006 (1.053898)	2.459599 (1.208501)	−1.320267 (0.8804684)	
invR&D	−2.94759 (1.253806)					0.0458509 (1.210775)
propertyrights					−0.0403816 (0.0283907)	
FDlinward						−1.387028 (0.3142798)***
Fdiintensity	0.0050077 (0.0047868)	0.0092125 (0.0040262)*	−0.0028727 (0.0042728)	0.0038052 (0.0035687)	0.0082639 (0.0027779)**	
privatecredit					0.0328621 (0.8804684)***	
profittax	−0.2337102 (0.0639815)***		−0.0980949 (0.037403)**	−0.1584209 (0.0407211)***		−0.1206898 (0.0569031)
sharehightech				−0.1341173 (0.0338133)***		
shareofservices			0.2222002 (0.0859045)**			
No of instruments	74	74	90	90	106	74
No of observations	133	133	133	133	198	133
AR(1)	−2.91 (0.000)	−1.92 (0.001)	−3.70 (0.000)	−4.09 (0.000)	−4.61 (0.000)	−2.16 (0.001)
AR(2)	0.83 (0.404)	0.27 (0.785)	0.87 (0.387)	1.15 (0.251)	0.6 (0.548)	−0.73 (0.466)
Sargan test	128.1 (0.065)	136.38 (0.098)	125.52 (0.103)	122.08 (0.123)	170.48 (0.16)	145.84 (0.19)
Wald test	609.43 (0.000)	778.91 (0.000)	1493.57 (0.000)	973.09 (0.000)	1875.41 (0.000)	584.53 (0.000)

All models include constant variable. Standard errors are in parenthesis. ***P statistically significant at 1%.

**P statistically significant at 5%.

*P statistically significant at 10%.

Source: Author's calculation.

significant, and the m2 statistics, which measure the second-order autocorrelation, are not significant. Moreover, the null hypothesis of the Sargan test could not be rejected. This means that the instruments used are not correlated with the errors and can be used in the model.

Table 1 refers to determinants of GVC participation in the EU-28. As was expected the strongest and most significant positive influence on GVC participation is the variable log GDP per capita, as well as lag of the dependent variable. The GDP growth rate has a weaker but also significant and positive impact. The level of wages, property rights, tax burden, investment in research and development have no significant impacts. The variable FDI intensity has a positive and significant impact. The variable private credit has a positive impact on GVC participation which is in accordance with our expectation – better financial conditions are in line with the development of international business and consequently an increase in GVC participation. Share of services in GDP has a negative and significant impact, while the share of high tech export in gross export is not a significant variable. Regarding the influence of FDI on GVC participation we tried with different variables (stock or flows, or intensity) and

Table 3. Panel data analysis –GMM estimation (GVC participation = dependent variable), EU-NMS (13).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
L1.GVC participation	0.7433497 (0.0678201)***	0.7666172 (0.0502336)***	0.7796163 (0.050222)***	0.6925807 (0.0531958)***	0.741299 (0.0383564)***	0.7639969 (0.0382602)***
logGDPpc	-0.97010131 (0.7010131)	0.4798381 (0.6027388)	0.5427286 (0.5967178)			
GDP growth				0.2504739 (0.0446106)***	0.289311 (0.0413791)***	0.2961517 (0.0426461)***
logwages		-1.031872 (0.7942086)	-1.252392 (0.7800779)	-0.087078 (0.772898)	-1.03962 (0.5054902)*	
invR&D	4.649675 (1.321469)***	2.8933 (0.8687482)***	2.986965 (0.9259462)***	4.199538 (1.058636)***	4.161477 (0.7726097)***	
Profit tax rate	0.159896 (0.0969506)					
propertyrights						0.0835326 (0.0245354)***
taxburden			0.0050432 (0.0232036)			
fdiintensity				0.2241326 (0.08787)*		
FDI inflows	0.8143722 (0.379777)					
FDLinward		0.4276286 (0.209269)*	0.4298549 (0.2063606)		0.539719 (0.1747756)***	0.7612333 (0.1811974)***
privatecredit					-0.0421529 (0.0085351)***	
shareofservices				-0.764683 (0.0615035)*		
sharehightech					0.0721159 (0.0303247)*	
No of instruments	74	82	98	96	97	97
No of observations	113	192	192	170	191	202
AR(1)	-2.92 (0.001)	-4.19 (0.000)	-4.36 (0.000)	-4.75 (0.000)	-3.92 (0.000)	-4.07 (0.000)
AR(2)	2.19 (0.028)	0.75 (0.452)	0.77 (0.441)	1.08 (0.278)	0.46 (0.647)	0.39 (0.96)
Sargan test	93.54 (0.232)	154.32 (0.192)	158.11 (0.210)	143.81 (0.202)	145.95 (0.21)	157.79 (0.212)
Wald test	367.40 (0.000)	627.68 (0.000)	653.38 (0.000)	719.49 (0.000)	1032.23 (0.000)	901.85 (0.000)

All models include constant variable. Standard errors are in parenthesis.

***P statistically significant at 1%.

**P statistically significant at 5%.

*P statistically significant at 10%.

Source: author's calculation.

we found the variables FDI inflows or FDI intensity have a positive impact while FDI stock (inward or outward) have an insignificant impact.

In the EU-15 (Table 2) the following variables have a positive and significant impact: lag of dependent variable, log GDP per capita, GDP growth rate, share of services in GDP, private credit provided by financial sector. Wages and profit tax rates have a negative impact. FDI intensity has a very weak positive impact in models 2 and 5, while FDI inward stock has a negative influence on GVC participation. Investment in R&D and property rights is not significant.

In the EU-NMS (Table 3), lag of dependent variable, GDP growth rates, investment in R&D, FDI inward stock, FDI intensity, share of high-tech products in export, and property rights have a positive impact on GVC participation. The variables of

private credit and share of services in GDP have negative impacts. The wages variable has a negative impact but in the majority of models, it is not significant.

The variables GDP growth rates, profit tax rates, FDI intensity and wages are significant and have the expected impact on GVC participation in all three groups of countries. The variable of investment in R&D is significant only for the EU-NMS; it is not significant for EU15 or the entire EU28. We suppose that such investments are crucial for the establishment of improved connections with other producers from different countries and that the level of investment in R&D in EU NMS is at a lower level than in the EU15 which is why the obtained result was expected. In the different models we have included the variables of FDI stock or flows: the FDI inward stock variable is significant for the EU-NMS, it is not significant for the EU28, and it has negative impact for the EU-15. We think that the variable FDI intensity is a better measure because it comprises the inflows and outflows of FDI (in comparison with GDP). Variables that refer to FDI have weak influence or no influence on the EU15 while for the EU-NMS their significance increases. For the EU-NMS, the FDI act as a channel creating an interconnection between different producers from different countries. The variable private credit explains the financial development, but it does not have the same influence: for the EU-28 and EU-15 it has a positive impact while for the EU-NMS it has a negative impact. The share of services in GDP has a negative impact on the countries' participation in GVCs in the EU-28 and EU-15, while in the EU-NMS it has a positive impact. The level of high-tech products in export has a positive significant impact for the EU-15, while it has negative impact for EU-NMS participation in GVCs.

The results in this paper refer to the GVC participation of the national economies, and not to their specific sectors. The majority of significant variables have the expected sign of influence. The existing level of GVC participation and the level of development are the crucial variables for a positive impact on GVC participation. These can be the result of MNC activities in EU member states that have already taken place which buy and produce a lot of intermediate products thereby increasing the participation of countries in GVCs. Also, the results confirm that the level of labour costs (wages) is an important determinant of location of production (that is in accordance with the FDI theory). We expected that financial development (measured here with the variable domestic credit provided by the financial sector) should have a stronger and more positive impact in all groups of countries, but the results point to its importance just for the EU-15 and EU-28. This could be because the main contributors of GVC participation of EU new member states are the EU-15 and they borrow on the domestic market, so the borrowing conditions on their markets are important. The positive sign of private credit indicated that countries with better financial development have relatively higher participation in GVCs in particular; the countries have higher domestic value added. The negative impact on EU new member states can be explained by their primarily receiving financial resources through the FDI inflows; the financial system was not very developed (especially at the beginning of the observed period), their systems were in the process of developing. In addition, their indebtedness increased over the analysed period, so the shares of private credit in GDP in some countries are near 300%, which is a very high level.

The variable property rights is not significant in the EU-28 and the EU-15 because the majority of EU members have already built strong institutional systems with a solid guarantee of ownership rights, but it is an important variable in EU-NMS where the regulations regarding this issue are more poorly developed.

4. Conclusion

The GVC participation index differs among EU member states, where the group of EU core and EU new member states have higher indexes than the Southern members. More specifically: Luxembourg, Slovakia and Hungary are the most integrated countries in GVCs, while Croatia is the least integrated.

With this research we have broadened the discussion on GVC participation to include the analysis of its main drivers. According to economic theory and studies that deal with foreign trade and/or FDI issues we chose to estimate the influence of different variables covering the general macroeconomic indicators, variables that are important for foreign investors in making decisions about the location of their investment and variables that determine the foreign trade.

We performed an analysis for the entire EU, and separately for the EU-15 and for EU-NMS (new member states). The common findings are mostly in accordance with our expectations: *lag of GVC participation*, *GDP per capita* or *GDP growth rate* have a positive and significant impact on GVC participation; *wages*, *profit tax rates* have a negative impact. The variables *FDI inward stock*, *FDI intensity* have a strong influence on GVC participation in EU-NMS while for the EU-28 they have a weaker influence. The results are quite similar for the EU-15 and EU-NMS, and the differences are as expected, as the new member states are more oriented to FDI inflows, which are the main drivers of production. Also, for the EU-NMS higher investment in research and development will create more sophisticated products that are involved in GVCs to a greater degree.

To be able to make more precise policy recommendations there is room for further analysis, specifically regarding the industry level, which would pave the way for further discussion on the differences between industries.

Notes

1. The value goes from 0 to 100, the higher the value the more open/liberalised/free market/economies are.
2. We have included the *logexport* variable as the instrumental variable in all models.

Disclosure statement

I declare that I do not have any competing financial, professional, or personal interests from other parties.

References

- Abramovsky, L., & Griffith, R. (2006). Outsourcing and offshoring of business services: how important is ICT? *Journal of the European Economic Association*, 4(2–3), 594–601. doi:10.1162/jeea.2006.4.2-3.594

- Amador, J., & Cabral, S. (2016). Global value chains: a survey of drivers and measures. *Journal of Economics Surveys*, 30(2), 278–301. doi:10.1111/joes.12097
- Amador, J., Cappariello, R., & Stehrer, R. (2015). Global value chains: A view from the euro area. *ECB Working Paper*, No. 1761
- Amiti, M., & Wei, S.-J. (2005). Fear of service outsourcing: is it justified? *Economic Policy*, 20(42), 308–347. doi:10.1111/j.1468-0327.2005.00140.x
- Antràs, P., & Staiger, R. (2012). Offshoring and the role of trade agreements. *American Economic Review*, 102(7), 3140–3183. doi:10.1257/aer.102.7.3140
- Arellano, M., & Bond, S. R. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), 277–297. doi:10.2307/2297968
- Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51. doi:10.1016/0304-4076(94)01642-D
- Baldwin, R. (2012). WTO 2.0: global governance of supply-chain trade. In *CEPR Policy Insight 64*, London: Centre for Economic Policy Research.
- Baldwin, R. (2008). *Big-think regionalism: A critical survey*, NBER Working Paper No. 14056. Cambridge, MA: NBER.
- Baldwin, R., & Lopez-Gonzalez, J. (2015). Supply-chain trade: A portrait of global patterns and several testable hypotheses. *The World Economy*, 38(11), 1682–1721. doi:10.1111/twec.12189
- Blinder, A. S. (2006). Offshoring: the next industrial revolution? *Foreign Affairs*, 85(2), 113–128. doi:10.2307/20031915
- Blundell, R., & Bond, R. S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143. doi:10.1016/S0304-4076(98)00009-8
- Bond, S. R. (2002). *Dynamic panel data models: a guide to microdata methods and practice*, CeMMAP Working papers CWP09/02, London: Centre for Microdata Methods and Practice, Institute for Fiscal Studies.
- Cieslik, E., Bieganska, J., & Sroda-Murawska, S. (2016). The intensification of foreign trade in post-socialist countries and their role in global value chains. *Acta Oeconomica*, 66(3), 465–487.
- Corrado, C., Haskel, J., Jona-Lasinio, C., & Iommi, M. (2012). Intangible capital and growth in advanced economies: Measurement methods and comparative results. *Working Paper*, [online], [cited 7 July 2017]. Retrieved from <http://www.intan-invest.net>.
- DFAIT. (2011). The evolution of global value chains, Chapter 8. In *Canada's State of Trade: Trade and Investment Update*. Ottawa, Canada: Department of Foreign Affairs and International Trade Canada (DFAIT); 85–101.
- Eurostat (2017). Database. Available from Internet: <http://ec.europa.eu/eurostat/data>. [online], [cited 1 June 2017].
- Gereffi, G., & Fernandez-Stark, K. (2011). *Global value chain analysis: A Primer*. Center on Globalization, Governance & Competitiveness (CGGC). North Carolina, USA: Duke University.
- Grodzicki, M. J., & Geodecki, T. (2016). New dimensions of core- periphery relations in and economically integrated Europe: The role of global value chains. *Eastern European Economics*, 54(5), 377–404. doi:10.1080/00128775.2016.1201426
- Heritage Foundation. (2017). Index of economic freedom. [online]. [cited 25 May 2017], Retrieved from <http://www.heritage.org/index/>.
- Hernández, V., & Pedersen, T. (2017). Global value chain configuration: A review and research agenda. *Business Research Quarterly*, 20(2), 137–150. doi:10.1016/j.brq.2016.11.001
- Hillberry, R. (2011). Causes of international production fragmentation: some evidence, Chapter 3. In A. Sydor (Ed.), *Global value chains: Impacts and implications*. Canada: Department of Foreign Affairs and International Trade Canada (DFAIT).
- Hoekman, B. (2014). *Supply Chains, Mega-Regionals and Multilateralism, A Road Map for the WTO*. London: CEPR. Retrieved from https://voxeu.org/sites/default/files/file/WTO_Roadmap.pdf.
- Hsiao, C.-J. (2003). *Analysis of panel data*. Cambridge. Cambridge University Press.

- Intan-invest. (2017). Nominal investment. Retrieved from <http://www.intan-invest.net/>. [online], [cited 23 May 2017].
- Javorsek, M., & Camacho, I. (2015). Trade in value added: Concepts, estimation and analysis. *ARTNeT Working Paper Series, No. 150*. Bangkok: ESCAP. [online], [cited 4 March 2018]. Retrieved from <http://www.artnetontrade.org>.
- Johnson, R. C., & Noguera, G. (2012). Accounting for intermediates: Production sharing and trade in value added. *Journal of International Economics*, 86 (2), 224–236. doi:10.1016/j.jinteco.2011.10.003
- Kaminski, B., & Ng, F. (2005). Production disintegration and integration of Central Europe into global markets. *International Review of Economics & Finance*, 14, 377–390. doi:10.1016/j.iref.2004.12.008
- Koopman, R., Powers, W., Wang, Z., & Wei, S.-J. (2010). Give credit where credit is due: Tracing value added in global production chains. [online], [cited 7 January 2017]. NBER Working Paper, 16426, Retrieved from <http://www.nber.org/papers/w16426>.
- Kowalski, P., Lopez Gonzalez, J., Ragoussis, A., & Ugarte, C. (2015). *Participation of developing countries in global value chains: Implications for trade and trade-related policies*. OECD Trade Policy Papers. Paris: OECD Publishing. [online], [cited 1 September 2017], Retrieved from <http://dx.doi.org/10.1787/5js331fw0xxn-en>.
- Leitner, S. M., & Stehrer, R. (2014). Trade integration, production fragmentation and performance in Europe – Blessing or curse? A comparative analysis of the new member states and the EU-15. *WIIW Research Report 397*.
- Nunn, N. (2007). Relationship-specificity, Incomplete Contracts and the patterns of trade. *Quarterly Journal of Economics*, 122(2), 569–600. doi:10.1162/qjec.122.2.569
- OECD. (2013). Knowledge-based capital and upgrading in global value chains. *Supporting Investment in Knowledge Capital, Growth and Innovation*. Paris: OECD Publishing, pp. 215–252.
- OECD-TiVA. (2017). Database. Retrieved from http://stats.oecd.org/Index.aspx?DataSetCode=TIVA2015_C1. [online], [cited 7 January 2017].
- Orlić, E. (2017). Determinants of global value chain participation in CESEE. In E. Gnan, & R. Kronberger (Eds.), *Schwerpunkt Außenwirtschaft 2016/2017 Direktinvestitionen: Trends, Erklärungsfaktoren, Barrieren*. Vienna: Facultas Verlags- und Buchhandels AG facultas.
- Osnago, A., Rocha, N., & Ruta, M. (2015). *Deep trade agreements and vertical FDI: The devil is in the details*. Policy Research Working Paper No. 7464. Washington, DC: World Bank.
- Roodman, D. M. (2009). How to do xtabond2: An introduction to difference and system gmm in stata. *Stata Journal*, 9(1): 86–136.
- Ruta, M. (2017). Preferential trade agreements and global value chains, theory, evidence and open questions. In *IBRD: Measuring and Analyzing the Impact of GVCs on Economic Development*, Retrieved from https://www.wto.org/english/res_e/booksp_e/gvcs_report_2017.pdf. [online], [cited 30 July 2017].
- Sargan, J. D. (1958). The estimation of economic relationships using instrumental variables. *Econometrica*, 26(3), 393–415. doi:10.2307/1907619
- Stehrer, R., Foster, N., & de Vries, G. (2012). *Value added and factors in trade: A comprehensive approach*. WIOD Working Paper, 7. Brussels: World Input-Output Database (WIOD).
- Taglioni, D., & Winkler, D. (2016). *Making Global Value Chains Work for Development*. Washington: The World Bank Group.
- Timmer, M. P., Los, B., Stehrer, R., & de Vries, G. J. (2013). Fragmentation, incomes and jobs: Analysis of European competitiveness. *Economic Policy*, 28(76), 613–661. doi:10.1111/1468-0327.12018
- Timmer, M. P., Los, B., Stehrer, R., & de Vries, G. J. (2016). An Anatomy of the Global Trade Slowdown based on the WIOD 2016 Release. *GGDC Research Memorandum*, 162. Retrieved from <http://www.ggdc.net/publications/memorandum/gd162.pdf>. [online], [cited 27 December 2016].
- UNCTAD. (2018). FDI statistics [online], Retrieved from <https://unctad.org/en/Pages/DIAE/DIAE%20Publications%20-%20Bibliographic%20Index/Pub-FDI-Statistics.aspx>.

- Van der Marel, E. (2015). Positioning on the Global Value Chain Map: Where do You Want to Be? *ECIPE Occasional Paper No.1*, Retrieved from http://ecipe.org/app/uploads/2015/02/Occasional-Paper-012015_Last1.pdf. [online], [cited 1 September 2017].
- Vrh, N. (2016). What drives the difference in domestic value added of EU exports? In Ž. Primorac, C. Bussoli, & N. Recker (Eds.), *16th International Scientific Conference on Economic and Social Development – The Legal Challenges of Modern World*, 704–713. Varaždin Development and Entrepreneurship Agency, Faculty of Law University of Split and University North, in Split [online], [cited 28 May 2017], 1–2 September, 2016., Retrieved from <http://www.esd-conference.com/?page=past-conferences>,
- World Bank. (2017). World development indicators. Retrieved from <http://databank.worldbank.org/data/>. [online], [cited 23 July 2017].
- WTO (2011). *World Trade Report 2011—The WTO and preferential trade agreements: From coexistence to coherence*. Geneva: WTO.