

PARTICIPATION OF V4 COUNTRIES IN GLOBAL VALUE CHAINS

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Účasť krajín V4 v globálnych hodnotových reťazoch

Abstract: *The increasing importance of global value chains, the increasing linkage between individual economies and the growing division of labor cause that it is needed to re-evaluate the traditional methods of measuring competitiveness and use more relevant indicators for this. The main aim of this paper is the accounting of gross exports of the V4 countries based on the research of Koopman et al. [3], and to point out the fact that the traditional indicators for measuring competitiveness of the country are not quite reliable anymore. The accounting of gross exports into nine components provides more detailed overview of the nature of the production and also provides information about the production stage in which most of the domestic value-added is produced and therefore determines the degree of participation of the countries in the global value chains.*

Keywords: *global value chains, value added, accounting of gross exports*

JEL Classification: F 14, E 01, E 16

1 Introduction

In the current globalized economy, it is important for the countries to open up their borders and actively participate in international trade. The dynamic development of the world economy means that countries that have previously been less involved in international trade can now compete in international markets by exploiting their potential. Entering the global market gives them an opportunity to grow and prosper, which is reflected

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either in the growth of employment, gross domestic product or the overall growth of the economy. The impact of competitiveness is growing due to the development of international trade and the influence of globalization. Countries that are constantly improving their competitiveness should benefit in the long run. Considerable is the impact of globalization on international trade, which also results from the fact that individual national economies are interconnected, not caring about the position of the country on the world map. Nowadays individual economies are becoming more open, interconnected and the international division of labor is deepening. This phenomenon may result in the division of the production process into several countries, which means that during the production process the product may cross the borders of several countries. For this reason, when we want to measure the competitiveness of the country, we have to take into account this fact.

2 Methods of Measuring Competitiveness

Recently due to the increased fragmentation of production process the international competitiveness of the country is changing. For this reason traditional indicators of competitiveness based on total exports are losing their importance and new methods of measuring are needed.

Traditional indicators of competitiveness are based on data of gross exports and gross imports. The basic assumption is sufficient information on international trade in order to calculate the comparative advantages of countries. This assumption is correct until the international division of labor is limited. Nowadays when some stages of the production process are moved to other countries it is inappropriate to measure the competitiveness solely on the basis of gross exports and imports. In the theory of international trade many famous economists had various theories. Among the best known are the theory of absolute advantages from Adam Smith, the theory of comparative advantages from David Ricardo, Heckscher-Ohlin theory and many others. These theories describe the international trade, while the main question remains how to apply them in the real world.

As a result of rapidly decreasing communication and coordination costs, individual production stages do not have to be close together. This means, that more parts of the production process are open to foreign competition. While in the past countries competed mainly in specific sectors on the

basis of price and quality, nowadays they are more competitive at each level of production process. In order to describe this phenomenon better, it is necessary to use new methods of measuring competitiveness, which are based on value-added, that is generated during the production, rather than on gross exports [6].

3 Global Value Chains

Nowadays the final product may consist of different parts coming from different countries. This fact forms the basis of the global value chains. Reducing transport and communication costs has allowed companies to geographically distribute their production. Not just every stage of the production process can take place in different production facilities, but the facilities themselves can be found in different countries. This type of production, which results in the movement of goods and services from one country to another, is the main reason why global trade in goods and services is growing at an enormous rate. A large part of this growth is due to the trade in intermediate goods that pass through different countries. In each part of the production process a certain value is added to the product and their sum will represent its total value. This process is called vertical specialization or vertical trade. Companies can reduce their overall costs by locating production to different countries, based on their comparative advantage.

Many economists have dealt with the issue of vertical specialization. Pilot research in this area is considered by Hummels et al. [2]. They pointed out in their research that smaller countries tend to have greater vertical specialization than larger countries. The enormous growth in vertical specialization is attributed to the reduction of trade barriers and to the more opened national economies. Since the product crosses the border several times, transport costs and tariffs have to be paid repeatedly. The production costs will be significantly reduced by lowering trade barriers, while each stage of the production process is broken up in several countries. The input-output model allows us to analyze the relationship between the fragmentation of production process and value-added creation. By using input-output tables, it is possible to divide the value of goods into the value-added generated in domestic country and value-added generated in foreign country. Increasing international fragmentation of the value chain will be reflected in a higher foreign share in the value of the final products.

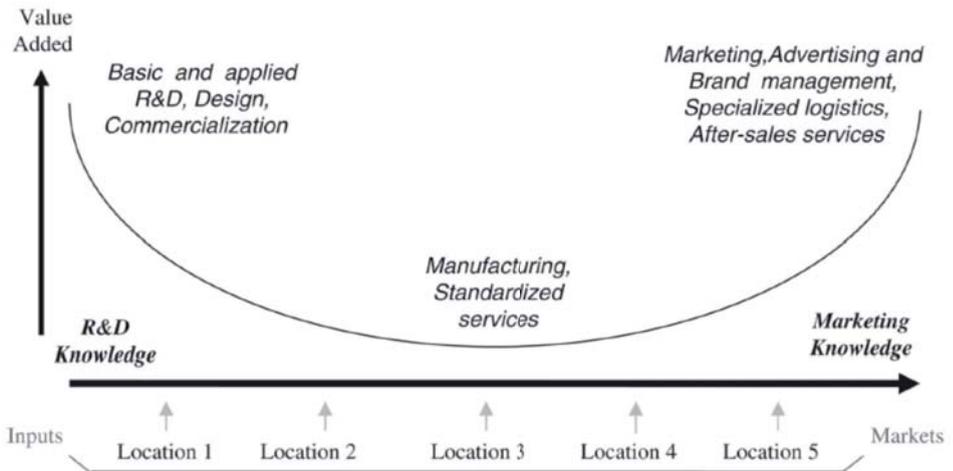
Los et al. [5] are dealt with the international fragmentation of value chains.

In their research they assume a simplified world economy which consists only of three countries. The production process takes place in these three countries, while the final stage takes place in the third country. The first part of the production process takes place in the first country. The first country uses some amount of domestic capital and labor in order to produce intermediate products. These intermediate products will be inputs in the second country. The second country, except for these intermediate products, will also use some amount of domestic capital and labor. The last stage of production process takes place in the third country, when the production process is finalized. The third country uses the intermediate products from the second country, uses some amount of domestic capital and labor in order to produce final goods from these inputs. At each stage of production process, some amount of value-added were generated. The sum of all value-added generated in this production process in all countries will be equal to the value of the final product that is produced for the final consumption.

In the terms of economic development there are many positive effects of global value chains. Firstly, companies, especially in developed economies, do not have to go through the whole production process. Instead of it, it is enough if the companies will concentrate on the specific process based on their comparative advantages that allow them to participate in the global economy. And thirdly, global value chains provide an opportunity to transfer technology or spillover effects to developing countries. It should be also noted, that the benefits from global value chains are not given automatically. The benefits can vary depending on the country's position in the value chain. For a simplified illustration we use a smiley-shaped curve represented in Figure 1. Given the differences in the comparative advantages of each country, rich countries tend to engage in that stage of production process, which includes research and development, design, commercialization, marketing, advertising, brand management, specialized logistics or after-sales services. Therefore, richer and more developed countries can move production to other countries with lower wages, thus reducing their production costs. On the other hand, poorer or less developed countries tend to focus on manufacturing and on standardized services. These types of production processes are in the lower position in the value chain, so it means, that they generate lower amount of value-added. It is assumed, that in the countries that are located at the bottom of smiley-shaped curve the created jobs are less valued compared to the upper part of the curve [7].

Figure 1

The Smiley-Shaped Curve



Source: Ye et al. [7].

The increasing complexity and sophistication of global value chains bring a hard task for economic policy makers, because what cannot be measured is difficult to manage. In order to better understand the principle of global value chains, it is important that we are able to measure it. We need to know the position and degree of the participation of countries and industries in global value chains. The smiley-shaped curve represents a valuable method to understand the country's position in global value chains. By relevant methods economy policy makers can analyze and determine the degree of participation of countries in the global value chains and improve the position within them. Although participation in the global value chains bears a certain risks, the right decisions of economic policy makers can reduce some of these deficits to the minimum.

4 Model and Data

4.1 Gross Exports Accounting

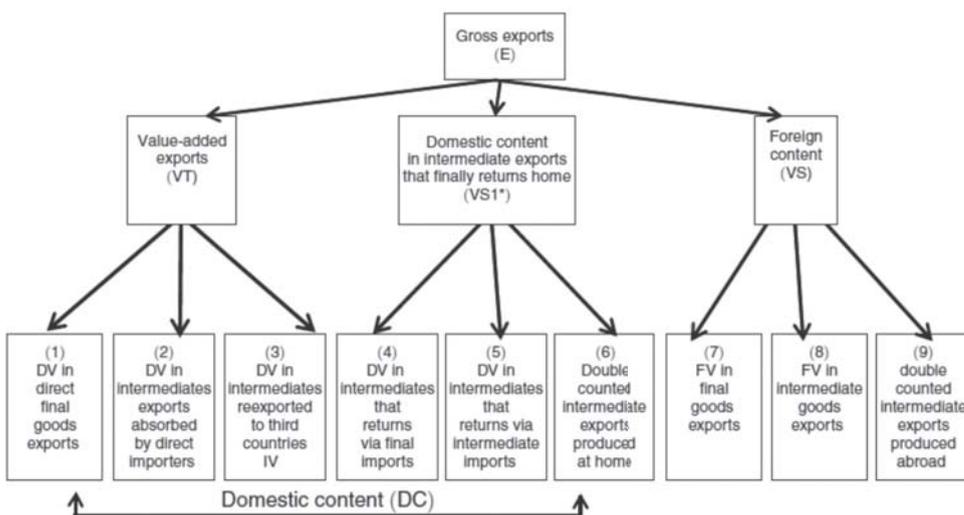
The pilot research paper of the gross exports breakdown is from Koopman et al. [4]. In their research they attempted to break down gross exports into value-added by origin. The biggest problem with the traditional indicators of competitiveness is, that certain products are counted twice in the total exports. Once as an intermediate product and then as a final product. Since the products can cross borders not only once or twice, but sometimes many times, these

indicators of competitiveness became unreliable. Within the supply chain each manufacturer buys inputs and then adds value (additional value-added) that will be included in the cost of the next production stage. The problem is the official trade statistics which are measured in gross terms and which include both intermediate products and final products, thus creating a double counting problem.

In 2014, Koopman et al. expanded their original research [3]. They were able to divide the gross exports into nine separate components so they got more detailed information of the nature of the gross exports. Figure 2 represents their proposal to accounting of gross exports. They divided the gross exports into three main groups: value-added exports, domestic content in intermediate exports that finally returns home and foreign content. The first two parts represent the domestic content of the gross exports. The foreign content is divided into foreign value in final goods exports, in intermediate goods exports and double counted intermediate exports produced abroad. Domestic value-added can be created in direct final goods exports, in intermediates exports absorbed by direct importers and in intermediates re-exported to third countries. The last part represents the share of domestic content in intermediate exports that finally return to domestic country. It is divided into intermediates that return via final imports, intermediates that return via intermediate imports and double counted intermediate exports produced at home.

Figure 2

Accounting of gross exports



Source: Koopman et al. [3].

Crucial parts of the accounting of gross exports are the sixth and ninth part in the Figure 2. The higher the value of these indicators, the less reliable the value of the total gross exports. Koopman et al. [3] used the following example to explain the core idea of the Figure 2. Let's say the final product will be a doll and the inputs will be head, body, hat, dress and boots. The doll is made in USA. If the hair is attached to the head in the last stage of production process in USA, the input will be American. But in case, if the hair would be firstly exported to a country where the head of the doll is made and they attach the hair in that particular country, then the hair would be the input of a country producing the head of the doll. From this situation we can see how the gross exports would be changing, but the value added of the doll will be still the same. If the hair of the doll would be attached in the country producing head, then this item will be counted into intermediates that returns via intermediate imports. If the hair would be attached in USA, the hair would represent imported intermediate needed to produce the final product.

4.2 Input-output Model

In the submitted paper our calculations are based on the World Input-Output Tables (WIOT), which are part of the World Input-Output Database (WIOD) with the newest release in 2016. The analysis based on the input-output tables allows us to reveal the relationship between various sectors of the national economy.

The WIOD was founded in order to create a database that would serve as a tool for economic policy makers so it would be easier to analyze various economic phenomena, such as effects of globalization or fragmentation of the production processes. The database also provides solutions to various problems from the view of socio-economic aspects (for example, the number of employees or value-added creation) as well as environmental aspects (energy use, emissions and water use). Furthermore, the database gives detailed information about national production activities and international trade data [1]. WIOD provides overall overview of all transactions in the global economy.

5 Conclusions and Policy Implications

Based on the research of Koopman et al. [3], we accounted the gross exports of the V4 countries and aggregate them into six groups that give us better information about the character of the gross exports. The results can be found in appendix. Figure 3 represents only the results for the year 2000 and 2014, the first and the last year of our database.

VAX ratio represents the sum of all the domestic value-added in the gross exports.

DC share also represents the share of domestic value added in exports, but it also includes those products that return home via imports. The VAX ratio is the sum of the first three components from the Figure 2. VS share represents all the foreign value-added. VS1 share represents the value of exported products that were used as inputs from the production from other countries. Koopman et al. were able to bring something new to the world of economics, because it had never been defined such indirectly exported goods. With the help of these indicators we can easily determine the amount of exported goods that are used as inputs in that countries. The last two components are the double count share and the share of the vertical trade.

As we can see in the Appendix and also in Figure 3, the value of double count shares are relatively high in every examined country. During the period from 2000 until 2014, this value has increased and represents approximately 50 % of the total gross exports in every country except for Poland, where the share of double counted goods represents only 31%. This implies that measuring competitiveness based only on gross exports are not relevant any more.

Comparing VAX ratio and DC share has interesting economic implication. The higher the differences between these indicators, the more the particular country will move some stages of their production processes abroad, to the cheaper countries. As the results indicate, none of the V4 countries have the tendency to move their production processes to the cheaper countries. Also, interesting fact is that the share of these indicators have a declining character, so the share of the domestic value added is decreasing. This indicates, that more developed or richer countries tend to move particular stages of their production processes to V4.

Figure 3

Accounting of gross exports – V4

SVK	VAX ratio	VS share	VS1 share	DC share	Double count share	Share of vertical trade
2000	61,50%	38,24%	9,60%	61,76%	38,50%	47,84%
2014	51,69%	47,94%	8,66%	52,06%	48,31%	56,59%
CZE	VAX ratio	VS share	VS1 share	DC share	Double count share	Share of vertical trade
2000	68,28%	31,38%	10,20%	68,62%	31,72%	41,59%
2014	53,77%	45,65%	10,38%	54,35%	46,23%	56,03%
HUN	VAX ratio	VS share	VS1 share	DC share	Double count share	Share of vertical trade
2000	52,13%	47,70%	6,94%	52,30%	47,87%	54,65%
2014	48,01%	51,71%	8,31%	48,29%	51,99%	60,02%
POL	VAX ratio	VS share	VS1 share	DC share	Double count share	Share of vertical trade
2000	75,00%	24,61%	10,66%	75,39%	25,00%	35,27%
2014	68,55%	30,70%	11,85%	69,30%	31,45%	42,55%

Source: author's calculations.

To confirm this fact we look at the VS share that represents the foreign share of the country's gross exports. In the period from 2000 until 2014, this value increased in all of the V4 countries. In Slovakia, the increase represents 9%, in the Czech Republic 14%, in Hungary 4% and in Poland approximately 6%.

The VS1 indicator measures the value of exported goods that served as inputs to production in other countries. The indicator has decreasing trend in the Slovak Republic in the monitored period. In all other countries of V4 has a slightly increasing character, but only by 1-2 %.

After summing up the VS and VS1 we get the share of vertical trade that reflects how intensively countries engage in the global value chains. In all of the V4 countries the mentioned indicator increased. It means that each country engages in the global value chains more and more during the monitored period. The highest value of the share of vertical trade is in Hungary – 60 %. In the Slovak Republic and the Czech Republic is about 56%, while in Poland about 42%.

The results showed that the character of the exports of V4 countries are very similar. All of the countries increasingly participate in the global value chains, but mainly at the lower stages of production process - the lower part of the smiley-shaped curve. The foreign share of the gross exports was increasing and domestic value added was decreasing during the monitored period. It is clear, that although V4 countries belong among the developed countries, if we look at them from the view of global value chains, these countries have still room to catch up the more developed countries. The main aim in these countries should be to catch up the more developed countries, to produce goods with more domestic value-added and this would significantly boost their economic growth.

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Appendix

Table 1

Accounting of Gross Exports – Slovakia

SVK	VAX ratio	VS share	VS1 share	DC share	Double count share	Share of vertical trade
2000	61.50%	38.24%	9.60%	61.76%	38.50%	47.84%
2001	60.67%	39.06%	9.68%	60.94%	39.33%	48.74%
2002	59.98%	39.76%	9.54%	60.24%	40.02%	49.30%
2003	58.07%	41.65%	9.36%	58.35%	41.93%	51.02%
2004	56.26%	43.37%	9.66%	56.63%	43.74%	53.03%
2005	55.12%	44.50%	9.69%	55.50%	44.88%	54.20%
2006	52.04%	47.61%	9.21%	52.39%	47.96%	56.82%
2007	51.85%	47.79%	9.07%	52.21%	48.15%	56.85%
2008	53.12%	46.48%	9.06%	53.52%	46.88%	55.54%
2009	53.13%	46.50%	8.33%	53.50%	46.87%	54.83%
2010	51.99%	47.63%	8.74%	52.37%	48.01%	56.37%
2011	48.38%	51.20%	8.96%	48.80%	51.62%	60.16%
2012	50.39%	49.21%	8.66%	50.79%	49.61%	57.87%
2013	51.31%	48.32%	8.46%	51.68%	48.69%	56.78%
2014	51.69%	47.94%	8.66%	52.06%	48.31%	56.59%

Source: author's calculations.

Table 2

Accounting of Gross Exports – Czech Republic

CZE	VAX ratio	VS share	VS1 share	DC share	Double count share	Share of vertical trade
2000	68.28%	31.38%	10.20%	68.62%	31.72%	41.59%
2001	67.47%	32.15%	10.68%	67.85%	32.53%	42.84%
2002	67.23%	32.40%	10.94%	67.60%	32.77%	43.34%
2003	65.89%	33.68%	11.42%	66.32%	34.11%	45.10%
2004	61.77%	37.73%	11.45%	62.27%	38.23%	49.17%
2005	60.24%	39.23%	11.01%	60.77%	39.76%	50.24%
2006	58.98%	40.49%	11.03%	59.51%	41.02%	51.51%
2007	58.13%	41.30%	11.28%	58.70%	41.87%	52.58%
2008	58.97%	40.43%	11.22%	59.57%	41.03%	51.65%
2009	60.49%	38.92%	10.38%	61.08%	39.51%	49.30%
2010	56.85%	42.56%	10.37%	57.44%	43.15%	52.93%
2011	55.18%	44.20%	10.52%	55.80%	44.82%	54.73%
2012	54.31%	45.09%	10.26%	54.91%	45.69%	55.34%
2013	54.46%	44.96%	10.52%	55.04%	45.54%	55.48%
2014	53.77%	45.65%	10.38%	54.35%	46.23%	56.03%

Source: author's calculations.

Table 3

Accounting of Gross Exports - Hungary

HUN	VAX ratio	VS share	VS1 share	DC share	Double count share	Share of vertical trade
2000	52.13%	47.70%	6.94%	52.30%	47.87%	54.65%
2001	54.09%	45.75%	7.56%	54.25%	45.91%	53.31%
2002	55.44%	44.39%	7.90%	55.61%	44.56%	52.28%
2003	54.25%	45.55%	8.14%	54.45%	45.75%	53.69%
2004	53.05%	46.71%	8.38%	53.29%	46.95%	55.09%
2005	52.31%	47.42%	8.49%	52.58%	47.69%	55.90%
2006	48.87%	50.86%	8.09%	49.14%	51.13%	58.96%
2007	48.98%	50.73%	8.16%	49.27%	51.02%	58.89%
2008	48.86%	50.86%	7.82%	49.14%	51.14%	58.68%
2009	52.16%	47.60%	7.57%	52.40%	47.84%	55.17%
2010	48.43%	51.33%	7.53%	48.67%	51.57%	58.86%
2011	47.25%	52.49%	7.75%	47.51%	52.75%	60.24%
2012	47.79%	51.95%	8.35%	48.05%	52.21%	60.30%
2013	48.69%	51.04%	8.50%	48.96%	51.31%	59.54%
2014	48.01%	51.71%	8.31%	48.29%	51.99%	60.02%

Source: author's calculations.

Table 4

Accounting of Gross Exports – Poland

POL	VAX ratio	VS share	VS1 share	DC share	Double count share	Share of vertical trade
2000	75.00%	24.61%	10.66%	75.39%	25.00%	35.27%
2001	75.94%	23.65%	11.24%	76.35%	24.06%	34.89%
2002	74.75%	24.82%	11.73%	75.18%	25.25%	36.55%
2003	72.31%	27.25%	11.46%	72.75%	27.69%	38.71%
2004	71.85%	27.67%	11.82%	72.33%	28.15%	39.50%
2005	72.23%	27.27%	11.99%	72.73%	27.77%	39.26%
2006	69.49%	29.94%	11.91%	70.06%	30.51%	41.85%
2007	68.54%	30.83%	11.79%	69.17%	31.46%	42.62%
2008	68.24%	31.09%	11.34%	68.91%	31.76%	42.42%
2009	71.93%	27.46%	11.22%	72.54%	28.07%	38.69%
2010	68.54%	30.77%	11.59%	69.23%	31.46%	42.36%
2011	66.92%	32.35%	11.74%	67.65%	33.08%	44.09%
2012	68.01%	31.29%	11.90%	68.71%	31.99%	43.19%
2013	68.62%	30.66%	11.77%	69.34%	31.38%	42.43%
2014	68.55%	30.70%	11.85%	69.30%	31.45%	42.55%

Source: author's calculations.