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V. Mytsenko,
PhD (Pedagogy),
Associate Professor,
ORCID 0000-0001-6034-0224,
e-mail: valeriy369@hotmail.com,
Central Ukrainian National Technical University, Kropyvnytskyi

THE IMPACT OF UKRAINE'S PARTICIPATION IN GLOBAL VALUE CHAINS ON THE COMPETITIVENESS OF THE NATIONAL ECONOMY

Problem statement. Global value chains (GVCs) have fundamentally changed the world production system and globalisation processes, increasing international integration and specialisation of economies. They account for almost 50% of global trade. Experts estimate that a 1% increase in a country's participation in GVCs increases per capita income by more than 1%, which is about twice as much as in the case of traditional trade. Unlike the classical model, where goods are produced in one country and sold in another, GVCs involve multiple crossings of national borders at different stages of production. In today's world, the traditional 'Made in' labelling is gradually losing its relevance, as most goods are now produced in global cooperation – *Made in the World* [1, p. 1].

A global value chain is a series of stages in the production of a product or service where each stage adds value and at least two of them are performed in different countries. For example, if a bicycle is assembled in Finland using parts from Italy, Japan and Malaysia and then exported to Egypt, this is an example of a GVC. According to this approach, a country, sector or company is considered to be a member of a GVC if it is integrated into at least one of its stages [2, p. 17, 71]. The place of a country in GVCs directly depends on the country's specialisation, its industrial, research and innovation potential, and whether it is able to use foreign technologies and create its own breakthrough innovations.

Analysis of recent research and publications. Global value chains have become an object of empirical research relatively recently. The growing interest in this topic is driven by both the increasing role of GVCs in the context of progressive globalisation and fragmentation of production processes, and the emergence of specialised databases that allow for relevant calculations.

In the academic literature, GVCs are studied in terms of their potential impact on various aspects of the economy, including economic growth, productivity, foreign direct investment (FDI), wages, the environment, etc. Some studies are aimed at identifying the factors that influence countries' participation in GVCs [5; 6], while others focus on statistical analysis that allows identifying differences among countries in terms of their level of integration and positioning in these chains [7; 8].

Interesting results have been demonstrated by the study aimed at identifying key factors that determine the difference between the European Union (EU) member states in terms of their level of participation in global value chains. This level is measured as a combination of indicators of backward and forward linkages. The EU member states were analysed both as a whole and by dividing them into 'old' member states and newer member states that joined later. Based on the data for 1995-2011, the author identified the key determinants of these countries' involvement in global value chains, including economic growth with a certain time lag, foreign direct investment, the level of financial sector development, the share of services in GDP, the share of high-tech products in exports, and the level of wages. The impact of these factors varies depending on the group of countries under analysis [9].

In the study based on a sample of 43 countries over the period 2000-2014 [6], the authors analysed the impact of various factors on five indicators of participation in GVCs, including the level of forward and backward integration. Based on the results of the analysis, they conclude that the size of the economy and openness to FDI are the key determinants of involvement in GVCs. They also emphasise that integration into GVCs depends on industry specifics and the level of technological development of the sector. At the same time, human capital and institutional quality factors in this study did not demonstrate a statistically significant impact on any of the indicators of participation in global chains.

One of the largest studies on the factors that determine the level of integration of countries into GVCs is the World Bank report [2]. The analysis, which covered almost 200 countries, led to a number of key conclusions. In particular, it was confirmed that a country's integration into GVCs depends on the level of supply of production factors, market size, geographic location, and the quality of institutions. The study also showed that low-skilled labour and FDI are important for enhancing backward linkages, while the availability of natural resources contributes to the growth of forward integration into value chains [2].

Among the works of Ukrainian scientists, it is worth noting the study [10], which is devoted to empirical analysis using panel data for EU member states to assess the impact of key macroeconomic indicators on their added value and competitiveness for the period 2006-2018. The researchers found that the key factors of value added growth for EU member states are strengthening the national currency, reducing the budget deficit, importing high-tech products, developing human capital, reducing corruption and increasing GDP. Based on their findings, they outlined priority areas of government regulation aimed at increasing added value, including budget balance, investment in human capital, maintaining currency stability and fighting corruption.

Taking into account the results of the studies reviewed, it can be concluded that a country's integration into global value chains is largely determined by the combination of production factors, the level of innovation potential and the quality of the institutional environment. For Ukraine, which is in need of structural transformation of its economy and seeks to strengthen its position in the international division of labour, it is particularly important to assess the factors that influence involvement of its industry in global value chains. Understanding these determinants will help to identify strategic directions for the development of national production aimed at increasing the technological component of exports and strengthening competitiveness.

The objective of the article is to identify and analyse the factors that have the greatest impact on the participation of Ukrainian industry in global value chains, as well as assessing their impact on improving the competitiveness of the national economy in the context of globalisation.

Presentation of the main research material. Global value chains, which connect companies from different countries through mutual flows of goods, services and information, are important for the economies of the countries involved. As global trade grows, these chains affect both the global economy in general and the economic development of individual countries in particular. The level of a country's integration into GVCs depends on its resource potential, the efficiency of natural and human resources, and changes in the macroeconomic environment. Close economic ties among countries open up new opportunities for development, but also pose challenges due to growing competition. In this context, in order to be competitive within global chains, it is important to focus on production factors that are difficult to transfer abroad, which ensures stability and long-term benefits for the country.

The analysis of scientific studies has shown that important factors for participation in GVCs are the qualifications of the labour force, access to investment (both domestic and foreign), the level of technological development of enterprises and their ability to introduce latest technologies for the manufacture of innovative products. Based on the results of studies analysing the impact of these factors on the participation of different countries in GVCs, it can be concluded that the efficiency of using these resources varies depending on the level of economic development of the country. In this context, it is advisable to put forward several hypotheses regarding the factors that influence the integration of the Ukrainian industry into GVCs.

Hypothesis 1: the degree of Ukraine's integration into global value chains is determined by the number of employees employed in industry, the level of innovation of industrial enterprises, and the volume of investments in the development of these enterprises.

Hypothesis 2: The share of foreign gross value added in Ukraine's exports depends on the level of employment in industry, the technical level of industrial enterprises, their ability to innovate, and the amount of investment attracted.

Hypothesis 3: The volume of national gross value added in Ukraine's exports depends on the level of employment in the industrial complex, the innovation activity of industrial enterprises, technological upgrading of their production, and the sufficiency of investment resources for the development of these enterprises.

To test the above-mentioned hypotheses, correlation and regression analysis will be applied, including the construction of linear regression models using ‘Statistica 7.0’ software. To confirm or refute the first hypothesis, a regression analysis will be conducted, where the coefficients of reverse participation, direct participation and the overall indicator of Ukraine's participation in global value chains will be used as the dependent variable (Table 1).

The independent variables are:

1) indicators characterising the employment of the able-bodied population in industry (X_1 is the number of people employed in industry, thousand people; X_2 is the share of industrial employees in the total number of employees, %);

2) indicators that characterise innovation activity and the ability to technologically upgrade production facilities (X_3 is the share of sold innovative products (goods, services) in the total volume of sold products (goods, services) of industrial enterprises, %; X_4 is the number of types of innovative products (goods, services) introduced in the reporting year, units; X_5 is the share of the number of industrial enterprises that introduced innovations (products and/or technological processes) in the total number of industrial enterprises, %; X_6 – research and development costs, million USD; X_7 is the share of expenditures on research and development in GDP, %);

3) indicators characterising the volume of investment in the processing industry (X_8 – FDI in the processing industry, million USD; X_9 is capital investment in the industry, million USD). USD; X9 – capital investments in the industry, USD million. USD) (Table 2).

Table 1

Indicators of Ukraine's participation in global value chains

Year	Reverse participation coefficient, %	Direct participation coefficient, %	Overall participation indicator in GVCs, %	Position of the country in GVCs
	gvcb_share	gvcf_share	gvc_share	gvc_position
2010	29,71	21,00	50,71	-0,33
2011	31,74	22,00	53,74	-0,35
2012	32,88	19,00	51,88	-0,53
2013	29,40	20,00	49,40	-0,37
2014	29,44	21,00	50,44	-0,32
2015	30,00	20,00	50,00	-0,39
2016	29,06	20,00	49,06	-0,36
2017	28,88	22,00	50,88	-0,26
2018	27,88	23,00	50,88	-0,19
2019	25,87	23,00	48,87	-0,11
2020	23,70	22,00	45,70	-0,07

Source: calculated by the author according to [11].

Table 2

Statistical data characterising human, innovation and investment determinants of Ukraine's participation in GVCs

Year	Value of the independent variable								
	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
2010	3461,5	18,0	3,8	2408	11,5	1022,3	0,75	90,2	6984,2
2011	3352,7	17,4	3,8	3238	12,8	1069,5	0,65	125,5	9890,2
2012	3236,7	16,8	3,3	3403	13,6	1179,0	0,67	134,3	11464,1
2013	3170,0	16,4	3,3	3138	13,6	1282,7	0,70	147,4	12212,0
2014	2898,2	16,0	2,5	3661	12,1	798,6	0,60	171,2	7259,4
2015	2573,9	15,7	1,4	3136	15,2	503,8	0,55	131,5	4013,6
2016	2494,8	15,3	1,1	4139	16,6	451,3	0,48	108,7	4608,8
2017	2440,6	15,1	0,7	2387	14,3	503,2	0,45	117,1	5389,2
2018	2426,0	14,8	0,8	3843	15,6	616,7	0,47	122,5	7349,1
2019	2461,5	14,8	1,3	2148	13,8	667,7	0,43	106,6	9837,3
2020	2358,6	14,8	1,9	4066	14,9	631,4	0,41	77,8	6696,5

Source: calculated by the author.

The regression analysis revealed a weak correlation (R=0.615) between the coefficient of Ukraine's reverse participation in GVCs (gvcb_share) and the volume of FDI that annually entered the manufacturing industry (Table 3). The relationship between the dependent and independent variables is direct: a 1% increase in FDI in the manufacturing industry leads to a 0.251% increase in the coefficient of reverse participation in GVCs, ceteris paribus. The coefficient of determination (R2=0.378) shows that the change in Ukraine's GVCs return ratio was only 37.8% dependent on FDI inflows into manufacturing, and 62.2% dependent on other factors. The relationship between the variables is not very tight, but the regression results are acceptable, since the calculated value of the Fisher's criterion exceeds its tabulated value, and the statistical error level does not exceed 5%.

The relationship between the indicator of Ukraine's direct participation in GVCs and the share of R&D expenditures in GDP is even weaker than the relationship discussed above, as evidenced by the low value of the correlation coefficient (R=0.567). The relationship between these indicators is inverse: a 1% increase in the independent variable causes a 0.166% decrease in the dependent variable, ceteris paribus. The coefficient of determination shows that the change in the value of direct participation in GVCs is only 32.1% dependent on the share of R&D expenditures in GDP. The relationship between the variables is not tight, as evidenced by the low estimated value of the Fisher's criterion. At the same time, the level of statistical error does not exceed 10%, which is acceptable.

A more significant relationship (R=0.762) was found between the overall indicator of Ukraine's participation in GVCs and such factors as the share of employees of industrial enterprises in the total number of employed and the share of sold innovative products in the total volume of sold products of industrial enterprises. The relationship between the dependent variable and the share of employees of industrial enterprises in the total number of employees was direct: a 1% increase in the independent variable resulted in a 0.798% increase in the overall participation rate in GVCs, ceteris paribus. The relationship between the dependent variable and the share of innovative products in the total volume of industrial sales was inverse: a 1% increase in the independent variable resulted in a 0.058% decrease in the dependent variable, ceteris paribus. The coefficient of determination indicates that the overall indicator of Ukraine's participation in GVCs

depends by 58.1% on changes in the share of employees of industrial enterprises in the total number of employed and the share of innovative products in the total volume of industrial enterprises' sales, and by 41.9% on other factors. The level of statistical error does not exceed 10%, which indicates the acceptability of the results.

Table 3

Influence of the main factors of industrial production on Ukraine's participation in GVCs in 2010-2021

Factorial signs	Dependent variable		
	gvcb_share	*gvcf_share*	*gvc_share*
Number of observations	11	11	11
Constant value	2,159*** (0,514)	2,951*** (0,051)	1,741** (0,686)
X_8	0,251** (0,107)	–	–
X_7	–	-0,166* (0,080)	–
X_2	–	–	0,798** (0,253)
X_3	–	–	-0,058* (0,027)
R	0,615	0,567	0,762
R^2	0,378	0,321	0,581
F-criterion	F(1,9)=5,478	F(1,9)=4,272	F(2,8)=5,556

** – statistical error rate 10%;*
*** – statistical error rate 5%;*
**** – statistical error rate 1%.*
Source: calculated by the author.

According to the regression analysis, there is no correlation between the coefficient of Ukraine's indirect participation in GVCs and indicators characterising the employment of the working-age population in industry and the innovative activity of industrial enterprises, as well as the volume of capital investment in industry. There is no correlation between the coefficient of Ukraine's direct participation in GVCs and indicators characterising employment of the working-age population in industry and investment in industry, as well as indicators of the share of innovative products in the total volume of industrial sales, the number of introduced types of innovative products, the share of innovative enterprises in the total number of industrial enterprises, and the cost of research and development. The overall indicator of Ukraine's participation in GVCs was not affected by the dynamics of such indicators as the number of people employed in industry, the number of types of innovative products introduced in the reporting year, the share of innovative enterprises in the total number of industrial enterprises, R&D expenditures, the share of R&D expenditures, FDI in manufacturing, and capital investments in industry.

Thus, the main factor of Ukraine's reverse participation in GVCs in the period under study was foreign direct investment in the manufacturing industry, while direct participation in GVCs was determined with a relatively high error by changes in the share of R&D expenditures in GDP. The main determinants of Ukraine's overall participation in GVCs were the share of employees of industrial enterprises in the total number of employed persons and the share of innovative products in the total volume of industrial products sold.

The main indicator used to assess Ukraine's participation in global value chains is the foreign gross value added in exports, which shows the extent to which imported intermediate goods are used by domestic industry to produce exports. To further test our hypotheses, we will conduct a regression analysis, where we will alternately use the indicators of foreign gross value added in exports and national gross value added (GVA) in exports as the dependent variable (Table 4). As independent variables, we use indicators characterising employment in industry, innovation and R&D activities of industrial enterprises, and the volume of domestic and foreign investments attracted by industrial enterprises, which are presented in Table 2.

Table 4

Dynamics of foreign and domestic gross value added in Ukraine's exports

Year	Foreign gross value added in Ukrainian exports, million USD	National gross value added in exports, million USD
	For_comp	*Nat_comp*
2010	14387	34039
2011	19109	41096
2012	20985	42836
2013	17967	43150
2014	15355	36810
2015	12246	28578
2016	11406	27848
2017	13189	32472
2018	14010	36240
2019	14142	40519
2020	12333	39708

Source: compiled by the author according to [11].

The results of the regression analysis revealed a strong link between the content of foreign GVA in Ukraine's exports and indicators characterising the employment of the working-age population in industry, as evidenced by the high value of the correlation coefficient (Table 5). The relationship between the volume of foreign GVA in exports and the number of people employed in industry was direct: a 1% increase in the independent variable led to a 3.727% increase in the dependent variable, ceteris paribus. At the same time, the relationship between the volume of foreign GVA in exports and the share of industrial employees in total employment was inverse: a 1% increase in the independent variable resulted in a 6.032% decrease in the dependent variable, ceteris paribus. The coefficient of determination shows that during the period under study, the volume of foreign GVA in Ukraine's exports depended on changes in industrial employment by 84.5% and other factors by 15.5%. The calculated value of the Fisher's criterion exceeds its tabulated value (F(2,8)=21.897), which indicates the tightness of the relationship between the dependent and independent variables. The statistical error in calculating the constant value was 13%, but the error in calculating the coefficients for the independent variables was less than 1%. Taking into consideration the high values of the correlation and determination coefficients, Fisher's criterion, and the low error rate for the coefficients on independent variables, the results of the calculations can be considered acceptable.

The regression analysis revealed no correlation between the volume of foreign GVA in Ukraine's exports and indicators characterising the innovation activity of industrial enterprises and the volume of foreign and capital investments in industry. Thus, the number of people employed in industry and the share of industrial employees in the total number of employees were the main determinants that influenced the foreign GVA content of exports, which is the basis for determining the level of Ukraine's reciprocal participation in GVCs. The impact of other indicators characterising the innovation and investment activities of the industry was not statistically significant.

Table 5 shows a strong significant relationship (R=0.919) between the share of national GVA in Ukraine's exports and foreign direct investment in manufacturing (X_8), the share of R&D expenditure in GDP (X_7), and R&D expenditure (X_6). The relationship between the dependent variable and the volume of FDI in manufacturing was direct: a 1% increase in the independent variable contributed to a 0.093% increase in the share of national GVA in exports.

An inverse relationship was found between the dependent variable and the share of R&D expenditures in GDP: a 1% increase in the independent variable resulted in a 0.804% decrease in the dependent variable, ceteris paribus. This relationship between these variables is due to the fact that the vast majority of R&D expenditures are directed to the research sector, where basic research and experimental work is carried out, and almost no funds are directed to the industry sector to introduce new technologies. Consequently, in the absence of links between innovation developers and industrial enterprises, the transfer of technologies needed by industry does not take place. Consequently, the domestic R&D sector is not currently a stimulating factor for increasing Ukraine's national GVA in exports.

Table 5

Dependence of foreign and national GVA in Ukraine's exports on changes in industrial production factors in 2010-2021

Factorial signs	Dependent variable	
	For_comp	*Nat_comp*
Number of observations	11	11
Constant value	-3,271 (1,969)	5,084*** (0,208)
X_1	3,727*** (0,766)	-
X_2	-6,032*** (1,652)	-
X_8	-	0,093*** (0,023)
X_7	-	-0,804*** (0,038)
X_6	-	0,677*** (0,021)
R	0,919	0,996
R^2	0,845	0,993
F-criterion	F(2,8)=21,897	F(3,7)=359,35

** – statistical error rate 10%;*
*** – statistical error rate 5%;*
**** – statistical error rate 1%.*
Source: calculated by the author

A direct relationship characterises the dependence of the content of national GVA in exports on changes in R&D expenditures of enterprises: a 1% increase in the independent variable contributed to a 0.677% increase in the dependent variable, ceteris paribus. Thus, an increase in R&D expenditures in the industry sector of the economy has a positive impact on the international competitiveness of domestic products.

The high value of the coefficient of determination shows that the share of national GVA in Ukraine's exports depended by 99.3% on changes in the volume of FDI attracted to the manufacturing industry, the share of R&D expenditures in GDP, and R&D expenditures by enterprises, and only by 0.7% on other factors. The tightness of the relationship between the dependent and independent variables is confirmed by the high calculated value of Fisher's criterion (F(3,7)=359.35). The statistical error of the regression does not exceed 1%, which indicates the statistical significance of the results.

There is no correlation between the share of national GVA in Ukraine's exports and the employment of the working-age population in industry, the volume of capital investment in industry, as well as the share of

innovative products in the total volume of industrial sales, the number of innovative products introduced, and the share of industrial enterprises that introduced innovations in the total number of industrial enterprises.

Thus, according to the results of our study, the main determinants of the volume of foreign GVA in Ukraine's exports in the period under study were the indicators of employment of the working-age population in industry. The content of national GVA in Ukraine's exports during this period was determined by changes in foreign direct investment in the manufacturing industry, the share of R&D expenditures in GDP, and R&D expenditures.

The impact of Ukraine's participation in global value chains on key industry indicators. In the context of globalisation [12], it is not so much the sales of industrial products that have a much greater impact on economic development and employment, but the extent of participation of national enterprises in production processes. Global value chains allow national economies to specialise in those stages of production where they have a competitive advantage, using intermediate products and services sourced from other countries, which eliminates the need to manage all stages of production. Although a significant portion of value added is related to services, industrial production remains the main element of GVCs.

In view of this, it can be assumed that to ensure the country's competitive position in GVCs, not only factors related to industrial employment, innovation activities of industrial enterprises and attraction of investments in the manufacturing industry are important, but also the impact of the degree of involvement of the national economy in GVCs on the development of the manufacturing industry.

To achieve this goal, we will test the impact of the level of a country's involvement in GVCs on the main indicators of the manufacturing industry development. At the first stage, we will use the linear regression method, where the independent variables are the coefficients of Ukraine's reverse, direct and total participation in global value chains (Table 1), as well as the indicators of foreign and domestic gross value added in Ukraine's exports (Table 4).

As dependent variables, we used the indicators that best reflect the development of Ukraine's manufacturing industry. These include: the number of introduced types of innovative products, the volume of sold products of the processing industry, the share of industrial enterprises that implemented innovations in the total number of industrial enterprises, and the level of employment in the industry (Table 6). At the same time, the regression analysis revealed no significant correlation between industrial development indicators and the coefficients of Ukraine's indirect, direct and total participation in GVCs, as well as changes in the content of national gross value added in Ukraine's exports.

Table 6

Indicators of industrial development in Ukraine

Years	Number of innovative products introduced, total units	Volumes of products sold in the processing industry, million USD	Share of industrial enterprises that introduced innovations in the total number of industrial enterprises, %	Number of people employed in industry, thousand people
	Innov_prod	*Prod_ind*	*Innov_ent*	*Empl_ind*
2010	2408	88693,57	11,5	3461,5
2011	3238	107102,7	12,8	3352,7
2012	3403	109029,6	13,6	3236,7
2013	3138	102344,7	13,6	3170,0
2014	3661	76071,99	12,1	2898,2
2015	3136	52161,78	15,2	2573,9
2016	4139	51378,83	16,6	2494,8
2017	2387	61207,38	14,3	2440,6
2018	3843	69316,4	15,6	2426,0
2019	2148	70755,7	13,8	2461,5
2020	4066	69709,77	14,9	2358,6

Source: compiled by the author.

At the same time, the results show that there is a direct dependence of the number of people employed in industry and the sales of manufacturing enterprises on changes in the content of foreign GVA in Ukraine's exports (Table 7). The relationship between the number of people employed in industry and the import component of exports is relatively weak, as the correlation coefficient was 0.766, and the statistical error in calculating the constant exceeded 10%. Nevertheless, with a probability of 58.8%, it can be stated that a 1% increase in the content of foreign value added in exports would result in a 0.582% increase in the number of people employed in industry, ceteris paribus. The statistical error of this dependence did not exceed 1%, and the calculated value of Fisher's criterion exceeded its tabular value, which indicates the acceptability of the results.

The relationship between the volume of manufacturing exports and the import component of Ukraine's exports is strong (R=0.93), and the impact of the independent variable on the dependent variable is significant: a 1% increase in the independent variable

Table 7

Dependence of Ukraine's industrial development indicators on indicators of involvement in GVCs

Factorial signs	Dependent variable	
	Empl_ind	*Prod_ind*
Number of observations	11	11
Constant value	2,341 (1,558)	-1,051 (1,611)
For_comp	0,582*** (0,162)	1,279*** (0,167)
R	0,766	0,930
R^2	0,588	0,865
F- criterion	F(1,9)=12,856	F(1,9)=58,145

** – statistical error rate 10%;*
*** – statistical error rate 5%;*
**** – statistical error rate 1%.*
Source: calculated by the author.

leads to a 1.279% increase in the dependent variable, ceteris paribus. Although the statistical error in the calculation of the constant exceeds 10%, the estimate of the dependence of the volume of manufacturing sales on changes in the foreign content of GVA in exports is statistically significant, as the error did not exceed 1%. The coefficient of determination shows that the change in the volume of manufacturing sales was 86.5% dependent on imports of intermediate goods as a component of exports, and 13.5% dependent on other factors. The calculated value of the Fisher's criterion exceeded its tabulated value, which confirms the tightness of the relationship between the dependent and independent variables.

Since there is no correlation between industrial development indicators and most of the indicators characterising Ukraine's participation in global value chains, we will conduct an additional study using the share of foreign value added in exports by major industries as independent variables (Table 8). The dependent variables are the same as in the previous regression analysis (Table 6).

Table 8

The share of foreign value added embodied in imported inputs in Ukraine's gross exports in 2010-2020, %

Year	Food products, beverages, tobacco	Textiles, clothing	Wood and paper products	Chemical and pharmaceutical products	Base metals and finished products	Computers, electronic and electrical equipment	Machinery and equipment	Transport equipment
	Food	*Textil*	*Wood*	*Chem*	*Metal*	*Comp*	*Machin*	*Transp*
2010	24,7	15,8	34,0	46,0	46,5	30,2	30,7	31,7
2011	26,4	18,4	37,4	48,0	48,3	34,4	34,8	36,4
2012	29,7	23,6	41,1	48,6	50,0	39,4	39,1	36,4
2013	29,0	22,3	39,9	47,1	49,4	39,5	36,1	30,9
2014	28,2	22,9	38,1	43,6	45,8	38,1	35,9	31,8
2015	27,7	25,0	38,3	44,2	47,2	39,3	37,2	34,6
2016	28,5	26,5	37,9	42,0	43,6	38,4	35,7	34,5
2017	29,1	27,8	37,2	42,6	42,1	37,3	35,2	33,3
2018	28,5	27,9	36,7	41,5	38,6	36,5	34,0	34,4
2019	28,2	27,4	34,4	40,2	36,2	35,1	32,9	33,1
2020	25,0	25,7	32,0	37,3	34,3	35,1	33,3	33,4

Source: compiled by the author based on data.

According to the results of the calculations, there is no statistically significant relationship between such indicators of industrial development as the number of introduced types of innovative products and the volume of sold products of the processing industry and the share of foreign added value embodied in imported resources in the gross exports of the main industries of Ukraine. There is also no statistically significant relationship between such indicators as the share of industrial enterprises that implemented innovations in the total number of industrial enterprises and the number of people employed in industry, and the share of foreign value added embodied in imported inputs in Ukraine's gross exports of food, wood and paper products, chemical and pharmaceutical products, machinery and equipment, and vehicles. There is no statistically significant relationship between the number of people employed in industry and the import component of exports of food products, textiles and clothing, wood products, chemicals and pharmaceuticals, machinery and equipment, and vehicles.

However, the study found a direct significant (R=0.783) relationship between the share of industrial enterprises that implemented innovations in the total number of industrial enterprises and changes in the share of foreign value added in textile and clothing exports: with a 1% increase in the independent variable, the dependent variable increased by 0.475%, ceteris paribus (Table 9). The coefficient of determination indicates that the introduction of innovations at industrial enterprises depended by 61.3% on the content of imported components in exports of textile products and clothing, which indicates the modernisation of enterprises in this industry. The calculated value of the

Fisher's criterion exceeds its tabulated value, which confirms the existence of a close relationship between the dependent and independent variables. The statistical significance of the calculation results is acceptable, since the level of statistical error of the regression did not exceed 5%.

Table 9

Dependence of Ukraine's industrial development indicators on the share of foreign value added in exports by industry sector

Factorial signs	Dependent variable	
	Innov_ent	*Empl_ind*
Number of observations	11	11
Constant value	1,130** (0,398)	7,292*** (1,012)
Textile	0,475*** (0,125)	-
Metal	-	1,045*** (0,167)
Comp	-	-0,916*** (0,268)
R	0,783	0,917
R^2	0,613	0,841
F- criterion	F(1,9)=14,303	F(2,8)=21,275

** – statistical error rate 10%;*
*** – statistical error rate 5%;*
**** – statistical error rate 1%.*
Source: calculated by the author.

The regression analysis revealed a strong (R=0.917) relationship between the number of people employed in industry and the share of foreign value added in exports of basic metals and finished metal products, computers, electronic and electrical equipment. The relationship between the number of employed and the import component of exports of basic metals and finished metal products was direct: a 1% increase in the independent variable led to a 1.045% increase in the dependent variable, ceteris paribus. At the same time, the relationship between the number of people employed in industry and the share of imported GVA in exports of computers, electronic and electrical equipment was inverse: a 1% increase in the independent variable resulted in a 0.916% decrease in the dependent variable, ceteris paribus. The coefficient of determination shows that the number of people employed at industrial enterprises depended by 91.7% on the content of imported components in exports of computers, electronic and electrical equipment, and only by 8.3% on other factors. The calculated value of the Fisher's criterion exceeds its tabulated value, which confirms the tightness of the relationship between the dependent and independent variables. The level of statistical error in the regression did not exceed 1%, which indicates the statistical significance of the results.

A regression analysis of the dependence of the main indicators of industrial development on the share of final products in Ukraine's exports by industry sector in 2010-2021 revealed a significant (R=0.868) direct impact of exports of finished woodworking products on the volume of processed industry sales: a 1% increase in the independent variable contributed to a 2.54% increase in the dependent variable, ceteris paribus (Table 9). The coefficient of determination shows that the volume of industry sales depended by 86.8% on the content of final products in exports of wood and wood products, and by 13.2% on other factors. The calculated value of the Fisher's criterion exceeds its tabulated value (F(1,9)=27.673), which confirms the existence of a close relationship between the dependent and independent variables. The level of statistical error of the regression did not exceed 1%, which indicates the statistical significance of the results.

There is a direct strong (R=0.95) dependence of the number of people employed at industrial enterprises on the share of final products in textile exports: a 1% increase in the independent variable contributed to a 2.732% increase in the dependent variable, ceteris paribus (Table 10). The coefficient of determination shows that the number of people employed at industrial enterprises depended by 90.2% on the content of final products in textile and clothing exports, and by 9.8% on other factors. The calculated value of the Fisher's criterion exceeds its tabulated value (F(1,9)=83.455), which confirms the existence of a close relationship between the dependent and independent variables. The level of statistical error of the regression did not exceed 5%, which indicates the acceptability of the results.

Table 10

Dependence of Ukraine's industrial development indicators on the share of final products in exports by industry sector

Factorial signs	Dependent variable	
	Prod_ind	*Empl_ind*
Number of observations	11	11
Constant value	4,586*** (1,263)	-4,055** (1,312)
Wood	2,540*** (0,482)	-
Textile	-	2,732*** (0,299)
R	0,868	0,950
R^2	0,754	0,902
F- criterion	F(1,9)=27,673	F(1,9)=83,455

** – statistical error rate 10%;*
*** – statistical error rate 5%;*
**** – statistical error rate 1%.*
Source: calculated by the author.

According to the regression analysis, there is no statistically significant relationship between such indicators of industrial development as the number of innovative products introduced and the share of industrial enterprises that introduced innovations in the total number of industrial enterprises and the share of final products in exports of products of major industries.

There is also no statistically significant relationship between such indicators as the volume of industrial output sold and the number of people employed in industry and the share of final products in exports of products from such industries as food, chemical and pharmaceutical products, basic metals and finished metal products, computers, electronic and electrical equipment, machinery and equipment, and vehicles. There is no statistically significant relationship between the number of people employed in industry and the share of final products in exports of wood and paper products, nor between the volume of industrial sales and the share of final products in exports of textiles and clothing.

Thus, the study has shown that the impact of Ukraine's participation in global value chains is mainly manifested through the dependence of the number of people employed in industry and the volume of industrial products sold on the foreign value added in exports. The growth in the share of foreign value added in exports of textiles and clothing, basic metals, and finished metal products plays a major role in the development of Ukrainian industry, which contributes to the innovation activity of industrial enterprises and increases employment in industry. At the same time, an increase in the imported component of exports of computers, electronic and electrical equipment leads to a decrease in the number of people employed in industry, but does not affect other indicators of industrial development. The increase in the share of final products in exports of wood products and textiles and clothing, which indicates the involvement of these industries in GVCs at the last stages of the production process, had a positive impact on the volume of industrial output sold and the number of people employed in industry, respectively.

Conclusions. The article analyses and evaluates the factors that have the greatest impact on the participation of Ukrainian industry in global value chains. The regression analysis *confirmed the first hypothesis* regarding the dependence of Ukraine's return participation in GVCs in 2010-2020 on the volume of foreign direct investment in the manufacturing industry, the weak influence of the share of R&D expenditures in GDP on the degree of direct participation in GVCs, and the influence of the share of industrial employees in the total number of employed and the share of innovative products in the total volume of industrial products sold on the degree of Ukraine's overall participation in GVCs in the studied period.

The second hypothesis about the impact of employment rates of the able-bodied population in industry on the volume of foreign gross value added in Ukraine's exports in the study period *was partially confirmed*. At the same time, there was no influence of indicators of innovation activity of industrial enterprises, the volume of FDI in the manufacturing industry and capital investment in industry on the content of foreign gross value added in Ukraine's exports.

The results of the regression analysis *confirmed the third hypothesis* regarding the dependence of the national GVA content in Ukraine's exports on the dynamics of foreign direct investment in the manufacturing industry, the share of R&D expenditures in GDP, and R&D expenditures.

The impact of Ukraine's participation in GVCs on the development of the domestic manufacturing industry in 2010-2020 was manifested through:

– dependence of the number of people employed in industry and the volume of industrial products sold on the foreign content of GVA in exports;

– the dependence of the level of innovation activity of industrial enterprises and the number of people employed in industry on the growth of the share of foreign value added in exports of textiles and clothing, basic metals and finished metal products;

– the inverse dependence of the number of people employed in industry on the increase in the imported component in exports of computers, electronic and electrical equipment;

– the positive impact of the share of final products in exports of wood products on the volume of industrial output sold, as well as the impact of the share of final products in exports of textiles and clothing on the growth of the number of people employed in industry.

Therefore, at the level of public policy, it is necessary to promote deeper integration of Ukrainian industry into global value chains, in particular by strengthening support for foreign direct investment in the manufacturing industry and enhancing the innovation activities of enterprises. It is also important to focus on the development of sectors with a high share of foreign value added in exports, such as textiles, clothing, and metallurgical products, which have a positive impact on employment. In addition, it is necessary to stimulate the reduction of dependence on imported components in high-tech exports and support the development of final production to restore and ensure the competitiveness of the national economy.

Prospects for further research include an in-depth study of the relationship between the integration of the national economy into global value chains and the transformation of the structure of national production, in particular through the study of the impact of digital technologies on the efficiency of industrial enterprises.

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Миценко В. Вплив участі України в глобальних ланцюгах створення вартості на конкурентоспроможність національної економіки

У статті здійснено ідентифікацію та аналіз ключових чинників, що визначають участь української промисловості в глобальних ланцюгах створення вартості (GVCs), з особливою увагою до їхнього впливу на конкурентоспроможність національної економіки в умовах глобалізаційних процесів. За допомогою регресійного аналізу підтверджено, що пряма участь України у GVCs значною мірою залежить від обсягів прямих іноземних інвестицій у переробну промисловість, а також впливу працевлаштованих у промисловому секторі та обсягу інноваційної продукції на загальну інтеграцію у GVCs. Частково підтверджено гіпотезу щодо впливу зайнятості в промисловості на вміст іноземної доданої вартості в експорті. Результати аналізу підкреслюють важливість розвитку певних секторів, таких як текстильна промисловість та металургія, що позитивно відображається на рівні зайнятості та інноваційній активності. Водночас виявлено необхідність скорочення залежності від імпортної складової у виробах високих технологій. На основі отриманих висновків окреслено пропозиції для державної політики, що передбачають посилення підтримки інвестицій в переробну промисловість, стимулювання інноваційних процесів та розвитку виробництва кінцевої продукції, що сприятиме відновленню та забезпеченню конкурентоспроможності економіки України на міжнародній арені.

Ключові слова: глобальні ланцюги створення вартості, конкурентоспроможність, національна економіка, промисловість.

Mytsenko V. The Impact of Ukraine's Participation in Global Value Chains on the Competitiveness of the National Economy

The article identifies and analyses the key factors that determine the participation of Ukrainian industry in global value chains (GVCs), with a special focus on their impact on the competitiveness of the national economy in the context of globalisation. Using regression analysis, the article confirms that Ukraine's direct participation in GVCs largely depends on the volume of foreign direct investment in the manufacturing industry, as well as the impact of the number of people employed in the industrial sector and the volume of innovative products on the overall integration into GVCs. The hypothesis about the impact of industrial employment on the content of foreign added value in exports was partially confirmed. The results of the analysis emphasise the importance of developing certain sectors, such as textiles and metallurgy, which has a positive impact on employment and innovation activity. At the same time, the need to reduce dependence on imports in high-tech products was identified. Based on the conclusions obtained, the article outlines proposals for state policy, which envisage strengthening support for investment in the processing industry, stimulating innovation processes and developing the production of final products, which will help restore and ensure the competitiveness of Ukraine's economy in the international arena.

Keywords: global value chains, competitiveness, national economy, industry.

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