



UDC 338.439.5:631

Global value chains and their impact on Ukraine's agro-industrial complex

Valerii Mytsenko*

PhD in Pedagogical Sciences, Associate Professor
Central Ukrainian National Technical University
25006, 8 Universytetskyi Ave., Kropyvnytskyi, Ukraine
<https://orcid.org/0000-0001-6034-0224>

Iryna Babets

Doctor of Economic Sciences, Professor
Central Ukrainian National Technical University
25006, 8 Universytetskyi Ave., Kropyvnytskyi, Ukraine
<https://orcid.org/0000-0003-0635-9375>

Ivan Mytsenko

Doctor of Economic Sciences, Professor
Central Ukrainian National Technical University
25006, 8 Universytetskyi Ave., Kropyvnytskyi, Ukraine
<https://orcid.org/0000-0002-2749-5117>

Olena Sokolovska

PhD in Philological Sciences, Associate Professor
Central Ukrainian National Technical University
25006, 8 Universytetskyi Ave., Kropyvnytskyi, Ukraine
<https://orcid.org/0000-0003-2368-4102>

Daria Nasypaiko

PhD in Economic Sciences, Associate Professor
Central Ukrainian National Technical University
25006, 8 Universytetskyi Ave., Kropyvnytskyi, Ukraine
<https://orcid.org/0000-0001-8374-0917>

► **Abstract.** In the contemporary global economic environment, integration into global value chains is a crucial factor for a country's economic growth. The aim of this research was to determine the impact of Ukraine's participation in global value chains on the country's agro-industrial complex. The study employed statistical analysis, regression analysis, econometric modelling, correlation analysis, and analysis of indices of a country's participation and position in global value chains. It was established that during 2010-2011, the Ukrainian economy demonstrated high growth rates of gross domestic product and exports due to the growth of foreign value-added. Starting in 2012, growth rates began to decline due to economic crises, political instability, and the war that began in 2014. The COVID-19 pandemic also had a negative impact on the economic situation in 2020. Despite the full-scale war in 2022, a slow economic recovery was observed in 2023, driven by an increase in foreign gross value-added in exports. Regression analysis showed a strong correlation between Ukraine's gross domestic product and indicators of foreign investment in exports and total exports. It was found that an increase in foreign gross value-added in exports has a negative impact on gross domestic product, while an increase in total exports has a positive impact on economic growth. Despite the complexity of the global value chain system, the results indicate Ukraine's potential for further integration into global economic processes. It has been found that the agricultural sector is also

► **Suggested Citation:** Mytsenko, V., Babets, I., Petryshchenko Mytsenko, I., Sokolovska, O., & Nasypaiko, D. (2024). Global value chains and their impact on Ukraine's agro-industrial complex. *Ekonomika APK*, 31(4), 33-43. doi: 10.32317/ekon.apk/4.2024.33.

*Corresponding author



Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (<https://creativecommons.org/licenses/by/4.0/>)

affected by fluctuations in foreign gross value-added, which is reflected in the productivity and export capabilities of the agricultural sector. An analysis of the participation of key industries, including the agro-industrial complex, in GVC_{participation} has shown a trend towards a decrease in the share of foreign value-added in the gross export of industrial products, indicating an increase in domestic value-added. The research results can be used to develop an effective strategy for Ukraine's economic development by optimising participation in global value chains and reducing dependence on foreign value-added in exports

► **Keywords:** exports; economic growth; regression analysis; country position index; gross exports; volatility

► Introduction

The contemporary economic landscape is characterised by the growth of global value chains, which integrate various sectors of the economy, including agriculture, into a unified international production chain. Global Value Chains (GVCs) are intricate networks of companies that collaborate to produce and deliver goods and services on the global market. For the agro-industrial complex, this signifies that every aspect of agricultural production, from sowing to market delivery, can be significantly reliant on international markets, technologies, and standards (Wang *et al.*, 2020; Cigna *et al.*, 2022).

Research conducted by scientists to study the impact of global value chains on the agro-industrial complex reflects a wide range of approaches and methods that enable strategic decision-making. As Z. Mao (2022) points out, one of the crucial aspects of global value chains is international competition. Participation in such chains requires agro-industrial businesses to not only ensure high-quality products but also continuously improve efficiency and reduce costs to maintain competitiveness in the international market.

Many countries rely on imports of certain agricultural products, such as grains, oils, or meat. Changes in global value chains, such as trade restrictions or tariff modifications, can significantly impact product prices and availability, thus threatening food security in these nations (Demi *et al.*, 2021). J. Barbero & E. Rodríguez-Crespo (2020) argue that participation in global value chains compels businesses to seek new technologies and production methods, which can improve efficiency, enhance product quality, and reduce costs. This involves the implementation of modern irrigation systems, the use of advanced soil cultivation techniques, and the improvement of genetic resources for agricultural crops.

Global value chains in the agro-industrial complex play a pivotal role in the production and supply of agricultural products to consumers (Shahini *et al.*, 2023). However, as noted by M. Keping *et al.* (2022), price fluctuations are a significant factor within GVCs. Global value chains often lead to substantial price fluctuations in agricultural products due to changes in demand, yields, or trade agreements. This can create instability for farmers and agribusinesses, who must adapt to such changes to maintain profitability. Moreover, G. Ellison *et al.* (2010) argue that participation in GVCs typically requires compliance with international quality standards, which is crucial for accessing international markets and maintaining consumer trust in products.

Researchers highlight that Ukraine possesses significant potential for developing its agro-industrial complex, which can be integrated into global value chains. Specifically, M. Mykhailova *et al.* (2024) assert that Ukraine

actively competes in international markets with other countries that are also major exporters of agricultural products. GVCs determine the conditions of access to these markets and influence the competitiveness of Ukrainian products. N. Kutsmus *et al.* (2024) emphasise that participation in GVCs enables the Ukrainian agro-industrial complex to attract investments, implement modern technologies, and enhance economic efficiency.

Several researchers, including M. Chepeliev *et al.* (2022), O. Krpec & V. Hodulak (2019), argue that Ukrainian agricultural enterprises are actively adopting modern agricultural technologies and production methods, enabling them to increase yields and product quality. However, this requires access to modern technologies, which are typically supplied through global value chains. Additionally, Ukrainian farmers often face significant instability in agricultural product prices, creating substantial economic risks for agribusinesses (Musayeva *et al.*, 2024). Therefore, it is necessary to understand the impact of GVCs on Ukraine's agro-industrial complex and develop effective strategies to improve its competitiveness in the global market.

Despite the significant amount of research on the impact of GVCs on various economic sectors, there are research gaps related to diversification, import dependency, lack of competitiveness, vulnerability to price fluctuations, limited access to international standards, insufficient investment in technology, and limited cooperation with international organisations. Filling these gaps is urgent as global value chains play a key role in the production and supply of agricultural products from Ukraine.

This research aimed to assess the impact of Ukraine's integration into global value chains on the country's economic development and identify ways to enhance the competitiveness of the national economy. To achieve this goal, the following analyses were conducted: an evaluation of the current state of Ukraine's agricultural sector and its competitiveness in the global market, the identification of promising directions for Ukraine's integration into global value chains, and an assessment of the impact of this integration on Ukraine's economic development.

► Materials and methods

To analyse Ukraine's participation in GVCs, data sources providing information on trade, economic growth, and the competitiveness of the national economy were used, including data from the Key indicators of socio-economic development of Ukraine (n.d.). Additionally, data from the World Bank supports Ukraine to maintain economic stability (2024) and the Organisation for Economic Co-operation and Development (OECD) (2024) were utilised.

Statistical data from 2010-2023, including the growth rate of Gross Domestic Product (GDP), exports, and the

foreign gross value-added content in Ukraine's exports, indicators of Ukraine's economic growth and its participation in GVCs, as well as the share of foreign value-added in the gross exports of Ukrainian industrial products, formed the information component of the study. The period 2010-2023 was chosen for the study for four key reasons: the recovery of the global economy and Ukraine after the 2008 financial crisis, political changes in Ukraine, and trade liberalisation through membership in the World Trade Organization. The study used indicators of a country's GVCs participation index and a country's GVCs status index. The country's participation index in GVCs ($GVC_{\text{participation}}$) was calculated using formula (1):

$$GVC_{\text{participation}} = \frac{IV}{E} + \frac{FV}{E}, \quad (1)$$

where IV – a value-added domestically that is not directly linked to exports; FV – a value-added from abroad that is linked to exports; E – a total export of the country.

The formula for calculating the country's GVCs status index is as follows (2):

$$GVC_{\text{position}} = \ln \left(1 + \frac{IV}{E} \right) + \ln \left(1 + \frac{FV}{E} \right). \quad (2)$$

Based on the results of contemporary research, a functional dependency (3) was used to model the impact of a country's GVCs participation index on economic growth:

$$Y = f(GVC_{\text{participation}}; GVC_{\text{position}}), \quad (3)$$

where Y – the economic growth of the country.

To conduct a regression analysis based on the functional relationship, an econometric equation was formulated, with the calculation of the Fisher criterion, in which α is a constant term, β_i is the coefficients to be estimated, and ε_t is the error term (4):

$$Y_t = \alpha + \beta_1 * FVA_{\text{export}} + \beta_2 * \text{Export} + \beta_3 * GVC_{\text{participation}} + \beta_4 * GVC_{\text{position}} + \varepsilon_t, \quad (4)$$

where Y_t – a vector of dependent variables, particularly Ukraine's GDP volume figures, GDP per capita, and the index of annual changes in Ukraine's GDP; FVA_{export} – a foreign value-added content in exports; Export – a gross export.

To further investigate the impact of involving major manufacturing industries in GVCs on economic growth, a functional dependency (5) was tested:

$$Y_t = \alpha + \beta_i * \left(\frac{FV}{E} \right)_n + \varepsilon_t, \quad (5)$$

where $(FV/E)_n$ – a vector of indicators of the share of foreign value-added embodied in imported resources within gross exports, by industrial sector.

Thus, the research methodology is based on theoretical foundations and empirical evidence of the impact of countries' GVCs participation on economic growth. To determine the relationship between the participation of state-owned enterprises in GVCs and a country's economic growth, the study employed statistical correlation analysis, which involves constructing a regression model of GDP indicators against changes in indicators of forward, backwards, and total GVCs participation, the country's GVCs position, and the content of imported value-added in exports of major industrial sectors.

► Results

Ukraine experienced significant fluctuations in economic growth between 2010 and 2023. In the period from 2010 to 2011, Ukraine's economy demonstrated exceptionally high GDP growth rates of 118% and 120%, respectively. This was driven by rapid growth in foreign value-added in exports, which increased by 122% and 138%, respectively. Additionally, gross exports also showed high growth rates, reaching 120% and 122%, respectively (Simakhova, 2022). However, in 2012, the growth rates of GDP and gross exports began to decline, which was linked to the economic crisis. In 2014, the growth rates of GDP and gross exports reached a minimum, reaching 70% and 90%, respectively. In 2016, the Ukrainian economy began to show signs of recovery, which was associated with the growth of foreign value-added in exports. And already in 2017, the growth rates of GDP and gross exports reached high values again, reaching 120% and 118%, respectively.

Nevertheless, in 2020, the Ukrainian economy again faced crisis phenomena due to the COVID-19 pandemic. The growth rates of GDP and gross exports began to decline, reaching 101% and 100%, respectively. In 2022, a full-scale war began in Ukraine, causing the growth rates of GDP and gross exports to reach a minimum again, reaching 70% and 75%, respectively. However, in 2023, there is a slow recovery of the Ukrainian economy, which is associated with the growth of foreign value-added in exports (OECD, 2024). The growth rates of GDP and gross exports are 91% and 80%, respectively. The analysis of the dynamics of Ukraine's GDP and gross exports revealed that they demonstrate synchronised fluctuations, which indicates a close link between economic growth and the country's exports (Fig. 1).

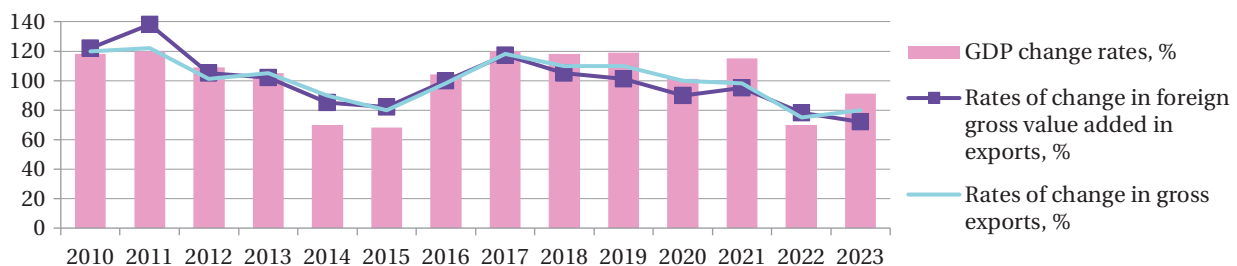


Figure 1. Growth rates of GDP, exports, and the share of foreign value-added in Ukraine's exports in 2010-2023, as a percentage compared to the previous year

Source: compiled by the authors

It is worth noting that in 2013 and 2023, years marked by the exacerbation of the economic crisis, foreign value-added to Ukraine's exports was more sensitive to the economic crisis than GDP and gross exports. In 2013, Ukraine's GDP and gross exports decreased by 0.05% and 0.05%, respectively, while foreign value-added in exports decreased by 0.02%. This suggests that foreign value-added in exports was more volatile and sensitive to the economic crisis. In 2023, the situation repeated itself. Ukraine's GDP and gross exports decreased by 0.09% and 0.2%, respectively, while foreign value-added in exports decreased by 0.28%. This again

suggests that foreign value-added in exports was more volatile and sensitive to the economic crisis. These findings may indicate that foreign value-added in exports is more volatile and sensitive to economic crises than GDP and gross exports. This is because foreign value-added in exports depends on many factors, such as global economic trends, political risks, changes in world trade, and others. To identify the impact of Ukraine's participation in GVCs on economic growth, a correlation regression analysis was conducted, where the dependent variable was represented by the following indicators: GDP index, GDP, and GDP per capita (Table 1).

Table 1. Indicators of economic growth in Ukraine

Year	GDP, billion USD	GDP per capita, USD	GDP index, % compared to the previous year
2010	141.2	3,078.4	104.1
2011	169.3	3,704.8	105.4
2012	182.6	4,004.8	100.2
2013	190.5	4,187.7	100
2014	133.5	3,104.7	89.9
2015	91	2,124.7	90.2
2016	93.4	2,187.7	102.4
2017	112.1	2,638.3	102.4
2018	130.9	3,096.6	103.5
2019	153.9	3,661.5	103.2
2020	156.6	3,751.7	96.2
2021	164.3	3,932	104.9
2022	130	3,111.2	79.1
2023	135	3,245.6	103.8

Source: Key indicators of socio-economic development of Ukraine (n.d.)

As independent variables, the coefficients of the country's GVCs participation, as well as indicators of Ukraine's exports and the content of foreign value-added in exports, were used (Table 2). The analysis of the results showed that Ukraine integrated into the global economy during 2010-2012, as evidenced by the increase in the content of foreign value-added in exports. However, the political and economic instability that began in 2013, including the war in eastern Ukraine and the annexation of Crimea, led to a decrease in these indicators. Gross exports increased until 2013, after which they experienced a significant decline until 2015. From 2016, exports began to recover gradually, reaching a peak in 2019. In 2020, due to the pandemic and economic difficulties, there was a decline, but forecast data for 2021-2023 indicates a gradual recovery of exports. The backward and forward GVCs participation coefficients remained relatively stable, despite economic challenges. The backward participation coefficient fluctuated between 22.9% and 28.6%, while the forward participation coefficient varied from 19.8% to 22.9%. The overall GVCs participation index ranged from 44.3% to 49.8%, with the highest value in 2018. The country's GVCs position also fluctuated, but forecast data for 2021-2023 indicates an improvement in these indicators.

Thus, the overall indicators of Ukraine's GVCs participation demonstrate the impact of political and economic instability on the country's economy, but there are signs of recovery and improvement in recent years. These data indicate Ukraine's potential for further integration into global economic processes, which can serve as a basis for developing strategies to increase its GVCs participation. The results of assessing Ukraine's GVCs position have shown at which stages of production (initial or final) the Ukrainian economy specialises. During 2011-2016, the Ukrainian economy specialised in the final stages of production, as the backward participation coefficient had a high value, indicating significant volumes of imported intermediate goods, and the country's GVCs position index had a negative value, which increased from -0.152 in 2010 to -0.321 in 2016 (Revak & Kondro, 2020). Starting from 2017, Ukraine's GVCs position index has shown a tendency to decrease, reaching -0.12 in 2023, although it remains negative. The position index in global supply chains also illustrates the impact of production fragmentation on Ukraine's trade. Over the period under review, there has been a decrease in the negative position, indicating an increase in imports of raw materials and semi-finished products, accompanied by an increase in exports of finished goods.

Table 2. Indicators of Ukraine's GVCs participation

Year	The content of foreign gross value-added in Ukraine's exports, million USD	Gross exports, million USD	Backward participation coefficient, %	Forward participation coefficient, %	Total GVCs participation indicator	The country's GVCs position
2010	10,703.6	43,433.5	24.6	21	45.6	-0.152

Table 2, Continued

Year	The content of foreign gross value-added in Ukraine's exports, million USD	Gross exports, million USD	Backward participation coefficient, %	Forward participation coefficient, %	Total GVCs participation indicator	The country's GVCs position
2011	14,690.3	54,314.5	27	21.9	48.9	-0.201
2012	17,084.2	59,719.6	28.6	19.8	48.4	-0.353
2013	15,936.8	60,044.8	26.5	20.3	46.8	-0.255
2014	14,023.2	51,808	27.1	22	49.1	-0.2
2015	11,369.2	39,988.7	28.4	20.1	48.5	-0.332
2016	10,709	38,527.2	27.8	19.9	47.7	-0.321
2017	12,567.4	45,051.5	27.9	21.4	49.3	-0.255
2018	13,329.2	49,611.7	26.9	22.9	49.8	-0.155
2019	13,497.9	53,832.4	25.1	22.1	47.2	-0.122
2020	11,936.8	52,091.3	22.9	21.4	44.3	-0.065
2021	12,500	55,000	22.7	21	43.7	-0.1
2022	11,000	45,000	24.4	20.5	44.9	-0.15
2023	11,500	47,500	24.2	21	45.2	-0.12

Source: Key indicators of socio-economic development of Ukraine (n.d.)

To conduct the regression analysis, natural logarithms of the data presented in Tables 1 and 2 were calculated. The results of the analysis revealed a strong correlation between Ukraine's GDP and indicators of foreign investment in exports and total exports of Ukraine, as confirmed by the high correlation coefficient (Table 3). According to the analysis results, a 1% increase in foreign investment in exports leads to a 1.453% decrease in GDP, assuming other conditions remain constant. This could be due to the replacement of domestic production with foreign investments. On the other hand, a 1% increase in total exports leads to a 2.59% increase in GDP, assuming other conditions remain equal, which is associated with an increase in production and value-added in Ukraine. The

coefficient of determination shows that 84.9% of the variations in Ukraine's GDP are explained by changes in foreign investment in exports and total exports, while 15.1% are attributed to other factors not included in the regression model. The results of the calculation of Fisher's criterion show a statistically significant relationship between the variables, and the statistical error of the regression is insignificant (less than 1%), confirming the reliability of the results. However, the analysis did not reveal a statistically significant relationship between Ukraine's GDP and indicators of Ukraine's participation in global value chains. This could be due to the fact that the global value chain is a complex phenomenon that depends on many factors, and its impact on Ukraine's GDP may not be as direct.

Table 3. Dependence of economic growth on Ukraine's GVCs participation

Features	Dependent variable	
	GDP	GDP per capita
Number of observations	16	16
Constant	-9.259*** (1.698)	11.236*** (2.212)
FVA _{export}	-1.452*** (0.404)	1.214*** (0.13)
Export	2.590*** (0.468)	-
GVC _{participation}	-	-3.797*** (0.732)
R	0.921	0.933
R ²	0.849	0.871
F-test	F(2.13)=36.72	F(2.13)=43.93

Note: * – error with a probability of 10%; ** – error with a probability of 5%; *** – error with a probability of 1%; R (correlation coefficient) – indicates the level of linear dependence between the dependent variable and independent variables; R² (coefficient of determination) – indicates the level of dependent variable by the independent variables; F (F-test) – indicates the level of significance of the regression model

Source: compiled by the authors

The regression analysis revealed a strong connection between GDP per capita and Ukraine's participation in the global value chain. Specifically, a 1% increase in the share of foreign value-added in exports leads to a 1.214% increase in GDP per capita, while a 1% increase in the overall participation coefficient in the global value chain results in a 3.797% decrease in GDP per capita. The coefficient of determination indicates that 87.1% of the variations in GDP per capita can be explained by

the dynamics of the share of foreign value-added in exports and the coefficient of Ukraine's overall participation in global value chains. The results of the Fisher test confirm a statistically significant relationship between these variables. However, no statistically significant relationship was found between GDP per capita and the coefficients of Ukraine's forward and overall participation in global value chains, nor with the indicator of Ukraine's gross exports (World Bank supports..., 2024).

The results of the regression analysis indicate the need for further research into the impact of involving major industrial sectors in GVCs on Ukraine's economic growth. To this end, a regression analysis was conducted

to examine the dependence of GDP, GDP per capita, and the GDP index on indicators of the share of foreign value-added in the gross exports of various industrial sectors (Table 4).

Table 4. The share of foreign value-added in gross exports of industrial products of Ukraine, %

Year	Food products, beverages, tobacco FVA _{food}	Chemical and pharmaceutical products FVA _{chemicals}	Basic metals and finished metal products FVA _{metal}	Computers, electronic and electrical equipment FVA _{electric}	Machinery and equipment (non-electrical) FVA _{machinery}	Vehicles FVA _{transport}
2010	1.7	1.5	8.8	0.8	1	0.9
2011	1.7	1.6	10.2	0.9	1.1	1.1
2012	1.5	1.7	10.3	0.8	1.1	1.1
2013	1.1	1	8.8	0.6	0.8	0.6
2014	1.7	0.8	9.6	0.4	0.7	0.3
2015	2.3	0.7	8.3	0.4	0.6	0.2
2016	2.7	0.5	6.9	0.4	0.6	0.2
2017	2.7	0.5	7	0.4	0.5	0.2
2018	2.4	0.5	6.5	0.4	0.4	0.2
2019	2.4	0.4	4.9	0.4	0.4	0.3
2020	2.3	0.4	4.6	0.4	0.4	0.3
2021	2.2	0.4	4.4	0.4	0.4	0.3
2022	2.1	0.4	4.2	0.4	0.4	0.3
2023	2.1	0.4	4	0.4	0.4	0.3

Source: compiled by the authors

An analysis of Ukraine's industrial product exports from 2010 to 2023 revealed a trend of decreasing foreign value-added. In the food products, beverages, and tobacco sector, the share of foreign value-added increased to 2.7% in 2016-2017 but then declined to 2.1% in 2022-2023, indicating a growth in domestic value-added. In the chemicals and pharmaceuticals sector, the share of foreign value-added consistently decreased from 1.5% to 0.4%, suggesting a reduced reliance on imported components. In the basic metals and finished metal products sector, the share of foreign value-added decreased from 8.8% to 4%, which is a result of structural changes in the metallurgy industry and an increase in production with higher domestic value-added. In the computer, electronics, and electrical equipment sector, the share of foreign value-added remained relatively stable, fluctuating between 0.4% and 0.9%. In the machinery and equipment sector, the share of foreign value-added decreased from 1% to 0.4%, indicating a growth in domestic production of necessary components and a decrease in the import component. In the vehicles sector, the share of foreign value-added decreased from 0.9% to 0.3%, which is a sign of decreased reliance on foreign components in the production of transport vehicles or changes in the structure of transport vehicle production in Ukraine.

Overall, the analysis indicates a trend towards a decrease in the share of foreign value-added to Ukraine's gross industrial product exports, which may point to the

development of domestic production and reduced dependence on imported components. These changes may be the result of both structural economic reforms and the adaptation of industrial enterprises to new market conditions and requirements. Regression analysis revealed a strong negative correlation between Ukraine's GDP and the share of foreign value-added in exports of food products, beverages, tobacco, basic metals and finished metal products. This means that an increase in the share of foreign value-added in the exports of these products leads to a decrease in Ukraine's GDP. On the other hand, a positive correlation was found between GDP and the share of foreign value-added in exports of vehicles, suggesting that an increase in the share of foreign value-added in the exports of vehicles contributes to GDP growth.

The analysis revealed that the negative impact of foreign value-added in exports of food industry products and metallurgical products on Ukraine's economic growth was greater than the positive impact of foreign value-added in exports of vehicles. Furthermore, it was found that Ukraine's GDP was 85.4% dependent on the import content in exports of food products, metallurgical products, and vehicles. The results of the regression analysis were statistically significant, confirming a strong relationship between the variables. Therefore, the results of the analysis can be used to conclude the relationship between Ukraine's GDP and the share of foreign value-added in exports of various products (Table 5).

Table 5. The impact of industry participation in GVCs on Ukraine's economic growth

Factor features	Dependent variable			
	GDP	GDP per capita		GDP index
Number of observations	11	11	11	11

Table 5, Continued

Factor features	Dependent variable			
	GDP	GDP per capita		GDP index
Constant	6.723*** (0.431)	8.267*** (0.063)	9.775*** (0.548)	4.785*** (0.047)
FVA _{food}	-0.602** (0.209)	-	-0.880*** (0.213)	-
FVA _{metal}	-0.585** (0.173)	-	-0.553** (0.218)	-
FVA _{transport}	0.215** (0.079)	0.523*** (0.101)	-	-
FVA _{machinery}	-	-0.653*** (0.181)	-	-
FVA _{chemicals}	-	-	-	-0.183*** (0.054)
FVA _{electric}	-	-	-	0.346*** (0.088)
R	0.924	0.884	0.824	0.815
R ²	0.854	0.781	0.679	0.665
F-test	F(3.7)=13.65	F(2.8)=14.34	F(2.8)=8.49	F(2.8)=7.95

Note: * – error with a probability of 10%; ** – error with a probability of 5%; *** – error with a probability of 1%

Source: compiled by the authors

The research confirmed a statistically significant relationship between Ukraine's GDP per capita and the dynamics of foreign value-added content in the exports of specific industrial sectors. Two models of the dependence of Ukraine's GDP per capita on changes in the share of foreign value-added in the exports of specific industrial sectors were constructed. The first model revealed a positive correlation between GDP per capita and the import component in exports of vehicles, as well as a negative correlation between GDP per capita and the import content in exports of non-electrical machinery. The second model confirmed the presence of a significant inverse relationship between Ukraine's GDP per capita and the dynamics of the share of foreign value-added in exports of food products, beverages, tobacco, basic metals and finished metal products. Additionally, a significant inverse relationship was found between Ukraine's GDP index and the change in the share of foreign value-added in exports of chemical and pharmaceutical products, as well as a positive relationship between Ukraine's GDP index and the change in the share of foreign value-added in exports of computers, electronics, and electrical equipment.

The research confirmed that the impact of Ukraine's participation in global value chains on economic growth is manifested through the dependence of economic growth indicators on the content of foreign value-added in exports. Moreover, the study confirmed the negative role of exports of products with high raw material content on Ukraine's economic growth in 2010-2023 and the advisability of deepening the participation of Ukrainian enterprises producing vehicles, computers, electronics, and electrical equipment in GVCs as one of the ways to accelerate economic growth.

► Discussion

Globalisation and technological advancements have led to GVCs, which have revolutionised the production, trade, and consumption of goods and services. In these chains, companies from all over the world collaborate to produce components, assemble finished products, and market, and sell goods on the global market. This allows them to specialise in their strengths, access new markets and resources, and increase their competitiveness (Miroudot & Ye, 2019; Meng *et al.*, 2020). In the modern economy,

global value chains play a key role, providing international cooperation and interdependence between countries and companies. They increase production efficiency, reduce costs, and improve product quality by integrating all stages of production, from raw materials to the finished product (Lin *et al.*, 2023; Martínez-Martínez *et al.*, 2023).

GVCs are characterised by a high degree of globalisation, production fragmentation, a growing role of services in production and trade, and an increasing influence of transnational corporations on the global economy. S. Sotelo (2020) notes that global value chains create new opportunities for economic growth, job creation, and exports, but also pose risks such as dependence on global events, environmental risks, and social challenges. Participation in GVCs encourages enterprises to improve product quality, as they must meet international standards and market demands. W. McKibbin & R. Fernando (2021) note that this, in turn, increases the competitiveness of products in global markets. In particular, in countries that are actively integrated into global value chains, exports of high-quality products are growing, which contributes to increased foreign exchange earnings and the development of the national economy.

The conducted research confirms the opinion of N. Fernandes (2020), who emphasises that countries and enterprises that participate in GVCs have greater resilience to global economic fluctuations due to the diversification of their production and trade links. They can more easily adapt to changes in supply and demand in global markets, reducing risks and ensuring the stability of economic development. Further evidence of this and confirmation of the results obtained can be found in the opinion of Y. Fang & Z. Shao (2022), who believe that integration into GVCs contributes to the growth of productivity and economic efficiency of enterprises through access to advanced technologies, innovations, and know-how. For example, agricultural enterprises gain access to new soil cultivation methods, efficient fertilisers, and genetically modified crops that have higher yields and disease resistance (Kalinichenko, 2023). This allows them to reduce production costs and increase output.

The results obtained coincide with the research conducted by A. Abdelaziz *et al.* (2022), also note that the integration of agricultural enterprises into global value

chains contributes to increased productivity through the implementation of advanced technologies and better access to resources. This is especially important for developing countries, where the modernisation of agricultural production is a key factor in economic growth (Park & Park, 2021). Global value chains are a critical element of modern agriculture. They not only provide opportunities for development and expansion but also create significant challenges that require a comprehensive approach to management and strategic planning by agricultural enterprises and governments (Hu *et al.*, 2021). This view is supported by P. Hellegers (2022), who argues that countries can become dependent on international markets and the economic situation in other countries. Additionally, there may be a need for significant investments to modernise production facilities and upgrade the skills of workers. It is also important to consider environmental risks and the need to comply with sustainable development standards.

The results of the conducted research align with other studies on the impact of GVCs on economic growth. Participation in GVCs can have a varying impact on economic growth, depending on the level of foreign value-added and the type of industry involved. Research conducted by J.M. Silva & S. Tenreyro (2022) showed that GVCs can lead to economic growth but also create risks such as dependence on external markets and the loss of domestic value-added. However, there are studies that, in contrast to the one conducted, demonstrate that participation in GVCs can have negative consequences for a country's economy. For example, research conducted by M. Keping *et al.* (2022) showed that countries that are actively involved in GVCs may face high vulnerability to external shocks, such as economic crises or changes in the trade policies of other countries. Additionally, countries that are actively involved in GVCs may face challenges in technology transfer and capital accumulation.

It should be noted that countries that rely heavily on GVCs may experience a decline in domestic industries and job losses due to outsourcing and offshoring (Silagadze *et al.*, 2022). J. Lin *et al.* (2020) emphasise that there are environmental and social costs associated with participation in GVCs, such as increased carbon emissions and labour exploitation. Several researchers, including E.H. Herlina & T. Kudo (2020), raise concerns about the potential risk of participation in global value chains for social justice and economic equality. They argue that the benefits of participating in the global chain may be concentrated among a limited group of privileged individuals, leaving the majority of the population without the benefits of economic growth.

Between 2000 and 2020, the global agricultural industry underwent significant changes due to integration into global value chains. Researchers such as V. Hrushko & R. Kovchar (2023), and S. Osendarp *et al.* (2022) note that global value chains have radically transformed the ways in which agricultural products are produced, processed, and traded, opening up new opportunities and challenges for countries. Ukraine is actively integrating into global value chains, which is associated with both positive and negative consequences for its agricultural sector. Furthermore, Ukraine, as a major producer and exporter of agricultural products, faces several risks associated with its dependence on fluctuating global prices, trade conflicts,

and natural disasters (The impact of the war..., 2023). This can lead to fluctuations in export earnings, disruptions in product supply, and production losses. Therefore, it is important to strengthen practical cooperation in crisis management to increase Ukraine's GVCs participation and reduce its dependence on fluctuating global prices.

Supporting this argument, S. Berenda & L. Grygorova-Berenda (2022) believe that Ukraine itself should rationally utilise its natural resources, and develop the primary, secondary, and tertiary sectors of the global economy to reduce its dependence on imports and increase its export competitiveness. Thus, Ukraine not only experiences the influence of global value chains but also actively interacts with them, seeking to leverage opportunities and manage risks to support the sustainable development of its agro-industrial sector. Ukraine should focus on increasing domestic value-added in exports, particularly in sectors such as vehicles, computers, and electronic and electrical equipment, as advised by Y. Konrad & T. Melnyk (2017). Furthermore, Ukraine should seek to diversify its exports, strengthen trade relations with other countries, and develop cooperation with international organisations to obtain financial and technical support.

Global value chains play a crucial role in the modern economy, facilitating interconnectedness and cooperation between countries and businesses at an international level. They contribute to increased production efficiency, improved product quality, and reduced costs. Participation in GVCs has a positive impact on economic growth, job creation, and increased exports, but also carries risks such as dependence on global events and social challenges.

► Conclusions

The study's findings establish that Ukraine's integration into global value chains significantly impacts its economic development. Regression analysis confirmed a strong correlation between Ukraine's GDP and foreign value-added in exports and total exports. The analysis of Ukraine's GVCs participation showed that from 2011 to 2016 the country specialised in the final stages of production, but later shifted to intermediate stages. This indicates a strategic reorientation of the economy towards greater participation in GVCs. A positive aspect is the increase in exports of high-tech goods, which contributes to the technological advancement of the country and attracts foreign investment. However, a significant dependence on foreign components in export products hinders economic progress and increases vulnerability to changes in the international market.

The study found a negative correlation between a country's level of economic development (GDP per capita) and its dependence on foreign components in exports across most industries. For instance, in the machinery industry, every 10% increase in the share of imported components led to a 0.5% decrease in GDP per capita. Similarly, in the chemical and pharmaceutical industries, a 15% increase in component imports reduced GDP per capita by 0.8%. However, in the production of vehicles, computers, electronics, and electrical appliances, a positive effect was observed from increasing foreign content in exports. Therefore, to ensure sustainable economic growth in a

globalised world, countries should focus on developing strategies that increase domestic value-added, and invest in innovation and technological progress, to enhance their competitiveness in the global market.

The limitation of this study is that it covers the period from 2010 to 2023, not taking into account earlier changes in the Ukrainian economy, which may also have influenced the results. Further research should focus on studying the earlier stages of Ukraine's economic development to gain a full understanding of Ukraine's integration into

GVCs. Additionally, studies should also focus on examining the impact of innovation and technological changes on Ukraine's integration into GVCs and their reflection on economic growth.

►Acknowledgements

None.

►Conflict of interest

None.

►References

- [1] Abdelaziz, A., Fahd, A., Oumayma, B., & Uri, D. (2022). *The economic implications of the war in Ukraine for Africa and Morocco*. Retrieved from <https://ideas.repec.org/p/ocp/ppaper/pb11-22.html>.
- [2] Barbero, J., & Rodríguez-Crespo, E. (2020). The role of institutional quality on participation in global value chains. *Cuadernos Económicos de ICE*, 100, 35-57. doi: 10.32796/cice.2020.100.7117.
- [3] Berenda, S., & Grygorova-Berenda, L. (2022). Formation of global value added chains on the example of the agricultural machinery sector of Ukraine. *Efficient Economy*, 6. doi: 10.32702/2307-2105.2022.6.22.
- [4] Chepeliev, M., Maliszewska, M., Filipa, M., & Pereira, S. (2022). The war in Ukraine disrupts agricultural value chains, but trade policy measures can mitigate the impacts. In *26th annual conference on global economic analysis* (pp. 1-29). Bordeaux. doi: 10.22004/ag.econ.339412.
- [5] Cigna, S., Gunnella, V., & Quaglietti, L. (2022). *Global value chains: Measurement, trends and drivers*. European Central Bank (ECB). Retrieved from <https://ideas.repec.org/p/ecb/ecbops/2022289.html>.
- [6] Demi, A., Xhaferri, S., Uku, S., Shahini, S., & Lushi, A. (2021). The impact of fiscal policies on albanian economic growth: The case of value-added tax. *Journal of Governance and Regulation*, 10(4 Special issue), 311-325. doi: 10.22495/JGRV10I4SIART11.
- [7] Ellison, G., Glaeser, E.L., & Kerr, W.R. (2010). What causes industry agglomeration? Evidence from coagglomeration patterns. *American Economic Review*, 100(3), 1195-1213. doi: 10.1257/aer.100.3.1195.
- [8] Fang, Y., & Shao, Z. (2022). The Russia-Ukraine conflict and volatility risk of commodity markets. *Finance Research Letters*, 50, article number 103264. doi: 10.1016/j.frl.2022.103264.
- [9] Fernandes, N. (2020). *Economic effects of coronavirus outbreak (COVID-19) on the world economy*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3557504.
- [10] Hellegers, P. (2022). Food security vulnerability due to trade dependencies on Russia and Ukraine. *Food Security*, 14(6), 1503-1510. doi: 10.1007/s12571-022-01306-8.
- [11] Herlina, E.H., & Kudo, T. (2020). Institutions and firm's participation in the global production network (GPN): Firm-level analysis in Indonesia. *Jurnal Ekonomi dan Studi Pembangunan*, 12(1), 26-44. doi: 10.17977/jum002v12i12020p026.
- [12] Hrushko, V., & Kovchar, R. (2023). Contemporary interpretation of global value chains. *Scientific Notes of "KROK" University*, 69(1), 9-14. doi: 10.31732/2663-2209-2022-69-9-14.
- [13] Hu, D., Jiao, J., Tang, Y., Han, X., & Sun, H. (2021). The effect of global value chain position on green technology innovation efficiency: From the perspective of environmental regulation. *Ecological Indicators*, 121, article number 107195. doi: 10.1016/j.ecolind.2020.107195.
- [14] Kalinichenko, Z. (2023). Methodological principles of analysis of value-added chains and Ukraine's participation in international integration. *Innovation and Sustainability*, 3(1), 176-187. doi: 10.31649/ins.2023.1.176.187.
- [15] Keping, M., Hui, S., & Minglong, K. (2022). Global value chains and spatial spillovers of economic growth – Based on the perspective of participation and status index in global value chain. *Sustainability*, 14(23), article number 15518. doi: 10.3390/su142315518.
- [16] Key indicators of socio-economic development of Ukraine. (n.d.). Retrieved from https://www.ukrstat.gov.ua/operativ/operativ2022/mp/arh_op2022.html.
- [17] Konrad, Y., & Melnyk, T. (2017). *Industry of Ukraine in global value chains*. *Economy and Society*, 8, 153-159.
- [18] Krpec, O., & Hodulak, V. (2019). War and international trade: Impact of trade disruption on international trade patterns and economic development. *Brazilian Journal of Political Economy*, 39(1), 152-172. doi: 10.1590/0101-35172019-2854.
- [19] Kutsmus, N., Zinchuk, T., Usiuk, T., Prokopchuk, O., & Palamarchuk, T. (2024). War in Ukraine: Impact on global agrifood trade. *Scientific Horizons*, 27(3), 130-142. doi: 10.48077/scihor3.2024.130.
- [20] Lin, F., Li, X., Jia, N., Feng, F., Huang, H., Huang, J., Fan, S., Ciaia, Ph., & Song, X.P. (2023). The impact of Russia-Ukraine conflict on global food security. *Global Food Security*, 36, article number 100661. doi: 10.1016/j.gfs.2022.100661.
- [21] Lin, J., Flachsbarth, I., & von Cramon-Taubadel, S. (2020). The role of institutional quality on the performance in the export of coconut products. *Agricultural Economics*, 51(2), 237-258. doi: 10.1111/agec.12552.
- [22] Mao, Z. (2022). Global value chains (GVCs) and economic growth: A nonlinear analysis. *The Singapore Economic Review*, 67(3), 985-10004. doi: 10.1142/S0217590821450028.

- [23] Martínez-Martínez, A., Esteve-Pérez, S., Gil-Pareja, S., & Llorca-Vivero, R. (2023). The impact of climate change on international trade: A gravity model estimation. *The World Economy*, 46(Special Issue 9), 2624-2653. [doi: 10.1111/twec.13464](https://doi.org/10.1111/twec.13464).
- [24] McKibbin, W., & Fernando, R. (2021). The global macroeconomic impacts of COVID-19: Seven scenarios. *Asian Economic Papers*, 20(2), 1-30. [doi: 10.1162/asep_a_00796](https://doi.org/10.1162/asep_a_00796).
- [25] Meng, B., Ye, M., & Wei, S.J. (2020). Measuring smile curves in global value chains. *Oxford Bulletin of Economics and Statistics*, 82(5), 988-1016. [doi: 10.1111/obes.12364](https://doi.org/10.1111/obes.12364).
- [26] Miroudot, S., & Ye, M. (2019). Multinational production in value-added terms. *Economic Systems Research*, 32(3), 395-412. [doi: 10.1080/09535314.2019.1701997](https://doi.org/10.1080/09535314.2019.1701997).
- [27] Musayeva, N., Tanriverdiyeva, G., Faradjova, D., & Mammadova, U. (2024). Assessment of the competitiveness of food products of Ukraine in the domestic and foreign markets. *Business Strategy and Development*, 7(1), article number e336. [doi: 10.1002/bsd2.336](https://doi.org/10.1002/bsd2.336).
- [28] Mykhailova, M., Yatsenko, O., Zavadzka, Y., Afanasieva, O., & Haas, R. (2024). The war in Ukraine and its impact on global agricultural trade. *Die Bodenkultur: Journal of Land Management, Food and Environment*, 74(2), 91-105. [doi: 10.2478/boku-2023-0008](https://doi.org/10.2478/boku-2023-0008).
- [29] Osendarp, S., Verburg, G., Bhutta, Z., Black, R.E., de Pee, S., Fabrizio, C., Headey, D., Heidkamp, R., Laborde, D., & Ruel, M.T. (2022). Act now before Ukraine war plunges millions into malnutrition. *Nature*, 604(7907), 620-624. [doi: 10.1038/d41586-022-01076-5](https://doi.org/10.1038/d41586-022-01076-5).
- [30] Park, S., & Park, I. (2021). The value-added creation effect of industry position in global value chains: Implications for Asia-Pacific economies. *Asian-Pacific Economic Literature*, 35(2), 95-122. [doi: 10.1111/apel.12329](https://doi.org/10.1111/apel.12329).
- [31] Revak, I., & Kondro, I.V. (2020). Sectoral analysis of import dependence of Ukraine's economy. *Social and Legal Studies*, 3(3), 145-153. [doi: 10.32518/2617-4162-2020-3-145-153](https://doi.org/10.32518/2617-4162-2020-3-145-153).
- [32] Shahini, E., Korzhenivska, N., Haibura, Y., Niskhodovska, O., & Balla, I. (2023). Ukrainian agricultural production profitability issues. *Scientific Horizons*, 26(5), 123-136. [doi: 10.48077/scihor5.2023.123](https://doi.org/10.48077/scihor5.2023.123).
- [33] Silagadze, A., Atanelishvili, T., & Silagadze, N. (2022). [Covid depression and search for a new paradigm](https://doi.org/10.1007/s10258-021-00203-w). *Bulletin of the Georgian National Academy of Sciences*, 16(1), 121-126.
- [34] Silva, J.M., & Tenreyro, S. (2022). The log of gravity at 15. *Portuguese Economic Journal*, 21, 423-437. [doi: 10.1007/s10258-021-00203-w](https://doi.org/10.1007/s10258-021-00203-w).
- [35] Simakhova, A. (2022). Post-war socialization of the economy: Ukrainian and European security. *Challenges to National Defence in Contemporary Geopolitical Situation*, 2022(1), 71-75. [doi: 10.47459/cndcgs.2022.9](https://doi.org/10.47459/cndcgs.2022.9).
- [36] Sotelo, S. (2020). Domestic trade frictions and agriculture. *Journal of Political Economy*, 128(7), 2690-2738. [doi: 10.1086/706859](https://doi.org/10.1086/706859).
- [37] The impact of the war in Ukraine on global trade and investment. (2023). Retrieved from <https://documents1.worldbank.org/curated/en/099750104252216595/pdf/IDU0008eed66007300452c0beb208e8903183c39.pdf>.
- [38] Trade in value-added. (n.d.). Retrieved from <https://www.oecd.org/en/topics/sub-issues/trade-in-value-added.html>.
- [39] Wang, J., Li, Z., & Sun, X. (2020). Empirical analysis on the influence of business environment on foreign direct investment inflow based on the panel data on 26 countries. *International Journal of Sustainable Development and Planning*, 15(8), 1223-1230. [doi: 10.18280/ijstdp.150808](https://doi.org/10.18280/ijstdp.150808).
- [40] World Bank supports Ukraine to maintain economic stability. (2024). Retrieved from <https://www.worldbank.org/uk/news/press-release/2024/03/26/world-bank-supports-ukraine-to-maintain-economic-stability>.

Глобальні ланцюги доданої вартості та їх вплив на агрокомплекс України

Валерій Миценко

Кандидат педагогічних наук, доцент
Центральноукраїнський національний технічний університет
25006, просп. Університетський, 8, м. Кропивницький, Україна
<https://orcid.org/0000-0001-6034-0224>

Ірина Бабець

Доктор економічних наук, професор
Центральноукраїнський національний технічний університет
25006, просп. Університетський, 8, м. Кропивницький, Україна
<https://orcid.org/0000-0003-0635-9375>

Іван Миценко

Доктор економічних наук, професор
Центральноукраїнський національний технічний університет
25006, просп. Університетський, 8, м. Кропивницький, Україна
<https://orcid.org/0000-0002-2749-5117>

Олена Соколовська

Кандидат філологічних наук, доцент
Центральноукраїнський національний технічний університет
25006, просп. Університетський, 8, м. Кропивницький, Україна
<https://orcid.org/0000-0003-2368-4102>

Дар'я Насипайко

Кандидат економічних наук, доцент
Центральноукраїнський національний технічний університет
25006, просп. Університетський, 8, м. Кропивницький, Україна
<https://orcid.org/0000-0001-8374-0917>

► **Анотація.** У сучасному глобальному економічному середовищі інтеграція до світових ланцюгів доданої вартості є вирішальним фактором економічного зростання країн. Мета дослідження полягала у визначенні впливу участі України у глобальних ланцюгах доданої вартості на агрокомплекс країни. У дослідженні використано статистичний аналіз, регресійний аналіз, економетричне моделювання, кореляційний аналіз та аналіз індексів участі і позиції країни у глобальних ланцюгах створення доданої вартості. Було встановлено, що протягом 2010-2011 років українська економіка демонструвала високі темпи зростання валового внутрішнього продукту та експорту завдяки зростанню іноземної валової доданої вартості. Починаючи з 2012 року, темпи зростання почали знижуватися через економічні кризи, політичну нестабільність та війну, що почалася у 2014 році. Пандемія COVID-19 також негативно вплинула на економічну ситуацію у 2020 році. Незважаючи на повномасштабну війну у 2022 році, у 2023 році спостерігається повільне відновлення економіки, обумовлене зростанням іноземної валової доданої вартості в експорті. Регресійний аналіз показав сильну кореляцію між валовим внутрішнім продуктом України та показниками іноземної інвестиції в експорті та загального експорту. Виявлено, що збільшення іноземної валової доданої вартості в експорті негативно впливає на валовий внутрішній продукт, тоді як збільшення загального експорту позитивно впливає на економічне зростання. Незважаючи на складність глобальної ланцюгової системи вартості, результати свідчать про потенціал України до подальшої інтеграції у світові економічні процеси. З'ясовано, що сільськогосподарська галузь також відчуває вплив від коливань іноземної валової доданої вартості, що відбивається на продуктивності та експортних можливостях аграрного сектору. Аналіз участі основних галузей промисловості, в тому числі агрокомплексу, у глобальних ланцюгах доданої вартості показав тенденцію зменшення частки іноземної доданої вартості у валовому експорті промислової продукції, що свідчить про зростання внутрішньої доданої вартості. Результати дослідження можуть бути використані для розробки ефективної стратегії економічного розвитку України шляхом оптимізації участі в глобальних ланцюгах доданої вартості та зменшення залежності від іноземної доданої вартості в експорті

► **Ключові слова:** експорт; економічне зростання; регресійний аналіз; індекс позиції країни; валовий експорт; волатильність