THE IMPACT OF CRISIS EVENTS IN UKRAINE ON THE EXPORT OF AGRICULTURAL PRODUCTS TO EU COUNTRIES AND THE WORLD

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Abstract
The article examines the impact of crisis events in Ukraine on the export of agricultural products to EU countries and the world. In particular, it was found that the economy of Ukraine remains raw material oriented. The country continues to sell products with a low level of processing abroad. Since 2008, Ukraine has had a negative trade balance (with the exception of 2014-2015), which grew to $8.7 billion in 2022. Russia's invasion of Ukraine, the sharp rise in commodity prices, and the Covid-19 pandemic have created a threat to the food security around the world. In turn, before the full-scale war, one of the largest shares of Ukraine's export and import partnership agreements was occupied by EU countries. The conducted research using economic and mathematical modeling showed a direct correlation between commodity circulation of Ukraine and the GDP of the country - with an increase of commodity circulation of Ukraine by 10% the GDP of the national economy will increase by 12.4%. A direct correlation between the level of exports of the national economy and the level of GDP was also established - with a 10% increase in exports, Ukraine's GDP will increase by 9%.

Keywords: agricultural policy, crisis events, agricultural products, correlation-regression analysis, commodity, import, export.
JEL Codes: B16, B27, C02.

Introduction

The issues of the crisis events impact in Ukraine on the export of agricultural products to EU countries and the world have not been sufficiently studied. Little attention and research have been paid to the local and global impact of military conflicts and threats on the logistical organization of commodity flows, in particular the foreign economic export and import activities of the state and their impact on the gross domestic product. To date, there are many studies concerning the global impact of crises on countries, as well as the military conflict in Ukraine influencing the very economy of the region, and a provoked humanitarian crisis. However, it was detected there are practically no studies on the impact of crisis events in Ukraine on the logistics of agricultural products export to the EU and countries of the world.

In the article of Agarwal S., Ang S.H., Varshneya S. (2022) the impact of 2008-2009 financial crisis on the United States of America and other World countries was reviewed. The authors attempted to identify predictive indicators of the approaching crisis and adapt their application for decision-making and effective management of the economic and financial consequences of COVID-19.

Balbaa M, Eshov M., and Ismailova N.(2022) mostly consider the history of the military conflict development between Ukraine and Russia and in the article make a forecast of the consequences of the crisis - the economic impact on production, consumption,
distribution of energy resources and the inevitable increase in prices for agricultural products. The authors have analyzed in detail the trend of energy price growth, particularly oil, in the period 2012-2022 and concluded that the price of $100 per barrel (the highest mark in 14 years) can be raised to $140 per barrel. This, in turn, will inevitably lead to the complication of the work of agricultural enterprises and the development of rural areas. The authors considered the impacts of the Russian-Ukrainian war and the sanctions imposed on Russia on various sectors of the economy (energy, military, banking and financial, trade sector).

Bluszcz J. and Valente M. (2019) carried out modeling of the impact in quantitative expression of the short-term consequences of the war in Donbas on the GDP of Ukraine using a synthetic method of control. The causal effect of the conflict on GDP per capita was defined by the authors as the difference between the results of “Ukraine after the war” and the result of “Ukraine without war”. The results of the synthetic control study showed that the underachieved GDP per capita due to the war was 15.1% on average in 2013-2017 in Ukraine.

Research results and discussion

Ukraine’s economy remains raw material-oriented. The country continues to sell products with a low level of processing abroad. Basically, these are iron ore, agricultural products and metallurgical semi-finished products. It is worth noting that according to the data of the State Customs Service of Ukraine (Statistics and Registers, 2022) the volume of food products and agricultural products exceeds imports by an average of 3-4 times annually.

The negative foreign trade balance increased to $8.7 billion in 2022. Since 2008, Ukraine has had a negative trade balance (with the exception of 2014-2015) (table 1).

Table 1. Trade turnover of Ukraine in 2008-2022, $million*

<table>
<thead>
<tr>
<th>Year</th>
<th>Trade turnover</th>
<th>Balance</th>
<th>Import</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>148668</td>
<td>-14735</td>
<td>81701</td>
<td>66967</td>
</tr>
<tr>
<td>2009</td>
<td>88608</td>
<td>-9308</td>
<td>48958</td>
<td>39650</td>
</tr>
<tr>
<td>2010</td>
<td>109113</td>
<td>-6397</td>
<td>57755</td>
<td>51358</td>
</tr>
<tr>
<td>2011</td>
<td>149420</td>
<td>-12754</td>
<td>81087</td>
<td>68333</td>
</tr>
<tr>
<td>2012</td>
<td>151933</td>
<td>-14473</td>
<td>83203</td>
<td>68730</td>
</tr>
<tr>
<td>2013</td>
<td>140221</td>
<td>-13631</td>
<td>76926</td>
<td>63295</td>
</tr>
<tr>
<td>2014</td>
<td>106613</td>
<td>1452</td>
<td>52580</td>
<td>54032</td>
</tr>
<tr>
<td>2015</td>
<td>74740</td>
<td>1601</td>
<td>36570</td>
<td>38171</td>
</tr>
<tr>
<td>2016</td>
<td>75234</td>
<td>-2505</td>
<td>38870</td>
<td>36364</td>
</tr>
<tr>
<td>2017</td>
<td>92797</td>
<td>-6277</td>
<td>49537</td>
<td>43260</td>
</tr>
<tr>
<td>2018</td>
<td>104204</td>
<td>-9547</td>
<td>56875</td>
<td>47329</td>
</tr>
<tr>
<td>2019</td>
<td>110476</td>
<td>-10353</td>
<td>60414</td>
<td>50061</td>
</tr>
<tr>
<td>2020</td>
<td>103429</td>
<td>-5040</td>
<td>54234</td>
<td>49195</td>
</tr>
<tr>
<td>2021</td>
<td>141377</td>
<td>-5201</td>
<td>73289</td>
<td>68088</td>
</tr>
<tr>
<td>2022</td>
<td>103676</td>
<td>-15331</td>
<td>44173</td>
<td>59503</td>
</tr>
</tbody>
</table>

*Concluded by authors according to the data of the State Customs Service of Ukraine (Statistics and Registers, 2022).
Concerning analysis of the export structure of Ukraine, it should be noted that the most expensive export commodity in 2021 was iron ore. The second position in terms of export value was sunflower oil. Ukraine is the world's largest exporter of these products (50% of world trade). The next positions were corn and wheat. A significant share in export was occupied by food products and agricultural products - $28 billion, metals and metal products - $16 billion. This group showed the largest increase in value. Its volume increased by 81% compared to 2020 (Ekonomichna statystyka…, 2022).

Ukraine is the fourth largest supplier of food to the EU and a key source of cereals (52% of EU corn imports, 19% of common wheat), vegetable oils (23% of EU imports) and oilseeds (22% of EU imports, especially rapeseed 72% of EU imports) (Communication from…, 2022).

However, it is worth noting that during the 11 months of 2022, the export of food and agricultural products decreased slightly compared to other groups of foreign trade goods - a decrease of 14% compared to 2021 was observed. Imports of this goods decreased by 22% in 2022 compared to 2021. Russia's invasion of Ukraine, the sharp rise in commodity prices and the Covid-19 pandemic have created a threat to food security around the world. There has been a cascading effect of the war in Ukraine for countries that have already faced conflicts and crises.

Countries that are heavily dependent on grain imports from Ukraine and other partners (mostly these are North African and Middle Eastern countries) have a higher risk of food insecurity due to disruptions in the supply chain. One of the main producers of basic food products is Ukraine, which provides a fairly large share of wheat supplies to Armenia, Georgia, Azerbaijan, Eritrea, Mongolia and Somalia. East Africa imports 72% of cereals from Russia and 18% from Ukraine.

Ukraine is a member of the World Food Program (it is the main supplier of wheat) and thus provides food aid to 115.5 million people in more than 120 countries. Since war disrupts production and export processes, these basic products become less available.

However, during the first 5 months of the war, Ukraine could not export grain via the main sea routes through the Black Sea. More than 10% of the country's arable land was not available for the sowing campaign, which significantly affected both the country's export potential and the state budget. And if farmers relatively quickly got used to difficult conditions and found options for storage, transportation of necessary resources and provided other important things so that sowing could take place, it was more difficult for less flexible agricultural holdings to adapt to new realities (Cherez boiovi dii…, 2022).

It is worth noting that due to the policy of promoting its agriculture development, the EU countries did not face the problem of food security. The European Commission constantly monitors the situation and coordinates decision-making in response to crises that affect or threaten to affect food supply and food security in the EU.

After the “COVID” 2020, the world's economy went up. In 2020, a decrease in consumption led to a halt in production and less consumption of raw materials. Consequently, when the world economy began to recover, the producers of commodities (traded goods) could not keep up with demand. Prices for raw materials in the world began to rise. This explains the growth of the nominal gross domestic product of Ukraine in 2021 by more than 3% (table 2).
The Impact of Crisis Events in Ukraine on the Export of Agricultural Products to EU Countries and the World

Table 2. Gross domestic product of Ukraine in 2011-2022, $ million*

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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross domestic product</td>
<td>163160</td>
<td>175781</td>
<td>183310</td>
<td>131805</td>
<td>90615</td>
<td>93270</td>
<td>112154</td>
<td>130832</td>
<td>153781</td>
<td>155582</td>
<td>200090</td>
</tr>
</tbody>
</table>

*Concluded by authors on the basis of (World Bank national accounts data, 2022; International Monetary Fund, 2022).

The situation with the agricultural products export from Ukraine was resolved by concluding agreements with Russia regarding some Ukrainian Black Sea ports resumption and the creation of so-called “solidarity routes”. Transportation of grain and oil crops was carried out by trains, trucks and inland waterways.

In 2021 the total turnover in Ukraine amounted to $141347 million, while the country imported goods and services in the amount of $68,088 million, and exported - $73,289 million. In 2021, the largest share of Ukraine's trade turnover was occupied by EU countries - 53%, the share with Eastern partners was 14%, and 32% were agreements with other partners.

In 2022 Ukraine's turnover decreased to $103,676 million while the country imported goods and services in the amount of $59503 million and exported in the amount of $44173 million (Fig. 1) (Statistics and Registers, 2022).

Export to EU countries amounted to 39%, CIS countries - 11%, other countries - 50% in 2021. However, the situation has changed significantly in 2022. The largest share in the Ukrainian export structure in 2022 was made up by EU countries - 63%, other countries - 32%, and eastern countries - 5% (Fig. 2) (Statistics and Registers, 2022). The structure of import between these two ears differs slightly.
In order to identify the impact of Ukraine's trade volume (Table 1) on the level of GDP (Table 2) for the period 2017-2021, we performed economic and mathematical modeling based on regression analysis. Figure 3 shows the results of the calculations.

The analysis of the modeling results leads to the conclusion that the level of turnover has a sufficient influence on the GDP of the national economy (the correlation coefficient is 0.89), which indicates a close correlation. The coefficient of determination R is 0.95, which indicates the adequacy of the constructed model. The regression equation of the model of the effect of turnover on the GDP of the economy of Ukraine has the form:

\[ y = -36631.9 + 1.69x \]  \hspace{2cm} (1)

The coefficient of elasticity is calculated according to the formula:

\[ k_e = \frac{a_1 \bar{x}}{a_0 + a_1 \bar{x}} \hspace{2cm} (2) \]

Results of the calculations will be:

\[ k_e = \frac{1.69 \times 110456.6}{-36631.9 + (1.69 \times 110456.6)} = 1.24 \hspace{2cm} (3) \]

Therefore the elasticity coefficient is 1.24, which means that if the turnover of Ukraine increases by 10%, the GDP of the...
The national economy will increase by 12.4%. That is, according to the simulation, we can argue that it is necessary to work on increasing Ukraine’s partnership agreements with European and world partners. It is necessary to direct the development strategy increasing the share of turnover with innovative technologies, high-tech developments of goods and services. This, in turn, will lead to the improvement of macroeconomic indicators of the Ukrainian economy.

The results of modeling the impact of exports on the dynamics of Ukraine’s GDP is presented in the figure 4. Analysis of the correlation effect will allow to implement the correct strategy for the development of the national economy in the near future.

![Figure 4. Correlation-regression analysis of the impact of export on GDP](image)

Analysis of the conducted simulation statistics leads to the conclusion that the level of export directly influences the level of Ukraine’s GDP. The correlation coefficient is 0.91, which indicates a high density between the indicators. The coefficient of determination 0.95 indicates the adequacy of the model and the possibility of applying the research results. The regression equation will take the form:

\[ y = 18405.1 + 3.27x \]  

(4)

According to formula 2 the calculation of the elasticity coefficient will be:

\[ k_e = \frac{3.27 \times 51586.6}{18405.1 + 168688.18} = 0.9 \]  

(5)

Therefore, the elasticity coefficient is 0.9, that is, if the export level increases by 10%, the dynamics of Ukraine’s GDP will increase by 9%, which is a significant indicator.

That is, it is necessary to increase export to provide the growth of the national economy and improvement of macroeconomic indicators. Currently, a balanced policy of Ukraine with European and world partners, ensuring trade routes and supply chains of agricultural products to European and world markets by sea, land and air is important.

**Conclusions**

We found that the deficit in the trade balance, which has been observed since 2008, ultimately leads to a deficit in the state budget. To cover it, Ukraine constantly borrows money from international institutions and on global capital markets through the issuance of domestic government loan bonds (Fedyshyn I.B., Harmatiy N.M., 2020). The main partners of Ukraine in trade, export and import are the EU countries. The war in the country complicated and for a certain time made impossible the logistics of agricultural goods both to the countries of the European Community and other World countries that urgently needed grain and other raw materials,
which Ukraine produced and supplied in accordance with the signed agreements.

The conducted research used economic and mathematical modeling which showed a direct correlation between the turnover level of the Ukrainian economy and the GDP of the country, the correlation coefficient was 0.89, which indicated a close correlation. The coefficient of elasticity was 1.24. This indicates that with an increase in Ukraine's trade turnover by 10%, the GDP of the national economy will increase by 12.4%.

We established a direct correlation between the level of Ukrainian export and the level of GDP using regression analysis. The calculated elasticity coefficient was 0.9, that is, if the level of exports increases by 10%, the dynamics of Ukraine's GDP will increase by 9%.

As the practice of economic activity convincingly shows, the use of any measures to stimulate economic initiatives is effective only when there are objective prerequisites that would serve as a basis for providing support and corresponding privileges. Forecasts regarding the future of the Ukrainian economy should be based on a clear understanding of what the country's economy is today and what fueled economic growth before the military conflict. Of course, it is necessary to take into account the fact that there is a direct relationship between the degree of economic freedom and the pace of economic development. To ensure effective economic stabilization, three main characteristics of an economic strategy are critically important: its structure, consistency, and institutional support.

References


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