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The impact of Ukrainian imports on the food security of its trade partners

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► **Abstract.** The relevance of the problem under study is that changes in foreign markets can significantly affect the food sector of other countries, and global food security, measured by a set of indicators, including the Global Hunger Index, is one of the main threats to international economic stability. The research aimed to assess the relationship between the food security of China, Bangladesh, Sri Lanka, Pakistan, Vietnam, Indonesia, and India and the dynamics of their imports of agricultural and food products from Ukraine. The study used a range of methods, including an analysis of the dynamics of the Global Hunger Index of Ukraine's largest importers, and structural and regression analysis of agricultural imports from Ukraine. The results revealed a positive impact of Ukraine's food imports on the food security of several countries. Specifically, the study found that imports of vegetables from Ukraine have a positive impact on China's food security, while Ukrainian milk, dairy products, poultry eggs, natural honey, oilseeds, and oilseed fruits help to ensure food security in Indonesia. Grain imports from Ukraine also have a positive impact on Pakistan's food security. However, the study did not confirm a statistically significant correlation between the dynamics of the Global Hunger Index and food imports from Ukraine to Bangladesh, India, Sri Lanka, Vietnam, and Vietnam in the period from 2011 to 2023. The study's practical significance is determined by understanding the impact of Ukrainian imports on trading

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partners' food security, as well as the need to develop strategies to diversify supplies and stimulate domestic production in order to guarantee the resilience and sustainability of these countries' food sectors

► **Keywords:** international trade; sustainable; Global Hunger Index; regression analysis; international markets

► Introduction

At the beginning of 2023, the world faced several acute challenges that seriously affected food security in different regions. Geopolitical conflicts and the war in Ukraine have become one of the main reasons for the growing instability in global food markets. The escalation of geopolitical conflicts has led to restrictions on the movement of goods and resources, as well as to a decline in agricultural production in some countries. In particular, the stoppage of grain supplies from Ukraine to world markets led to higher prices for bread products, which exacerbated the global food crisis (Zaliznyuk, 2022).

As V. Myronchuk *et al.* (2022) state that after the start of Russia's full-scale armed invasion of Ukraine in 2022, supply chains are disrupted and the global economic recovery from the pandemic is slowing down significantly. The author notes that global agricultural markets are currently under pressure as demand for food is constantly growing and supply is becoming increasingly limited. L. Tsymbal & T. Chernytska (2022) state that a sharp rise in food prices leads to a deterioration in global food security. The author notes the importance of establishing Ukraine's role in shaping global food security, studying the impact of the war in Ukraine on the international food market, and identifying ways to mitigate the negative effects of this impact for an extended period. The relationship between the economy and war is explored in I. Sas *et al.* (2022) confirm that the armed conflict has become an integral part of modern Ukraine, significantly changing all spheres of public life. This has led to a new understanding of the nature of modern wars and their impact on the economy, both locally and globally. The key factors for successful post-war recovery will be rational decision-making, pragmatic goals, and a focus on improving the overall security of the country (including economic, social and military security) (Leshchenko & Leshchenko, 2023). According to the author, only by taking these determinants into account can sustainable development and prosperity be ensured after a period of armed conflict.

V. Boiko & L. Boiko (2022) note the importance of food security for the state, namely the importance of adequate food supply to the population, which contributes to the stability of society, reduces the risks of social tensions, and ensures sustainable development. According to the authors, when people have access to sufficient food, the risk of mass protests, unrest or social conflicts related to hunger or lack of food availability is reduced. Finally, O. Shevchenko (2022) concluded that food security is one of the key components of Ukraine's economic security. Ensuring food security includes the creation of strategic documents, laws and programmes aimed at developing the agricultural sector to ensure access to food for all segments of the population. In addition, the food security policy should consider international aspects, cooperation with other countries and participation in international organisations, which contributes to ensuring stable food security at the global level (Trusova *et*

al., 2021). The significant impact of geopolitical conflicts, particularly the war in Ukraine, on global food security has been highlighted. This research aimed to investigate the relationship between the volume of Ukrainian food imports, their impact on the food security of Ukraine's partner countries that trade with it and identify possible consequences for the food security of these countries.

► Materials and methods

The methodology employed in this research is based on a comprehensive approach that includes both quantitative and qualitative methods. To answer the question of how the supply of agricultural and food products from Ukraine affects the food security of its largest trade partners, authors will use the functional dependence of the level of their national food security on the volume of their imports of agricultural and food commodities (1):

$$Y_i = f(\text{volimp}1; \text{volimp}2; \text{volimp}3; \text{volimp}N), \quad (1)$$

where Y_i is the Global Hunger Index for the country i that imports agricultural and food products from Ukraine; $\text{volimp}1 \dots \text{volimp}N$ is the volume of imports of agricultural and food commodities commodity groups by the country i from Ukraine.

The commodity groups used in this research are the following commodity groups of the Harmonised Commodity Description and Coding System (HS):

1. HS04 Dairy produce; birds' eggs; natural honey; edible products of animal origin...
2. HS07 Edible vegetables and certain roots and tubers.
3. HS10 Cereals.
4. HS12 Oil seeds and oleaginous fruits; miscellaneous grains, seeds, and fruit; industrial or medicinal...
5. HS15 Animal or vegetable fats and oils and their cleavage products...

To test this hypothesis, authors build a linear regression model that is described by the following equation:

$$Y = \beta_0 + \beta_1 \cdot x_1 + \dots + \beta_k \cdot x_k + u, \quad (2)$$

where Y is the dependent explanatory variable, (x_1, x_2, \dots, x_k) are the independent explanatory variables, and u is a random error whose distribution is generally determined by the independent variables but whose mathematical expectation equals zero.

The data used in this model (2) are measured in different units of scale, because of this they must be standardised using the natural logarithm. Thus, the equation for regression analysis takes the following form:

$$\ln Y = \beta_0 + \beta_1 \ln(\text{volimp}1) + \beta_2 \ln(\text{volimp}2) + \beta_3 \ln(\text{volimp}3) + \beta_n \ln(\text{volimp}N) + u. \quad (3)$$

To carry out a regression analysis and develop a model of food security dependence of major importers of Ukrainian agricultural and food commodities, authors will use data of changes of the Global Hunger Index in the

countries in question and data on exports of agricultural and food commodities provided by the Official website of the State Statistics Service of Ukraine (n.d.) for the period of 2010-2023. Key documents such as the Global Hunger Index (2023) reports and Official website of the State Statistics Service of Ukraine (n.d.) were utilised to track food security trends in Ukraine's major trade partners, including China, Bangladesh, and Pakistan. Additionally, data from Export of Agriproducts (n.d.) were analysed to assess changes in agricultural exports following the Russian invasion in 2022. The quantitative aspect of the research involved conducting regression analysis to model the relationship between Ukrainian food exports and the Global Hunger Index in the selected countries. The dependent variable in the regression models was the Global Hunger Index, while independent variables included trade volumes of specific agricultural commodities, such as dairy produce, birds' eggs; natural honey (HS04), edible vegetables and certain roots and tubers (HS07), cereals (HS10), oil seeds and oleaginous fruits; miscellaneous grains, seeds, and fruit (HS12), animal or vegetable fats and oils (HS15).

To identify the role of Ukraine in improving the state of food security of its main trading partners, authors will conduct a study of the dependence of the dynamics of the Global Hunger Index in these countries on the amount of food that is imported from Ukraine. In this research, authors selected countries that meet the following conditions: the Global Hunger Index of the country is greater than 5 points, which indicates the presence of threats to food security; the country is dependent on the imports of food products; the country is a major importer of agricultural and food commodities from Ukraine. The countries that met those criteria are Bangladesh, China, India, Indonesia, Pakistan, Sri-Lanka, Vietnam. The regression analysis is going to be carried out with the Multiple Regression module of the Statistica software 7.0. Thus, the proposed study of the impact of Ukraine on the food security of its main trade partners utilises the following methodological

approaches and methods: (1) analysis of the dynamics of the Global Hunger Index of the largest importers of agricultural and food commodities from Ukraine for identification of countries with high threats to food security; (2) structural analysis of imports of Ukrainian agricultural commodities by countries with high Global Hunger Index, identification of the largest commodity groups; (3) regression analysis to demonstrate the dependency of the dynamics of the Global Hunger Index of the identified countries in question on changes in the structure of their imports of agricultural and food commodities from Ukraine.

► Results

Ukraine is a world leader in the supply of sunflower, vegetables, wheat, barley, sugar beets, fruits, tobacco, legumes, and corn to international markets. Over 55% of Ukraine's territory is arable, and agriculture provides work for 14% of Ukraine's population. Agricultural commodities are the most important item of export of Ukraine (27.8 billion USD in 2021, 41% of the country's total exports of 68 billion USD) (Official website of the State Statistics Service of Ukraine, n.d.). Full-scale Russia's invasion of the Ukrainian territory in February 2022 has left a massive impact on global food security disrupting the supply chains, increasing prices on international food markets, and creating a risk of famine on global scale. According to the Ukrainian government, after the start of the invasion, the global market lost more than 20 million tons of projected Ukrainian food exports, and overall Ukraine has supplied three times less agricultural and food commodities than was planned for 2022. After the introduction of martial law, the Ukrainian government limited the export of basic food products (wheat, oats, millet, buckwheat groats, sugar, meat, and meat offal). This have caused an immediate response from United Nations experts sounding the alarm of the danger of a hunger crisis in various countries. The main destination of Ukraine's agricultural exports is Asia, particularly, China, Indonesia, Vietnam, Pakistan, Bangladesh, India and Sri-Lanka (Fig. 1).

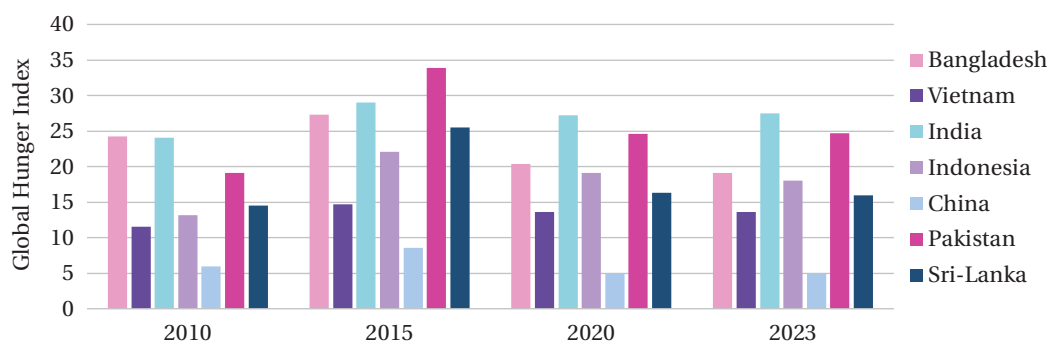


Figure 1. Dynamics of the Global Hunger Index of Ukraine's major trade partners in Asia

Source: Global Hunger Index (n.d.)

In 2010-2023, only China made a significant improvement in its food security decreasing the value of the Global Hunger Index from 6 to 5 points. A slight improvement of this indicator was also observed in Bangladesh (a decrease from 24.2 points in 2010 to 19.1 points in 2023). The food security of other researched countries has significantly worsened, as evidenced by an increase in the

value of their Global Hunger Index in the same period. However, the Russian-Ukrainian war, which began on 24 February 2022, has hurt imports of Ukrainian products to Asia. On the one hand, the war has led to a decline in production in Ukraine and an increase in prices for Ukrainian goods. On the other hand, the war has also led to a reorientation of Ukrainian exports to other markets,

in particular Europe and the United States. As a result, the volume of imports of Ukrainian products to Asia in 2022 decreased by more than 50% compared to 2021. This harmed the economies of importing countries, which lost access to cheap Ukrainian goods. The analysis of the dynamics of agricultural and food exports from Ukraine to China reveals the major increase in the volumes of trade. The statistical data presented in Table 1 suggest that the

improvement in the food security of China and the following decrease of the Global Hunger Index was achieved by the increase of agricultural (primarily cereals) imports from Ukraine was relevant up to 2021. To test this hypothesis, authors conducted a regression analysis and design a model of the linear dependence of the Global Hunger Index on changes in China's imports of food resources from Ukraine.

Table 1. Input data for a regression analysis of the impact of food exports from Ukraine on the change of the Global Hunger Index of China

Year	Dependent variable		Independent variable			
	Global Hunger Index <i>HGI_{Ch}</i>	HS04 <i>X_{1,Ch}</i>	Value of Imports, thousands of USD			
			HS07 <i>X_{2,Ch}</i>	HS10 <i>X_{3,Ch}</i>	HS12 <i>X_{4,Ch}</i>	HS15 <i>X_{5,Ch}</i>
2011	5.5	5,330.4	2	1.3	798	94,621.8
2012	5.1	4,490.5	2.3	0.2	1208.5	71,707.6
2013	5.5	3,448.2	4.3	26,092.3	291.8	436,590.5
2014	5.4	2,504.5	8.1	368,821.2	302.3	363,558.8
2015	8.6	1,613.9	0.9	676,940.7	681.7	533,208.2
2016	7.7	2,121.7	3.3	464,139.9	3,761.7	527,220.6
2017	7.5	11,760.2	8.6	447,333.1	6,009.4	511,112.6
2018	7.6	16,730.7	30.2	552,235.5	202.3	426,064.4
2019	6.5	26,796.3	99.9	858,653.3	12,521	741,273.8
2020	5	17,478.2	582.6	1,854,823.8	25,490.7	1,100,623.8
2021	5	8,321.8	533.7	2,552,513.9	24,032.8	987,852.4
2022	7	4,211.3	246.1	1,263,340.3	11,998.7	455,279.3
2023	5	5,468.6	181.4	1,131,428.8	12,349.1	624,268.6

Source: Global Hunger Index (n.d.); Official website of the State Statistics Service of Ukraine (n.d.)

Conducted regression analysis reveals a strong connection between the Global Hunger Index in China and the change in the volumes of food imports from Ukraine in 2011-2023. This is demonstrated by the high correlation coefficient. ($R=0.897$). The growing volumes of vegetable imports from Ukraine had a positive impact on China's food security: a 1% increase in the volumes of imports of HS07 "Edible vegetables" commodity group contributed to a decrease in the Global Hunger Index by 0.125%:

$$HGI_{Ch} = 0.522 + 1.146 * X_{1Ch} - 0.125 * X_{2Ch} + 0.033 * X_{3Ch}. \quad (4)$$

At the same time, a direct relationship between China's Global Hunger Index and the imports of HS04 "Dairy produce..." was observed. When the independent variable grew by 1%, the dependent variable also increased by 0.145%. This negative impact of the imports of dairy products from Ukraine on the food security of China can be explained by the fact that in most Chinese provinces dairy products do not belong to the traditional ration of local population. A negative impact of imports of HS10 "Cereals" on China's food security was also revealed: a 1% growth in the independent variable resulted in a 0.033% increase in the dependent variable. This can be explained by the fact that grain imported from Ukraine is used in China as livestock feed for the further production of meat products, which not every resident can afford to buy in the sufficient quantity. The coefficient of determination indicates that the Global Hunger Index in China in 2011-2023 was 80.6% dependent on changes in the volume of imports

of HS04, and of HS10 "Cereals", and 19.4% dependent on changes in other factors. The level of statistical error does not exceed 5%, which confirms the statistical significance of the regression analysis. The calculated value of Fisher's test is 9.711 and exceeds its tabular value (3.7), so authors can assume the relationship between the dependent and independent variables to be significant.

Therefore, the improvement of China's food security in 2011-2023 was due to the increase in the volume of imports of vegetables from Ukraine, and the increase of the imports of Ukrainian dairy products and cereals negatively affected the value of the Global Hunger Index, lowering China's food security. At the same time, the impact of imports of HS15 "Animal or vegetable fats and oils commodity group..." from Ukraine on the dynamics of China's Global Hunger Index turned out to be statistically insignificant. According to the United Nations Food and Agriculture Organization, Ukraine's food exports in 2022 decreased by 60% compared to 2021. Grain exports, in particular wheat, corn, and barley, decreased the most. Exports of these crops decreased by 58%, 51%, and 20%, respectively. Exports of oilseeds, in particular sunflower oil, also decreased by 41%. A similar regressive analysis was conducted for Indonesia, Pakistan, Bangladesh, India, and Sri-Lanka. In 2017-2021 the Global Hunger Index of Indonesia decreased from 22 to 18 points, leading to the improvement in food security. During this period, there was a significant increase in the import of vegetables, cereals, fats, and oils of animal or vegetable origin from Ukraine (Table 2).

Table 2. Input data for a regression analysis of the impact of food exports from Ukraine on the change of the Global Hunger Index of Indonesia

Year	Dependent variable		Independent variable			
	Global Hunger Index	HS04	HS07	HS10	HS12	HS15
	HGI_{Ch}	X_{1-Ch}	X_{2-Ch}	X_{3-Ch}	X_{4-Ch}	X_{5-Ch}
2011	12.2	2,288.1	145.7	744.5	361.4	0
2012	12	2,490.3	26.6	9,044.2	1,902.5	0
2013	10.1	3,655.2	80.1	64,465.1	2,555.5	292.4
2014	10.3	6,081.9	72.4	68,928.2	837.2	0
2015	22.1	3,580.9	168.4	157,746.6	18.2	0
2016	21.9	2,045.2	0.7	330,600.2	103.6	0
2017	22	435.1	197.7	328,543.6	94.8	348.9
2018	21.9	2,370.7	409.6	487,155.3	33.1	729.3
2019	20.1	1,956.5	188.1	537,479.1	6.9	771.4
2020	19.1	1,308.2	127.3	546,711.2	57.3	620.9
2021	18	597.8	2,747.4	749,759.7	571.1	374.4
2022	18	303.4	1,456.1	365,124.9	341.2	120.9
2023	17.6	0	173.7	117,183.4	205.5	524.2

Source: Global Hunger Index (n.d.); Official website of the State Statistics Service of Ukraine (n.d.)

The linear regression model describing the dependence of the Global Hunger Index of Indonesia on agricultural and food imports from Ukraine is described by the following equation:

$$HGI_{Indz} = 4.730 - 0.168 * X_{1Indz} - 0.127 * X_{4Indz} \quad (5)$$

The regression model illustrates the notable ($R=0.917$) influence of HS04 imports from Ukraine on Indonesia's Global Hunger Index: a 1% rise in the independent variable results in a 0.168% drop in the dependent variable. The food security in Indonesia was also positively affected by the change in the volume of imports of HS12 "Oil seeds and oleaginous fruits...": a 1% increase in the imports of this commodity group contributed to a decrease in the Global Hunger Index by 0.127%. The coefficient of determination indicates that the Global Hunger Index of Indonesia in 2011-2023 was 84.1% dependent on changes in the volume of imports of HS04 and of HS10 from Ukraine, and 15.9% dependent on changers in other factors. The estimated value of Fisher's test exceeds its tabular value ($F(2,8) = 21.243$), which confirms the significance

of relationships between the dependent and independent variables. The level of statistical error does not exceed 1%, which indicates the acceptability of the obtained results of the regression analysis. The impact of imports of HS15 "Animal or vegetable fats and oils..." on the state of food security in Indonesia turned out to be statistically insignificant. The situation in 2022 was much worse. Imports fell by about 50% across all indicators. Bread prices rose by 20%, meat availability fell by 10%, and the number of undernourished persons grew by 5%.

The food security of Pakistan in the researched period deteriorated; the Global Hunger Index of this country has increased from 20.7 points in 2011 to 24.7 points in 2021. At the same time, in the medium-term period, there was a decrease in Global Hunger Index from 33.9 points in 2015 to 24.6 points in 2020. During this medium-term time-frame, the volume of imports from Ukraine to Pakistan in cereals, oil seeds and oleaginous fruits grew dynamically. Although the dynamics of these indicators had a stochastic nature, authors assume that the change in the Global Hunger Index for Pakistan was caused by the dynamics of imports volumes of these commodity groups (Table 3).

Table 3. Input data for a regression analysis of the impact of food exports from Ukraine on the change of the Global Hunger Index of Pakistan

Year	Dependent variable		Independent variable			
	Global Hunger Index	HS04	HS07	HS10	HS12	HS15
	HGI_{Ch}	X_{1-Ch}	X_{2-Ch}	X_{3-Ch}	X_{4-Ch}	X_{5-Ch}
2011	12.2	2,288.1	145.7	744.5	361.4	0
2012	12	2,490.3	26.6	9,044.2	1,902.5	0
2013	10.1	3,655.2	80.1	64,465.1	2,555.5	292.4
2014	10.3	6,081.9	72.4	68,928.2	837.2	0
2015	22.1	3,580.9	168.4	157,746.6	18.2	0
2016	21.9	2,045.2	0.7	330,600.2	103.6	0
2017	22	435.1	197.7	328,543.6	94.8	348.9
2018	21.9	2,370.7	409.6	487,155.3	33.1	729.3
2019	20.1	1,956.5	188.1	537,479.1	6.9	771.4

Table 3, Continued

Year	Dependent variable		Independent variable			
	Global Hunger Index	HS04	Value of Imports, thousands of USD			
			HS07	HS10	HS12	HS15
<i>HGI_Ch</i>	<i>X₁_Ch</i>	<i>X₂_Ch</i>	<i>X₃_Ch</i>	<i>X₄_Ch</i>	<i>X₅_Ch</i>	
2020	19.1	1,308.2	127.3	546,711.2	57.3	620.9
2021	18	597.8	2,747.4	749,759.7	571.1	374.4
2022	26.4	241.3	1,572.9	334,612.7	241.9	116.8
2023	26.6	113.9	782.5	45,401.3	10.7	0

Source: Global Hunger Index (n.d.); Official website of the State Statistics Service of Ukraine (n.d.)

The linear regression model describing the dependence of Global Hunger Index of Pakistan on food imports from Ukraine is described by the following equation:

$$HGI_{Pak} = 1.523 + 0.247 * X_{1Pak} - 0.037 * X_{3Pak} + 0.026 * X_{4Pak} \quad (6)$$

According to the regression model, HS04 imports from Ukraine had a substantial negative influence on Pakistan's Global Hunger Index between 2011 and 2023: a rise of 1% in the independent variable resulted in a 0.247% increase in the dependent variable. The imports of HS12 from Ukraine had a somewhat lesser negative influence on Pakistan's Global Hunger Index: for every 1% rise in the independent variable, the dependent variable increased by 0.026%. Pakistan's food security improved mainly because of a rise in the amount of HS10 "Cereals" imports from Ukraine: a 1% increase in the independent variable resulted in a 0.037% drop in the dependent variable. The correlation coefficient ($R = 0.924$) indicates a significant connection between changes in Pakistan's Global Hunger Index and food imports from Ukraine. The coefficient of determination suggests that variations in the amount of imports from Ukraine of HS04, HS10, and HS12 account for 85.5% of the change in the value of the Global Hunger Index, with the remaining 15.5% owing to other variables.

The estimated value of Fisher's test exceeds its tabular value ($F(3,7) = 13.749$), which confirms the strength of relationships between the dependent and independent variables. The level of statistical error does not exceed 1%, which indicates the acceptability of the obtained results of the regression analysis. As a result of the regression analysis, no statistically significant influence of the import of HS07 and HS15 from Ukraine on the state of food security of Pakistan was revealed. In the context of an integrated response to Russian aggression, the international community is closely monitoring the practical challenges and threats facing Ukraine. The war, condemned by a UN special commission, has had a serious impact on Pakistan, making it one of the 12 countries in the world most affected by rising energy prices and the food crisis. Ukraine is one of the largest suppliers of grain, corn, and other agricultural products to Pakistan. However, given the circumstances created by the conflict, food supplies are under significant threat. In the summer of 2020, Ukraine played an important role as a guarantor of food security for Pakistan, supplying 1.2 million tonnes of grain. However, the situation is now at risk due to the ongoing hostilities and uncertainty in the region. Ukraine's position as a key provider of agricultural products has been crucial to world food security, particularly in Asia, but the Russian

invasion in 2022 interrupted these shipments, resulting in a dramatic fall in food supplies and raising prices. As a result, nations such as Pakistan, Bangladesh, and Indonesia saw increased food insecurity, although China's Global Hunger Index improved, owing mostly to pre-war increases in Ukraine imports.

► Discussion

The study's findings revealed that Ukraine is a major provider of agricultural goods to foreign markets. Its main export commodities include tobacco, wheat, corn, vegetables, barley, pulses, sugar beet, fruits and sunflower. Agriculture is an important sector, providing employment for 14% of the country's population and accounting for a significant share of Ukraine's export earnings (Lin *et al.*, 2023). Food security and a stable supply of food resources to international markets are becoming increasingly important aspects of the global economy, especially given the growth of the world's population. Ukraine plays a key role in ensuring the food security of the global community due to its large supplies of crops to the world markets (Wellington *et al.*, 2023). Food security in China and Ukraine has some similarities due to the common challenges and characteristics of their agricultural sectors. Agriculture in both countries is an important component of the economy. It not only provides food for domestic consumption but is also a significant source of exports (Wu *et al.*, 2023). A colleague from China, Y. Jin (2023), noted that in recent years, consumption of agricultural products in China has been growing, which creates a certain pressure on exports, as the domestic market is becoming more attractive to local producers. The author stated that in 2021, China imported 164.539 mln tonnes of grain – 24.1% of the total volume (682.85 mln tonnes). In June 2022, China's wheat imports totalled \$200,485. In July, it increased to \$280,843. China's agricultural exports provide the country with significant revenues and contribute to global food security, but also pose challenges for China to maintain product quality, compete in the global market, and support sustainable agricultural development.

The Russian invasion of Ukraine in February 2022 had a serious impact on global food security. The imposed martial law restricted exports of staple foods, leading to a decline in exports and higher prices on international food markets (Hellegers, 2022). According to the Ukrainian government, the world market lost more than 20 million tonnes of Ukraine's projected food exports, and Ukraine supplied three times less agricultural and food products than planned for 2022 (Flockhart & Korosteleva, 2022). Unexpected restrictions and market instability may be

the main reasons for such large losses. Preventing such unforeseen situations and developing mechanisms to ensure food security in the face of geopolitical instability are becoming critical tasks for the international community. A similar situation can be noticed in Syria, where the Syrian economy has been devastated by a conflict that has touched both economic and social components of commercial activity, resulting in severe fluctuations and instability in the macroeconomic environment since 2011. H. Mkiyes (2023) discovered in his research that the exchange rate of the Syrian pound against foreign currencies was relatively stable from 2007 until the outbreak of the Syrian civil war. However, since 2011, the Central Bank of Syria has followed an exchange rate system, implying that it has not adopted a specific exchange rate system. The Syrian economy contracted at the second-largest rate in history in 2012, with a decline of 26.33%, which was nearly replicated the following year at 26.3%. The author concludes that the hostilities and destruction of infrastructure in Syria have led to a significant decline in the production of oil, gas, textiles, phosphates and other exports, which has forced many foreign companies to limit their cooperation with Syrian enterprises, restricted access to foreign markets and reduced the country's economic independence. The hostilities and the presence of rebel-controlled territories have created problems with transport and logistics for exports, which has led to delays and interruptions in supply, making Syria dependent on assistance from some foreign countries and international organisations.

The global food security crisis created by the Russia-Ukraine conflict necessitates an immediate national and global reaction to give relief in the near term, as well as long-term policy measures to diversify global food markets in order to build resilience and avoid repeating crises (Jagtap *et al.*, 2022). The stability of Ukraine's food supply to global markets has been challenged by restrictions on production and exports due to the conflict. This has led to a deterioration in the food situation in many countries that rely on Ukraine for their supplies. Certain countries are especially susceptible, such as those experiencing a weak and disproportionate economic recovery from the COVID-19 epidemic, those with conflict-affected and unstable economies, and low-income countries that rely heavily on food imports (Semenenko *et al.*, 2024). It is also important to consider regional and national specificities to develop effective food export and trade strategies (Mbah & Wasum, 2022). Some countries may be more vulnerable to changes in global markets due to their dependence on certain food commodities or supply partners. This necessitates comprehending and recognising regional and national vulnerabilities in order to justify urgent and long-term interventions (Leon *et al.*, 2022).

K.A. Abay *et al.* (2023) noted that to ensure the food security of Ukraine's partner countries, it is important to take coordinated measures to ensure a sustainable and reliable food supply. Expanding sources of supply, including other agricultural nations and regions, can help reduce dependence on a single supplier. In addition, developing domestic production and supporting agricultural enterprises can provide greater independence from external factors (Mukhametov *et al.*, 2023). Meanwhile, M. Al-Saidi (2023) expressed the importance of considering

regional and national specificities to develop effective food export and trade strategies. Some countries may be more vulnerable to changes in global markets due to their dependence on certain food products or supply partners. Meanwhile, S.K. Wegren (2023) has identified favourable production prospects for the 2022/23 winter plantings, but uncertain in Ukraine. In western Ukraine, where the fighting has halted activity on available land and spring crops such as corn, barley and sunflower seeds have been sown, difficulties have arisen due to remnants of war hindering agricultural operations. The author notes that disruptions to essential public services and localised shortages of inputs due to supply chain constraints have also negatively impacted agricultural activities. It is estimated that the area under main spring crops has decreased by around 20% in the government-controlled territory.

Having analysed the regression data, it can be concluded that Ukrainian exports to the main trade partners in Asia affect food security in different ways. The situation can have both positive and negative consequences. This suggests that engagement in international trade processes and active involvement in the global division of labour help to improve the food security component at the national level (Chorny & Chorna, 2017). However, it is important to understand that ensuring sustainable food security depends on a skilful balance: exporting surplus agricultural and food products after meeting domestic demand and importing the necessary volumes that cannot be produced in the country (Hall, 2023). Similar conclusions were reached by H. Hussein & M. Knol (2023), who argue that a country should be able to meet the needs of its domestic consumers in the first place, and only then export the surplus. If certain food products are not available for cultivation or production in the country, imports of these products are required to address the home demands of the people. This helps to maintain the country's food security, as it does not depend solely on domestic production, but can trade with other countries, ensuring a greater level of resilience and stability of the food market (Shahini *et al.*, 2023).

As a result, imports of agricultural and food products from Ukraine have a positive impact on the food security of some countries, including China, Indonesia, and Pakistan, but the study also points to the negative impact of high prices and limited imports on the affordability of products for the population. This aspect is particularly relevant due to the impact of geopolitical factors, such as war, on Ukraine's agricultural sector. It is noted that the effective development of international trade is a key tool for improving food security, but it is important to ensure the availability of the necessary products on the domestic market before exporting them. The situation highlights the need for careful analysis and management of foreign economic processes to maintain food security stability, especially in the context of the impact of conflicts and global events on the national agricultural market.

► Conclusions

The research examined Ukraine's role in global food security and showed that, while Ukrainian agricultural exports had a positive impact on the Global Hunger Index in certain countries, the conflict significantly disrupted

supply networks, undermining food security in the majority of places. There is a considerable correlation between Ukraine's agricultural exports and improvements in the Global Hunger Index of its primary trading partners. Specifically, the regression analysis revealed that a 1% increase in edible vegetable imports from Ukraine lowered China's Global Hunger Index by 0.125%, demonstrating that these exports improved China's food security. In contrast, a 1% increase in dairy product imports resulted in a 0.145% increase in China's Global Hunger Index, indicating a negative impact, probably owing to variances in local dietary preferences. However, the conflict in Ukraine resulted in a 60% decline in food exports in 2022, a 50% drop in imports to Asia, and a large increase in food insecurity in countries such as Pakistan, Bangladesh, and Indonesia.

The practical implications of this research are critical to global food security policy. Ensuring a consistent food supply from Ukraine has the potential to dramatically reduce the Global Hunger Index in key regions, particularly

Asia. Policymakers and international organisations should emphasise repairing and preserving Ukrainian export channels to mitigate the war's negative impact on global food markets and lower the possibility of hunger crises in vulnerable nations. This report stresses Ukraine's essential role in global food security and the need for concerted efforts to preserve its agricultural trade. Therefore, the increase in exports of food and agricultural products negatively affects the consumption of these products in the domestic market of Ukraine. This issue must be further researched in great detail to maintain the food security of Ukraine, especially considering the negative impact of war on the state of the national market and agricultural sector.

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► Conflict of interest

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Вплив українського імпорту на продовольчу безпеку торговельних партнерів

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► **Анотація.** Актуальність досліджуваної проблеми полягає в тому, що зміни на зовнішніх ринках можуть суттєво впливати на продовольчий сектор інших країн, а глобальна продовольча безпека, яка вимірюється комплексом індикаторів, зокрема Глобальним індексом голоду, є однією з головних загроз міжнародній економічній стабільності. Метою дослідження була оцінка взаємозв'язку між продовольчою безпекою Бангладеш, Китаю, Індії, Індонезії, Пакистану, Шрі-Ланки та В'єтнаму і динамікою їхнього імпорту сільськогосподарської та харчової продукції з України. У дослідженні було використано низку методів, включаючи аналіз динаміки Глобального індексу голоду найбільших імпортерів України, структурний та регресійний аналіз імпорту сільськогосподарської продукції з України. Результати дослідження виявили позитивний вплив імпорту продовольства з України на продовольчу безпеку низки країн. Зокрема, дослідження показало, що імпорт овочів з України має позитивний вплив на продовольчу безпеку Китаю, тоді як українське молоко, молочні продукти, яйця птиці, натуральний мед, насіння олійних культур та плоди олійних культур допомагають забезпечити продовольчу безпеку Індонезії. Імпорт зернових з України також має позитивний вплив на продовольчу безпеку Пакистану. Проте дослідження не підтвердило статистично значущого зв'язку між динамікою Глобального індексу голоду та імпортом продовольства з України до Бангладеш, В'єтнаму, Індії, Шрі-Ланки та В'єтнаму у період з 2011 по 2023 роки. Практичне значення дослідження визначається розумінням впливу українського імпорту на продовольчу безпеку торговельних партнерів та необхідністю розробки стратегій диверсифікації поставок і стимулювання внутрішнього виробництва для забезпечення стійкості та сталості продовольчого сектору цих країн

► **Ключові слова:** міжнародна торгівля; стійкість; Глобальний індекс голоду; регресійний аналіз; міжнародні ринки