

Comparison of Foreign Trade Characteristics between Taiwan and Ukraine: Impact on Economic Growth and Threats to National Economic Security*

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Abstract

The full-scale invasion of Russian troops into Ukraine not only changed the geopolitical situation but also brought attention to the threat of a similar situation by China against Taiwan because there are significant similarities in the geographical and historical factors of the development of Ukraine-Russia and Taiwan-China relations, as well as in bilateral political, economic relations. Ukraine's economic and trade dependence on Russia, while simultaneously deepening Ukraine's cooperation with European countries, led to the deterioration of Ukrainian-Russian relations, which finally resulted in a full-scale invasion of Russian troops into Ukraine. The similarity of relations between Taiwan

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and China to Ukrainian-Russian relations lies in close trade ties and the corresponding interdependence of the two countries' economies, which is also accompanied by the strengthening of political influence and territorial claims of China over Taiwan.

Thus, in this study, we will compare Taiwan and Ukraine according to the main indicators of foreign trade, identify the largest trade partners of these countries (Taiwan-China, Taiwan-America, Ukraine-Russia, Ukraine-China), and respectively evaluate their structure of trade for analyzing the impact of foreign trade with the main trade partner on economic growth. Besides, we will realize whether the foreign trade of Taiwan and Ukraine meets the criteria of economic security, which is defined as the share of the leading partner country in the total turnover of foreign trade.

Through the objective analysis of the data in this paper, we found that there are a number of differences that indicate a low probability of applying China's military scenario regarding Taiwan due to the difference in the economic development, the different structure of the economy and the degree of inclusion in the global chains of creation of added value, which is all reflected in the foreign trade of Ukraine and Taiwan with leading partner countries. Taiwan is facing the same economic security issues that Ukraine faced in the past, but Taiwan's economic status has an advantage over Ukraine in facing economic security threats.

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Keywords: foreign trade, economic growth, economic security,
Ukraine-Russia, Taiwan-China

I. Introduction

The full-scale invasion of Russian troops into Ukraine significantly changed the geopolitical situation, showing the ineffectiveness of the existing system of international law and upsetting the balance of power in the world. Given the significant territorial advantage, as well as the superiority in the number of the population and armed forces of Russia over Ukraine, the mass media began to pay attention to the increasing threat of China implementing a similar scenario with regard to Taiwan.¹ In July 2022, the Ketagalan Forum-2022 Indo-Pacific Security Dialogue was held in Taipei, where, among the main issues of ensuring security in the region, much attention was paid to the issues of confrontation between democracy and authoritarian regimes, the impact of the war between Russia and Ukraine on the Indo-Pacific order, as well as analysis of the effectiveness of sanctions against Russia as a tool to stop aggression.²

¹ See: Mehdi Chebil. "China's military threat to Taiwan is much more credible than it was 20 years ago," *France 24*, July 08, (2022).

<https://www.france24.com/en/asia-pacific/20220807-china-s-military-threat-to-taiwan-is-much-more-credible-than-it-was-20-years-ago>; "How to deter China from attacking Taiwan. What Taiwan can learn from Ukraine about resisting invasion," *The Economist*, April 23, (2022).

https://www.economist.com/leaders/2022/04/23/how-to-deter-china-from-attacking-taiwan?gclid=CjwKCAiAnZCdBhBmEiwA8nDQxRTRLxXnvZ0BvuBwMbJsGJo-bAVLv8XW1r1afg20lwOeLFUw7mSzjRoC43wQAvD_BwE&gclid=c=aw.ds.

² "Ketagalan Forum starts July 26 in Taiwan," *Taiwan Today*, July 21, (2022).

<https://taiwantoday.tw/news.php?unit=2&post=222401>.

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There are a few significant similarities in the geographical and historical factors of the development of Ukrainian-Russian and Taiwan-Chinese relations and a similar disparity in military power (Russia's military advantage over Ukraine is similar to China's advantage over Taiwan). Besides, most importantly, the relationship between Taiwan and China is like the Ukrainian-Russian relationship precisely in the simultaneous existence of mutual economic dependence and political disputes.

The economy and foreign trade were important factors in constructing pre-war Ukrainian-Russian relations, in which Ukraine's dependence on energy imports from Russia and the orientation of Ukrainian food, chemical, and machine-building industries, as well as agricultural enterprises to the Russian market, were formed. During 2008-2013, there was a significant aggravation of the trade war between Ukraine and Russia due to the introduction of trade restrictions by the Russian side in relation to Ukrainian goods (pipes, metal, synthetic fibers, sugar, caramel), which led to significant losses for Ukrainian exporters. Since 2014, after the annexation of Crimea by Russia and the occupation of parts of the Donetsk and Luhansk regions, the volume of Ukrainian-Russian trade has significantly decreased, and in 2016, Russia terminated the agreement on a free trade zone with Ukraine, which forced Ukrainian exporters to look for new markets for their goods and importers – new suppliers of energy carriers, raw materials, materials, and other goods. In view of this,

a favorable factor was the signing of the agreement on the Ukraine-EU Comprehensive and Deep Free Trade Area.

Ukraine's economic and trade dependence on Russia, while simultaneously deepening Ukraine's cooperation with European countries, led to the deterioration of Ukrainian-Russian relations, which finally resulted in a full-scale invasion of Russian troops into Ukraine. Thus, the situation in Ukraine shows how the country, which was its leading trade partner for a long time, constantly strengthened its influence on political development with the help of economic instruments. However, when Russia failed to achieve its goals, particularly Ukraine joining the Eurasian Economic Union (EAEU), the Russian leadership decided to implement a military scenario.

The similarity of relations between Taiwan and China and Ukrainian-Russian relations lies. First of all, close trade ties and the corresponding interdependence of the two countries' economies are accompanied by the strengthening of China's political influence and territorial claims over Taiwan. Over the past ten years, China has been Taiwan's leading partner country, and bilateral trade is characterized by significant exports and imports of both raw materials and high-tech products. As Bukhari S. points out, Taiwan and China "are valuable trade partners for each other, as they have invested tens of billions of dollars in each other's economy," at the same time, given the "unbalanced economic interdependence," the scientist predicts "that China's

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enormous economic influence can be used as political leverage in Taiwan.”³ In case of deterioration of political relations between countries, the intensity of trade may decrease, and Taiwanese manufacturers will have to urgently look for new export markets and suppliers of raw materials and materials.

China has significant economic leverage over Taiwan, some of which is already being used. In particular, China imposed sanctions on the import of a number of Taiwanese products (citrus, mackerel fillets, and other fish products, more than a hundred types of food) and banned the export of sand to Taiwan. At the same time, the sanctions do not apply to electronics products (such as microchips or optical components) that China requires greatly.⁴ Therefore, China’s application of export and import restrictions in trade with Taiwan is an element of a trade war, which makes the relationship between these countries similar to the Ukrainian-Russian relationship during 2010-2013. However, the difference is that China’s sanctions on the import of certain agricultural products from Taiwan so far have little impact on the economy, as the share of these products in Taiwanese exports is less than 1%. The sanctions imposed by Russia on Ukrainian metallurgical products had a significant negative impact on the

³ Syed Shahid Hussain Bukhari. “The Dynamics of China-Taiwan Politico-Economic Interdependence: Divergence to Rapprochement,” *Pakistan Journal of Social Sciences*, 36, no. 1, (2016): 25-37.

⁴ Thomas Kohlmann. “How much does Taiwan depend on China?” *Deutsche Welle*, August 6, (2022).
<https://www.dw.com/en/how-much-does-taiwan-depend-on-china/a-62725691>.

economy of Ukraine, as these products at that time accounted for more than 40% of the total volume of Ukrainian exports.

In this regard, we note that the threat to Taiwan's economy will become critical if China imposes restrictions on the import of industrial goods, in particular semiconductor devices. In the event of China's military aggression against Taiwan, the work of companies that manufacture semiconductor devices will be stopped. The semiconductor industry is seen as Taiwan's "silicon shield,"⁵ which protects Taiwan from Chinese aggression due to the dependence of many global electronics manufacturers on Taiwanese semiconductor devices.

Therefore, as a result of the introduction of a number of trade restrictions on Taiwanese goods and China's demonstration of force during military exercises, threats to Taiwan's sovereignty and independence have increased, which also significantly threatens the country's economic stability. The similarity of this situation to Ukrainian-Russian economic and political relations over the past ten years determines the relevance of studying the dependence of Taiwan and Ukraine on the leading trading partner countries and the impact of foreign trade on the economic growth of the countries under study. At the same time, in order to

⁵ Vivek Ramaswamy and Mike Pompeo. "China's Threat to Taiwan Semiconductors. Why aren't American asset managers paying attention to the risks from an invasion of the island?" *The Wall Street Journal*, October 10, (2022).

<https://www.wsj.com/articles/investing-silicon-semiconductors-chips-taiwan-invasion-tsmc-china-intel-blackrock-asset-manager-11665408814>.

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determine the positive effects and threats to the economies of Taiwan and Ukraine, it is important to take into account both the volume of exports and imports of bilateral trade with leading partner countries (Taiwan-China, Taiwan-America, Ukraine-Russia, Ukraine-China) and the structure of trade.

That is, this paper will adopt quantitative analysis by citing relevant data to compare the economic security issues brought by the economic-trade relations between Taiwan and Ukraine with their major trading partner countries to reach an objective explanation of the existing disputes between the relationship between Ukraine and Russia and the relationship between Taiwan and China. This quantitative analysis method will become the main academic contribution of this paper because, currently, there is a relative lack of analytical papers that compare the economic security issues of Taiwan and Ukraine through the quantitative analysis approach.

II. Theoretical and methodological foundations of the study of the influence of foreign trade on the economic growth of countries

In the conditions of globalization, increasing countries' dependence on foreign trade in the process of deepening bilateral relations can have both positive effects for partner countries and threaten to reduce economic growth rates due to a sharp deterioration of cooperation or the beginning of a trade war. The

result of many theoretical and empirical studies was confirmation of the relationship between economic growth and foreign trade. Thus, Hendrik V. and Lever J. confirmed: “the hypothesis that a high level of openness of the economy and active participation in international trade ensures higher incomes and higher rates of economic growth,” and they also “disproved the alternative hypothesis about the negative impact of trade on economic growth, because there is no convincing statistical evidence of a negative correlation between international trade and the economic growth of countries.”⁶

The study of the relationship between the openness of the economy and the quality of economic growth in China in terms of exchange rate fluctuations from 1994 to 2018 allowed scientists to draw a conclusion: “Trade openness can significantly promote the quality of economic growth in both the short and long term.”⁷ The results of the research done by Sun P. and Heshmati A. “demonstrates that increasing participation in the global trade

⁶ Hendrik Van den Berg and Joshua J. Lewer. “Trade and Growth: The Empirical Evidence”, in *International Trade and Economic Growth*, Van den Berg H. and Lewer, J. eds. New York: Routledge, (2007): 38. <https://doi.org/10.4324/9781315703282>.

⁷ Qunxi Kong, Dan Peng, Yehui Ni, Xinyue Jiang and Ziqi Wang. “Trade openness and economic growth quality of China: Empirical analysis using ARDL model,” *Finance Research Letters*, 38 (C), no. 101488, (2021). <https://doi.org/10.1016/j.frl.2020.101488>.

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helps China reap the static and dynamic benefits, stimulating rapid national economic growth.”⁸

A. The economic effects of export in foreign trade

In the scientific literature, strong arguments are presented in support of the export-oriented strategy for the development of countries in the conditions of globalization. The researchers found that increasing export volumes has a positive effect on the economic growth of countries.⁹ The increase in export volumes provides additional foreign currency income, which allows the importation of more goods, materials, and components. Exports have a positive effect on economic growth due to increased productivity, which, according to Alhajhoj H., “occurs as a result

⁸ Peng Sun and Almas Heshmati. “International Trade and Its Effects on Economic Growth in China.” *IZA Discussion Paper*, no. 5151, (2010). <https://ssrn.com/abstract=1667775>.

⁹ Bela Balassa. “Export and economic growth: Further evidence,” *Journal of Development Economics*, 5, no. 2, (1978): 181-189. [http://dx.doi.org/10.1016/0304-3878\(78\)90006-8](http://dx.doi.org/10.1016/0304-3878(78)90006-8); Yuriy Bilan. “Increase diversification through strengthened enabling environment for entrepreneurship: A focus on skill endowments and export orientation (example of Hungary and Poland),” *Economics and Sociology*, 2, no. 2, (2009): 33-45. <https://doi.org/10.14254/2071-789X.2009/2-2/3>; Iskra Stancheva-Gigov & Klimentina Poposka. “Foreign Trade and Economic Growth a Panel Regression Analysis,” *International Journal of Economics, Commerce and Management*, 2, no. 12, (2014): 1-10.

of a better allocation of resources through specialization based on comparative advantages.”¹⁰

However, the results of empirical studies indicate the ambiguous impact of exports on the economic growth of countries. In particular, Awokuse T. studied Japan’s foreign trade and showed that “exports contribute to economic growth” in this country.¹¹ Reppas P. and Christopoulos D. found that “in the countries of Asia and Africa, there is a unidirectional cause and effect relationship from exports to economic growth.”¹² Bajo-Rubio O. and Díaz-Roldán C. obtained empirical evidence that “exports contribute to economic growth in the Czech Republic, while in eight other new EU members, no significant causal relationship between these variables was found.”¹³ The positive effect of exports on growth is conditional, as confirmed by Abu-Qarn A. and Abu-Bader S. for nine countries of the Middle East and North Africa: “promoting exports may contribute

¹⁰ Hassan Alhajhoj. “Exports and Economic Growth in Saudi Arabia: A VAR Model Analysis,” *Journal of Applied Sciences*, 7, no. 23, (2007): 3649-3658. <http://dx.doi.org/10.3923/jas.2007.3649.3658>.

¹¹ Titus Awokuse. “Export-led growth and the Japanese economy: evidence from VAR and directed acyclic graphs,” *Applied Economics*, 12, no. 14, (2005): 849-858. <https://doi.org/10.1080/13504850500358801>.

¹² Panayiotis A. Reppas and Dimitris Christopoulos. “The export-output growth nexus: Evidence from African and Asian countries,” *Journal of Policy Modeling*, 27, no. 8, (2005): 929–940. <https://doi.org/10.1016/j.jpolmod.2005.06.007>.

¹³ Oskar Bajo-Rubio and Carmen Díaz-Roldán. “Do exports cause growth? Some evidence for the new EU members,” *Post-Communist Economies*, 24, no. 1, (2012): 125–131. <https://doi.org/10.1080/14631377.2012.647632>.

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to economic growth only after a certain threshold of manufactured exports has been reached.”¹⁴

B. The economic function of imports in foreign trade

In addition to exports, imports are an important component of the foreign trade balance, which affects the country’s economy. The results of empirical studies confirm the impact of imports on economic growth. Using data for Argentina, Colombia, and Peru, Awokuse T. confirmed the significant contribution of both exports and imports to the economic growth of these countries, with “the impact of imports on growth being more well-argued.”¹⁵ Examining annual data from 1964-2004, Herrerias M. and Orts V. determined that “imports are the engine of growth in China mainly because it gives it access to new technologies.”¹⁶

According to the results of some studies, imports play a more important role than exports in stimulating economic growth. In particular, Thangavelu S. and Rajaguru G. found that “exports

¹⁴ Aamer Abu-Qarn and Suleiman Abu-Bader. “The validity of the ELG hypothesis in the MENA region: Cointegration and error correction model analysis,” *Applied Economics*, 36, no. 15, (2004): 1685–1695, <https://doi.org/10.1080/0003684042000266865>.

¹⁵ Titus Awokuse. “Trade openness and economic growth: Is growth export-led or import-led?” *Applied Economics*, 40, no. 2, (2008): 161–173. <https://doi.org/10.1080/00036840600749490>.

¹⁶ Maria Jesus Herrerias and Vicente Orts. “Capital goods imports and long-run growth: Is the Chinese experience relevant to developing countries?” *Journal of Policy Modeling*, 35, no. 5, (2013): 781–797. <https://doi.org/10.1016/j.jpolmod.2013.02.006>.

have an insignificant effect on productivity growth in Hong Kong, Indonesia, Japan, Taiwan, and Thailand,” while “the hypothesis of growth due to imports was confirmed for India, Indonesia, Malaysia, the Philippines, Singapore, and Taiwan,” while “in the long term, imports exceed exports in terms of contribution to growth.”¹⁷

According to the results of modern research, an important factor in economic growth is also the country’s specialization in the production of certain goods, which determines the structure of foreign trade. The leading role in forming the country’s international specialization is attributed to technical progress, which determines significant differences between economic sectors: the country’s specialization in the production of high-tech goods ensures higher rates of economic growth compared to those countries that specialize in low-tech goods. Lucas R. notes that “the ability to change the specialization model towards the most technologically advanced industries becomes an important factor of economic efficiency.”¹⁸

¹⁷ Shandre mugan Thangavelu and Gulasekaran Rajaguru. “Is there an export or import-led productivity growth in rapidly developing Asian countries? A multivariate VAR analysis,” *Applied Economics*, 36, no. 10, (2004): 1083–1093. <https://doi.org/10.1080/0003684042000246795>.

¹⁸ Robert E. Lucas. “On the Mechanisms of Economic Development,” *Journal of Monetary Economics*, no. 22, (1988): 3-4. [https://doi.org/10.1016/0304-3932\(88\)90168-7](https://doi.org/10.1016/0304-3932(88)90168-7).

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C. The structure of foreign trade: the key to economic growth

The structure of foreign trade indirectly characterizes the level of technological and economic development of the country. For example, over a period of 30 years, China underwent institutional reforms that contributed to the liberalization of foreign trade in the 1980s, as well as a gradual transition from a commodity-based economy to the production of goods with higher added value. Based on the study of these processes, scientists noted that “China is ambitious in acquiring advanced technology and building up a sophisticated system to promote technological capability,” and therefore, “structural changes taking place in China’s intermediate goods trade.”¹⁹

A study of the economies of 28 OECD and developing countries by Lewer, J. J. & Van den Berg, H. found that “the composition of trade determines the strength of the “engine of growth,” and “countries that import mostly capital goods and export consumer goods tend to grow faster than countries that export capital goods.”²⁰ Based on the analysis of the process of

¹⁹ Yanghua Huang, Nimesh Salike and Feiteng Zhong. “Policy effect on structural change: A case of Chinese intermediate goods trade,” *China Economic Review*, no. 44(C), (2017): 30–47.

²⁰ Joshua Lewer and Hendrik Van den Berg. “Does trade composition influence economic growth? Time series evidence for 28 OECD and Developing Countries,” *The Journal of International Trade and Economic Development*, 12, no. 1, (2003): 39-96.

<https://doi.org/10.1016/j.chieco.2017.03.005>.

industrial diversification in the countries that were part of the European Union (EU-27) and those that were the target of the European Neighbourhood Policy (ENP), Boschma R. and Capone G. showed “that the future export structures of countries are affected by their imports.”²¹

In view of the above, the results of modern studies of international trade conducted by scientists confirm the significant influence of trade on the economic growth of countries.

D. Methodology of this study

Based on the considered theoretical and empirical substantiation, the country’s economic growth is influenced by foreign trade and the commodity structure (in which goods dominate exports and imports), we can assume that the change in the total volume of exports and imports of the country with the leading trading partner is an important factor in economic growth. It is also necessary to take into account the impact of changes in exports and imports by main product groups in such bilateral trade on economic growth.

So, in our study, we will compare Taiwan and Ukraine according to the main indicators of foreign trade, identify the largest trade partners of these countries, and evaluate the impact of

²¹ Ron Boschma and Gianluca Capone. “Relatedness and diversification in the European Union (EU-27) and European Neighborhood Policy countries,” *Environment and Planning C: Government and Policy*, 34, no. 4, (2016): 617-637. <https://doi.org/10.1177/0263774X15614729>.

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foreign trade with the main trade partner on the economic growth of Taiwan and Ukraine, respectively.

At the same time, we consider the study of compliance of the country's foreign trade with the criteria of economic security to be an important element of the research, which is determined by such indicators as: "the share of the leading partner country in the total volume of exports of goods; the share of the leading partner country in the total volume of goods imports; the share of the leading product (product group) in the total volume of export of goods; the share of the leading product (commodity group), excluding energy imports, in the total volume of goods imports; the share of raw and low-grade industrial exports in the total volume of goods exports."²²

From the point of view of the foreign economic security of the state, the indicator of the geographical structure of foreign trade is important, which is defined as the share of the leading partner country in the total turnover of foreign trade. The limit value of the indicator is set at the level of 30%,²³ which means the aggravation of threats to the economic security of the state in

²² Metodyka rozrakhunku rivnia ekonomichnoi bezpeky Ukrainy. Nakaz Ministerstva ekonomichnoho rozvytku i torhivli Ukrainy 29.10.2013 № 1277 [Methodology for calculating the level of economic security of Ukraine. Order of the Ministry of Economic Development and trade of Ukraine 29.10.2013 No. 1277], accessed November 17, 2022. https://zakononline.com.ua/documents/show/218014__218079#n9. (in Ukrainian).

²³ Metodyka rozrakhunku rivnia ekonomichnoi bezpeky Ukrainy.

the event that the calculated value of this indicator is greater than the limit value. A significant increase in the share of the leading partner country in the foreign trade turnover indicates an increased dependence of the economy of the studied country on one priority export market of goods or services, as well as dependence on the import of raw materials or goods from a small number of suppliers mainly from one country.

Using the theoretical basis discussed above for the study of the relationship between foreign trade and economic growth, in our study, we will conduct a regression analysis of the dependence of the economic growth of each country on the volume of export and import of goods according to the following model:

$$Econ_gr_i = f(Exp_i; Imp_i; RT_i), \quad (1)$$

where $Econ_gri$ is a vector of the dependent variable characterizing the economic growth of a given country and includes indicators of GDP (GDP_{tw} , GDP_{ukr}), (GDP_{pc_tw} , GDP_{pc_ukr}), GDP index relative to the previous year of Taiwan (GDP_{ind_tw}) and Ukraine (GDP_{ind_ukr}); Exp_i - the volume of exports of goods from the i -th country to the partner country; Imp_i - volumes of imports from the partner country to the i -th country; RT_i - the share of the leading partner country in the foreign trade turnover of i -th country.

Based on the functional equation (1), we can formulate an econometric equation in which α is a constant term, β_i are coefficients to be estimated, and ϵ_t is an error:

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$$Y_{ti} = \alpha + \beta_1 \cdot Exp_i + \beta_2 \cdot Imp_i + \beta_3 \cdot RT_i + \varepsilon_t, \quad (2)$$

where Y_{ti} is a vector of dependent variables, including indicators of economic growth of the i th country.

In order to determine the influence of the commodity structure of foreign trade on the economic growth of each of the studied countries, we will build a linear regression model that expresses the dependence of economic growth (GDP, GDP per capita, GDP index) on the volumes of exports and imports of the main groups of goods:

$$Econ_{gr}_i = f(Exp_1; Exp_2; Exp_n; Imp_1; Imp_2; Imp_n), \quad (3)$$

where $Exp_1; Exp_2; Exp_n$ – export volumes of basic goods (commodity group 1, 2, ... n) from i -th country; $Imp_1; Imp_2; Imp_n$ – volumes of import of basic goods (commodity group 1, 2, ... n) to i -th country.

The reliability of the regression study results depends on the statistical data's quality and completeness. Therefore, in our research, we will use data from official statistics on the volume and structure of foreign trade of Taiwan and Ukraine with the main trading partner countries, which are provided on the website of the World Trade Organization and on the oec.world platform, for the period 2010-2020, according to the practice of taking ten years in general long-term research.

III. Comparison of the main trends of foreign trade in goods between Taiwan and Ukraine

In 2020, Taiwan ranked 15th among the 50 countries that are the leading exporters in terms of exports of goods. Taiwan's economy exported goods worth USD 347 billion, which accounted for 2% of world exports. At the same time, it should be noted that Taiwan's export volumes increased by 5% in 2020 compared to 2019 as a result of the economic crisis due to quarantine restrictions. The growing trend was characteristic of few countries (China (+4%), Vietnam (+ 7%), Ireland (+5%), Chile (+3%), Poland (+2%).²⁴ Ukraine's position in this rating is much worse (48th place) due to relatively low export volumes - USD 49 billion, which accounts for only 0.3% of global exports, as well as a decrease in exports in 2020 by 2% compared to the previous year.

In the ranking of importing countries, Taiwan took 18th place in 2020 with import volumes of USD 288 billion, which practically did not change compared to 2019 and accounted for 1.6% of global imports. In 2020, Ukraine imported goods worth USD 54 billion, which was 0.3% of the world import volume and was 11% less compared to the previous year. Among the 50 leading importing countries, Ukraine took 48th place in 2020. The contribution of Taiwan and Ukraine to the formation of world exports is

²⁴ "World Trade Statistical Review 2021." WTO, accessed November 17, 2022. https://www.wto.org/english/res_e/statis_e/wts2021_e/wts21_toc_e.htm.

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significantly different (Fig. 1). During the studied period, the share of Ukraine in the world export of goods did not exceed 0.4%, but about 2% of the world's exports of goods are formed annually due to Taiwan's exports.

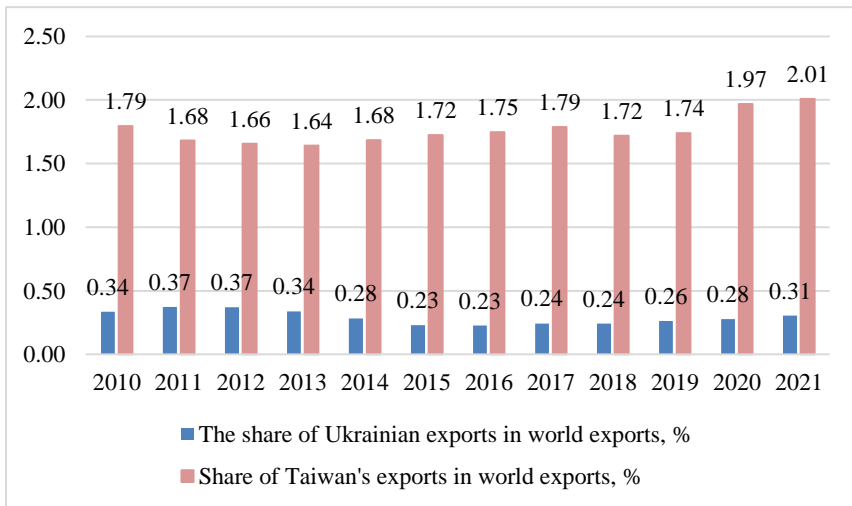


Figure 1. The share of Taiwan and Ukraine in the world volume of exports of goods Source: calculated by the authors based on the data stats.wto.org.²⁵

The dynamics of Ukraine's foreign trade are characterized by alternating clearly defined crises (2009-2010; 2015-2016; 2020) and post-crisis recovery. The growth of foreign trade turnover in 2011 after the global financial and economic crisis of 2008 took place at a high rate (34.4% compared to the previous year). As a result of Russia's annexation of Crimea and the start of hostilities

²⁵ "Merchandise exports by product group." WTO, accessed November 17, 2022. <https://stats.wto.org>.

in Donbas, the volume of foreign trade turnover in 2015 decreased by 30.2% compared to 2014 and recovered at a slightly lower rate, which amounted to 122.8% in 2017 and 112.5% in 2018. This increase in foreign trade was largely due to the signing of the Association Agreement between Ukraine and the EU and the introduction of a free trade regime between the countries. Quarantine restrictions decreased Ukrainian foreign trade turnover in 2020 by 6.6% compared to 2019, which was significantly less compared to the crisis drop in 2015. At the same time, the recovery of foreign trade in 2021 had the highest growth rates for the studied period (35.8% for the year).

Foreign trade of Taiwan, which, compared to Ukraine, has a much smaller territory and population, is carried out in larger volumes. Thus, Taiwan's foreign trade turnover in 2021 amounted to USD 829.8 billion and exceeded the foreign trade turnover of Ukraine by 5.9 times (USD 140.6 billion). Taiwan's foreign trade turnover increased by 57.8% during the research period - from USD 525.8 billion in 2010 to USD 829.8 billion in 2021. In general, the annual growth rates of Taiwan's exports are mostly positive (Fig. 2), except in 2015, when export volumes decreased by 2.1% compared to 2014 due to a slight slowdown in the world economy.

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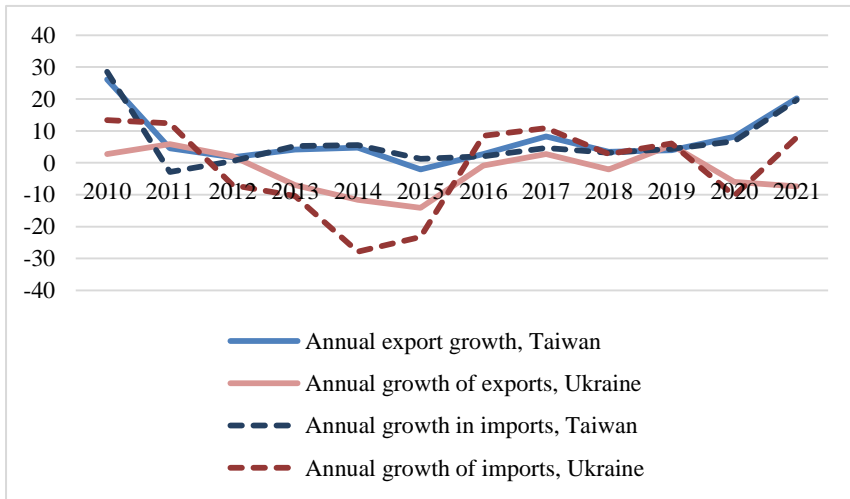


Figure 2. Dynamics of annual changes in the volume of exports and imports of goods of Taiwan and Ukraine (% compared to the previous year). Source: built by the authors from the data stats.wto.org.²⁶

Let's pay attention to the dynamics of annual changes in Taiwan's import volumes, which practically coincide with the dynamics of changes in exports. However, in certain periods, the growth of imports significantly lagged behind the growth of exports. Over the past two years, exports have grown at a faster rate (+8.2% in 2020 and 20.2% in 2021) than imports (6.8% and 19.7%, respectively), which caused a significant increase in Taiwan's foreign trade surplus.

²⁶ "Merchandise export volume change - annual (% change over previous year)." WTO, accessed November 17, 2022. <https://stats.wto.org>.

The specified differences in export volumes of Ukraine and Taiwan, differences in the dynamics of export (import) volumes, and the ability to restore foreign trade volumes after crisis periods are largely due to the structural features of exports and imports of these countries.

According to statistical data,²⁷ Taiwan's exports are dominated by integrated circuits (USD 138 billion), office machine parts (USD 16.1 billion), computers (USD 10.9 billion), pure audio media (USD 9.2 billion) and broadcasting equipment (USD 8 billion), which are exported mainly to China (USD 104 billion), the USA (USD 54.8 billion), Hong Kong (USD 50 billion), Singapore (USD 24.9 billion) and Japan (USD 24.3 billion). In general, high-tech goods make up more than 50% of Taiwan's exports. Integrated microcircuits form the basis of Taiwan's merchandise exports, the share of which increased by 17.7 percentage points (pp) during the period under review - from 19.2% in 2010 to 36.9% in 2020 (Fig. 3).

²⁷ "Chinese Taipei. Yearly Trade. Export." Observatory of Economic Complexity, accessed November 25, 2022. <https://oec.world/en/profile/country/twn>.

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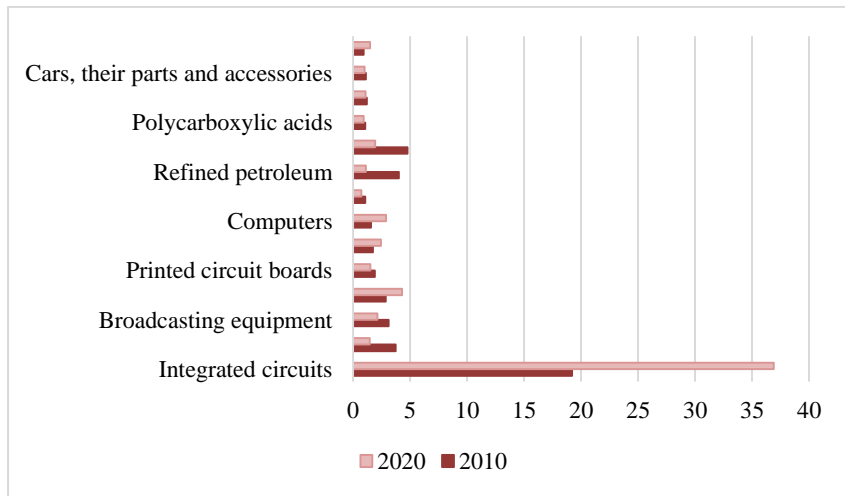


Figure 3. Dynamics of the share of basic goods in Taiwan's exports in 2010 and 2020, %. Source: Built by the authors from the data oec.world.²⁸

In exports to China, which is the leading partner country of Taiwan, integrated microcircuits prevail - 40.7% of the total volume of exports to this country in 2020, which in terms of value amounted to USD 42.2 billion or 30.6% of the total export of these products (USD 138 billion). The second place in terms of share in exports to China in 2020 was occupied by liquid crystal displays - 5.38% of the total volume of exports to this country or USD 5.58 billion, which accounted for 76.7% of the total volume of exports of these products from Taiwan (USD 7.27 billion).

²⁸ OEC, "Chinese Taipei. Yearly Trade. Export."

The structure of Ukraine's commodity exports is significantly different from the structure of Taiwan's exports, and over the past ten years, it has changed significantly - there has been a transition from the dominance of ferrous metallurgy products to the predominance of agricultural products (Fig. 4). Thus, according to statistical data,²⁹ in 2010, more than 40% of Ukrainian exports were ferrous metallurgy products, and in 2020, the share of these products in the export of goods has almost halved. Such changes are due to the fact that in 2010, more than half of ferrous metallurgy products came from Ukraine to Russia, and after 2014, due to the introduction of an embargo on Ukrainian products, the Russian market was lost to Ukrainian manufacturers, and to increase the share of sales in the markets other countries did not succeed in the conditions of significant economic changes in the world market of metallurgical products.

²⁹ "Ukraine. Yearly Trade. Export." Observatory of Economic Complexity, accessed November 17, 2022. <https://oec.world/en/profile/country/ukr/>.

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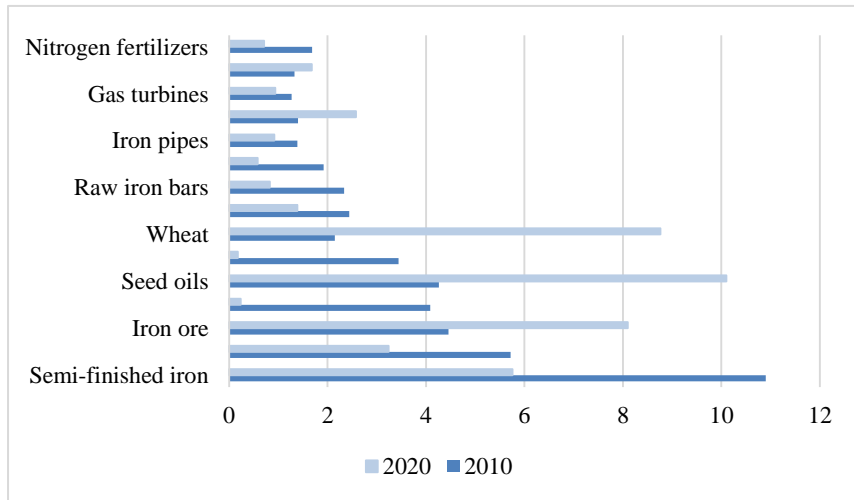


Figure 4. Dynamics of the share of basic goods in the export of Ukraine in 2010 and 2020, % Source: built by the authors from the data oec.world.³⁰

The change in relations between Ukraine and Russia, which was the main trading partner until 2019, was also reflected in the volume of exports of Ukrainian engineering products. In particular, in 2020, the share of freight rail cars in Ukraine's exports decreased to 0.18% compared to 2010, when it was 3.44%. Railway freight cars accounted for 12% of the total volume of exports from Ukraine to Russia in 2010, and in 2020 their share decreased to 0.3%.

The level of economic and technological development of countries significantly determines the list of main partner

³⁰ OEC, "Ukraine. Yearly Trade. Export."

countries in commodity trade. Developed countries mainly export high-tech products and goods with a high level of added value, while countries with a low level of economic development export raw materials and goods with a low level of added value. Taiwan's exports significantly exceed Ukraine's exports, which indicates the larger size of its economy compared to Ukraine's.

IV. Economic security and dynamics of the share of the leading partner country in the foreign trade turnover of Taiwan and Ukraine

The diversification of foreign trade is considered one of the key indicators of the country's international competitiveness, a factor of economic growth, and a matter of national economic security, as it will spread the risk of market concentration. Therefore, in our study, we will compare the geographical structure of foreign trade between Taiwan and Ukraine for 2010-2021.

Taiwan's main trading partner is China, whose share in the country's total exports has slightly decreased over the past ten years - from 25.7% in 2010 to 22.7% in 2020. On the other hand, Hong Kong's share has increased significantly (from 12.8% to 13.3%), the USA (from 11.7% to 14.6%) and Singapore (from 4.86% to 6.64%). About half of Taiwan's export deliveries are made to Asian countries, which is due to geographical proximity, similar consumption culture, and consumer tastes. Taiwan's trade with the United States of America, despite the countries' close

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political cooperation, is developing slowly due to a number of trade barriers that Taiwan has imposed on the import of goods from the United States, which is also reflected in the volume of exports from Taiwan to this country.

Over the past ten years, there have been changes in the structure of Taiwan's imports. In 2010, most goods were imported from Japan (17.7% of the total volume of goods imports), and China was in second place (12.3%). In 2020, the situation changed, and the main country from which goods were imported to Taiwan became China, the share of which was 23.5% of the total volume of imports, and the share of Japan decreased to 16.5%.

The structure of Ukraine's exports over the past ten years has undergone more significant changes compared to those that took place in Taiwan's exports. In 2010-2018, the leading country to which the majority of export goods from Ukraine were sent was Russia. In 2010, the share of Russia in the total volume of Ukrainian exports was 24.3%, but since 2013, it has been gradually decreasing (to 17% in 2014, 11.9% in 2015, 8.15% in 2018) and in 2020, this indicator reached the lowest value for the studied period - 5.64%. At the same time, there was an increase in China's share (from 2.6% in 2010 to 13.8% in 2020), and exports increased particularly intensively in the last two years covered by our study. The volume of exports from Ukraine to China in value

terms increased from USD 3.67 billion in 2019 to USD 7.26 billion in 2020.

Under the influence of geopolitical factors, significant transformations also took place in the structure of Ukraine's imports. Russia's share in the total volume of imports decreased by almost three times - from 33.7% in 2010 to 11.3% in 2020, which indicates a significant decrease in import dependence on the aggressor country. China took the leading place in the import of goods to Ukraine. The share of Chinese goods in imports increased from 8.67% in 2010 to 13.3% in 2020.

Differences in structural changes in the geography of foreign trade between Taiwan and Ukraine caused different trends in trade dependence on the leading partner country. The increase in Taiwan's trade with China led to a deterioration of the indicator of the share of the leading partner country in Taiwan's foreign trade turnover for 2010-2020 relative to the criteria of economic security (Fig. 5). Although the value of this indicator of foreign economic security for Taiwan in 2020 did not exceed the limit value (30%), the steady upward trend of the indicator indicates the growth of threats arising from increased dependence on China as the main trading partner.

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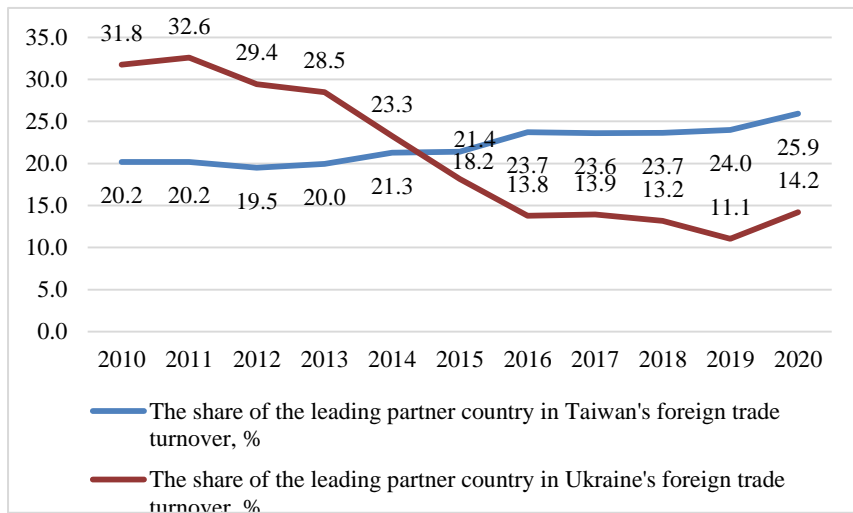


Figure 5. Dynamics of the share of the leading partner country in the foreign trade turnover of Taiwan and Ukraine in 2010-2020. Source: built by the authors from the data oec.world.

In Ukraine, on the contrary, the gradual reduction of Russia's share in foreign trade contributed to the improvement, from the point of view of economic security, of the value of the leading partner country's share in foreign trade turnover. The decrease of Russia's share in Ukraine's foreign trade turnover to 13.2% in 2018 and to 10% in the future indicates an increase in the level of foreign economic security according to this indicator.

Since 2019, China has become the leading partner country in trade with Ukraine, whose share in the foreign trade turnover of our country increased from 11.1% to 14.2% in 2020. Currently, the value of this indicator meets the criteria of economic security,

and its growth is not considered threatening. The significant decrease in the share of Russia and the insignificant increase in the share of China in Ukraine's foreign trade turnover may indicate an increase in the diversification of the country's trade due to the redistribution of foreign trade turnover between other trading partners, in particular EU member states. Accordingly, the increase in China's share in Taiwan's foreign trade turnover during the studied period could lead to a decrease in the diversification of the country's foreign trade.

V. The impact of trade with a leading partner country on the dynamics of economic growth in Taiwan and Ukraine

The key task of the comparative characterization of the structural features of the foreign trade of Taiwan and Ukraine is to assess the impact of export and import volumes with the leading partner country on the economic growth indicators of these countries. In order to describe the vector of the dependent variable, in our study, we will use indicators of GDP in actual prices (GDP_{tw} , GDP_{ukr}), GDP per capita (GDP_{pc_tw} , GDP_{pc_ukr}), GDP index relative to the previous year of Taiwan (GDP_{ind_tw}) and Ukraine (GDP_{ind_ukr}) for the period of 2010-2020. The list of independent variables will cover the volumes of exports and imports of the studied countries by main geographical directions. As an independent variable, we will also use the indicator of foreign economic security - The share of the leading partner country in foreign trade turnover.

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In general, Taiwan's GDP is characterized by stable growth, with the exception of 2015, when there was a slight decrease in this indicator. In 2020, Taiwan's GDP was about USD 669.25 billion, which was 50.6% more compared to 2010. In 2015, Taiwan's GDP decreased by 0.15% compared to the previous year (from USD 535.3 billion to USD 534.5 billion), but since 2016, the rapid recovery of the economy began, and the GDP in 2017 already amounted to USD 590.7 billion.³¹

The dynamics of GDP in actual prices and GDP per capita of Taiwan in the long term is growing, while it coincides with the dynamics of foreign trade turnover (Fig. 6), which suggests the existence of a significant relationship between these indicators.

³¹ "Taiwan: Gross domestic product (GDP) in current prices from 1987 to 2027 (in billion U.S. dollars)." Statista, accessed November 17, 2022. <https://www.statista.com/statistics/727589/gross-domestic-product-gdp-in-taiwan>.

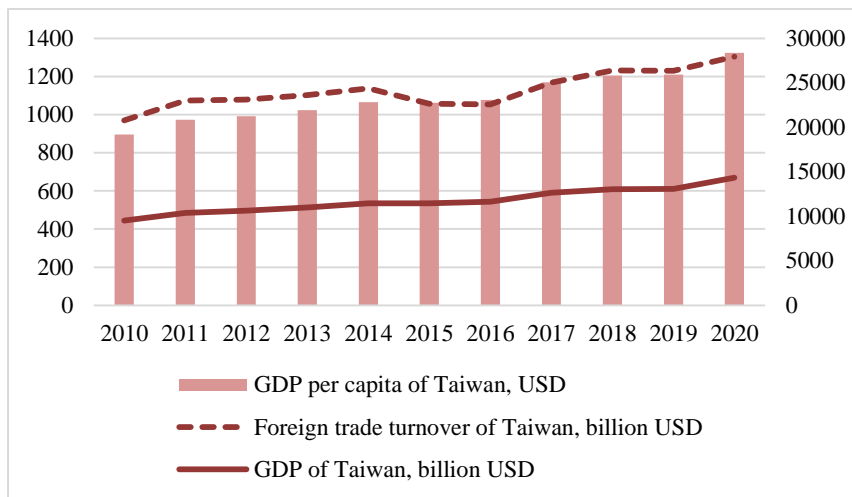


Figure 6. Indicators of Taiwan's economic growth and foreign trade in 2010-2020. Source: built by the authors from the data.³²

Taiwan's economy is characterized by a high level of openness, which is evidenced by the significant excess of foreign trade volumes over GDP volumes. The ratio of foreign trade turnover to GDP was the highest in 2011 and amounted to 121%, which makes the country dependent on changes in the situation on foreign markets of goods and services. After the global financial crisis of 2009, Taiwan's export-oriented economy suffered another blow in 2015, mainly due to weak global demand for consumer electronics combined with falling crude oil prices.

³² Statista. "Taiwan: Gross domestic product (GDP) in current prices from 1987 to 2027"; "World Economic Outlook (April-2021). GDP Growth of Taiwan." IMF, accessed November 25, 2022. <https://statisticstimes.com/economy/country/taiwan-gdp-growth.php>.

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Taiwan's economy grew by only 1.47%, and the total value of merchandise trade decreased by 13.3% in 2015. Growth resumed in 2020, with exports and imports increasing by 4.88% and 0.06%, respectively, and the total value of trade increasing by 2.64% year-on-year.

As shown above, Taiwan's leading trading partner is China. Accordingly, the list of independent variables for regression analysis should include volumes of exports to China and imports from China, China's share in exports, imports, and foreign trade turnover (Table 1). Given the close cooperation between Taiwan and the United States, we added Taiwan's exports to the United States and imports from the United States to the list of independent variables, although these trade relations are seen more as strengthening political cooperation.

In order to determine the relationship between GDP and indicators of the geographic structure of Taiwan's foreign trade, we conducted a regression analysis of dependent and independent variables using the "Multifactor regression" function in the computer program "Statistica 7.0".

Table 1. Indicators of Taiwan's foreign trade with the main partner countries

Periods	Exports to China, billion USD	The share of China in imports, %	Imports from China, billion USD	The share of China in foreign trade turnover, %	Exports to the USA, billion USD	Imports to the USA, billion USD
	<i>EXPch</i>	<i>RTch_imp</i>	<i>IMPch</i>	<i>RTch_trade</i>	<i>EXPus</i>	<i>IMPus</i>
2010	73,4	12,3	32,7	20,18	33,4	24,9
2011	80,5	13,1	38,6	20,20	38,2	25,0
2012	74,9	12,9	38,9	19,50	36,2	23,3
2013	75,6	13,7	42,0	19,95	34,6	23,2
2014	80,8	16,7	47,3	21,28	37,6	24,8
2015	67,2	18,7	44,6	21,39	37,3	23,0
2016	79,0	16,0	42,1	23,70	36,0	25,2
2017	89,6	17,2	46,5	23,61	39,2	26,3
2018	97,5	17,9	49,7	23,66	42,1	31,3
2019	92,5	21,1	55,8	24,01	49,1	30,1
2020	104,0	23,5	60,7	25,93	54,8	28,9

Source: Compiled by the authors based on the data from oec.world.³³

The results of the regression analysis confirmed the important role of China, as a leading trading partner, in ensuring Taiwan's economic growth. The greatest influence on the change in Taiwan's GDP during 2010-2020 was exerted by the change in export volumes to China: when the independent variable increased by 1%, the dependent variable increased by 0.744% (Table 2). We also consider the discovery of the direct dependence

³³ OEC, "Chinese Taipei. Yearly Trade. Export"; "Chinese Taipei. Yearly Trade. Import," Observatory of Economic Complexity, accessed November 25, 2022. <https://oec.world/en/profile/country/twn>.

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of Taiwan's GDP on imports from China to be an important result of the study: a 1% increase in the independent variable provided an increase in GDP by 0.658%. The coefficient of determination shows that 92.1% of the increase in Taiwan's GDP in actual prices was due to the increase in imports from China, and only 7.9% depended on other structural factors of foreign trade.

The calculations also revealed a direct dependence of Taiwan's GDP on imports from China and China's share in Taiwan's foreign trade turnover. With high probability, we can state that during 2010-2020, Taiwan's GDP increased by 0.454%, with an increase in imports from China by 1%. There was also an increase in Taiwan's GDP by 0.457%, while China's share in foreign trade turnover increased by 1%, with the remaining conditions being equal. Therefore, increasing the value of this indicator of foreign economic security to 25% in 2020 corresponds to the normative value (does not exceed 30%) and does not pose a threat to Taiwan's economic security, as it has a positive impact on the country's economic growth.

Table 2. The impact of trade with China on Taiwan's GDP in 2010-2021

Factor features	Dependent variable		
	<i>GDP_{tw}</i>	<i>GDP_{tw}</i>	<i>GDP_{tw}</i>
Number of observations	11	11	11
Intercept	3,016*** (0,746)	3,796*** (0,243)	3,157*** (0,260)
<i>EXP_{ch}</i>	0,744*** (0,169)	-	-
<i>IMP_{ch}</i>	-	0,658*** (0,063)	0,454*** (0,077)
<i>RT_{ch_trade}</i>	-	-	0,457** (0,141)
R	0,826	0,960	0,982
R ²	0,682	0,921	0,966
Fisher Criterion	F(1,9)=19,385	F(1,9)=106,20	F(2,8)=114,05

* – statistical error rate (p-level) $\leq 10\%$; ** – statistical error rate (p-level) $\leq 5\%$; *** – statistical error rate (p-level) $\leq 1\%$.

Source: calculated by the authors.

As a result of the regression analysis, a strong positive direct relationship between the GDP per capita of Taiwan with changes in export volumes to China and changes in China's share in Taiwan's total imports was revealed (Table 3). According to the results of our calculations, a 1% increase in the volume of exports to China in 2020-2020 led to an increase in GDP per capita in Taiwan by 0.348%, with an increase in China's share of goods imports by 1%, there was an increase in GDP per capita by 0.353% with the remaining conditions being equal. A positive effect of the import of goods from China to Taiwan and China's

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share in Taiwan's foreign trade turnover on the GDP indicator per resident of Taiwan was also revealed: with a 1% increase in the independent variables, the dependent variable increased by 0.436% and 0.424%, respectively.

Table 3. The impact of trade with China and the USA on the GDP per capita of Taiwan in 2010-2021

Factor features	Dependent variable		
	<i>GDP_pc_tw</i>	<i>GDP_pc_tw</i>	<i>GDP_pc_tw</i>
Number of observations	11	11	11
Intercept	7,528*** (0,332)	7,082*** (0,243)	7,642*** (0,455)
<i>EXPch</i>	0,348*** (0,094)	-	-
<i>IMPch</i>	-	0,436*** (0,072)	-
<i>RTch_trade</i>	-	0,424** (0,132)	-
<i>RTch_imp</i>	0,353*** (0,059)	-	-
<i>EXPus</i>	-	-	0,655*** (0,123)
R	0,971	0,983	0,870
R ²	0,944	0,967	0,757
Fisher Criterion	F(2,8)=67,551	F(2,8)=117,23	F(1,9)=28,04

* – statistical error rate (p-level) $\leq 10\%$; ** – statistical error rate (p-level) $\leq 5\%$; *** – statistical error rate (p-level) $\leq 1\%$. *Source: calculated by the authors.*

As the calculation results showed, Taiwan's trade with the US also had a positive impact on economic growth in 2010-2020: increasing the Taiwanese exports to the US by 1% led to an increase in Taiwan's GDP per capita by 0.655%. No statistically significant relationship was found between the change in imports from the US to Taiwan and the GDP per capita of Taiwan during the studied period. This largely explains why Taiwan is in no rush to lift restrictions on food imports from the US while at the same time increasing exports to the country.

It is obvious that the significant positive influence of the geographical structure of Taiwan's exports and imports on the main indicators of the country's economic growth is largely due to the sectoral structure of its economy and, accordingly, the commodity structure of foreign trade. Therefore, over the past ten years, despite certain political problems in relations with China, Taiwan has been actively expanding economic cooperation with other countries. In particular, Taiwan signed an economic cooperation agreement with New Zealand in 2013, an economic partnership agreement with Singapore, and economic cooperation agreements with Paraguay, the Kingdom of Eswatini, and Belize in 2017, 2018, and 2020, respectively.³⁴ According to the results of our research, foreign trade with China is beneficial for Taiwan and provides a significant share of its economic growth. Therefore, despite the aggravation of political relations between

³⁴ Taiwan. "Economy," accessed November 25, 2022. https://www.taiwan.gov.tw/content_7.php.

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these countries, China will remain Taiwan’s leading trading partner in the long term.

The dynamics of indicators of economic growth and foreign trade in Ukraine during 2010-2020 indicate the existence of a relationship between GDP and GDP per capita and the volume of foreign trade turnover (Fig. 7).

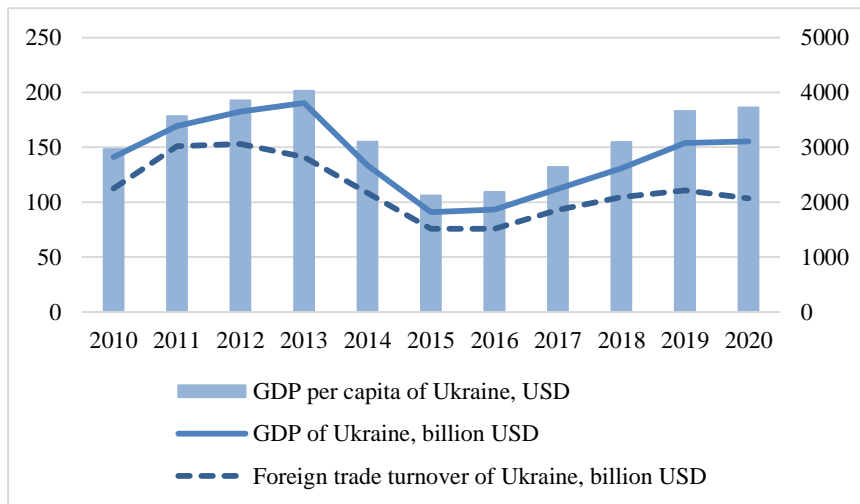


Figure 7. Indicators of economic growth and foreign trade of Ukraine in 2010-2020. Source: built by the authors from the data³⁵ in GDP (current US\$).

The positive dynamics of GDP indicators in 2010-2013 and in 2017-2019 were accompanied by the growth of foreign trade turnover, which is also confirmed by the high value of indicators

³⁵ “GDP (current US\$) – Ukraine.” World Bank national accounts data, and OECD National Accounts data files, accessed November 20, 2022. <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=UA>.

of the openness of the national economy. Accordingly, we can assume that the economic growth of Ukraine during the studied period depended significantly on trade with leading countries - Russia, whose share was the largest in the foreign trade turnover of Ukraine until 2019, and China, with which trade has been gradually increasing since 2016.

To test the hypothesis formulated above, we will conduct a regression analysis of the dependence of Ukraine's economic growth indicators on changes in trade volumes with China and Russia. So, as a dependent variable, we will use indicators of GDP volume and GDP per capita for 2010-2020 (Figure 7). The vector of independent variables includes data on the volume of Ukrainian exports to China and Russia and the volume of imports to Ukraine from these countries (Table 4).

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Table 4. Indicators of foreign trade of Ukraine with the main partner countries in 2010-2020

Period	China's share in Ukraine's exports, %	Exports to China, billion USD	Imports from China, billion USD	China's share in imports to Ukraine, %	Exports to Russia, billion USD	Imports from Russia, billion USD
	<i>RTch_exp</i>	<i>EXP_ch</i>	<i>IMPch</i>	<i>RTch_imp</i>	<i>EXPrus</i>	<i>IMPrus</i>
2010	2,6	1,46	5,7	8,67	13,6	22,1
2011	3,13	2,29	7,06	7,96	19,8	29,4
2012	2,51	1,86	8,64	9,58	17,6	27,5
2013	4,2	2,8	8,58	9,91	15,1	25,1
2014	4,62	2,75	5,83	9,6	10,1	15,1
2015	5,88	2,47	3,95	9,7	4,99	8,75
2016	4,74	1,88	4,74	11	3,76	6,67
2017	4,26	2,01	5,72	10,6	4,37	8,57
2018	4,2	2,18	7,69	12,4	4,23	9,55
2019	6,72	3,67	8,58	13,6	3,75	7,04
2020	13,8	7,26	7,46	13,3	2,97	6,31

Source: Compiled by the authors based on the data from oec.world.³⁶

The results of the regression analysis confirmed the dependence of Ukraine's economic growth indicators on trade with China. The greatest positive impact on the change in Ukraine's GDP during 2010-2020 was exerted by the change in export volumes to China: when the independent variable increased by 1%, the dependent variable increased by 0.837%, with the remaining conditions being equal (Table 5). A change in

³⁶ OEC, "Ukraine. Yearly Trade. Export"; OEC, "Ukraine. Yearly Trade. Import".

the volume of imports from China had a somewhat smaller positive impact on Ukraine's economic growth: an increase in the independent variable by 1% ensured GDP growth of 0.378%.

Let's pay attention to the existence of an inverse relationship between the GDP of Ukraine and the share of China in the total volume of Ukrainian exports of goods: with an increase in the independent variable by 1%, there was a decrease in the dependent variable by 0.766%. This research result confirms the presence of threats associated with an increase in the share of China in the export of goods from Ukraine, which can reduce the level of geographical diversification of foreign trade.

A similar dependence was revealed as a result of the regression analysis of the relationship between Ukraine's GDP per capita and foreign trade with China. The change in the volume of Ukrainian exports to China had the greatest positive impact on the dependent variable: an increase in the independent variable by 1% leads to an increase in GDP per capita by 1.178%. An increase in the share of Chinese goods in the total volume of Ukrainian imports also had a positive effect on the dependent variable. The dependence of GDP per capita on the change in China's share in Ukraine's exports was reversed. One of the reasons for this may be the inefficient structure of Ukrainian exports, which we will explore in the next subsection.

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Table 5. The impact of trade with China and Russia on the economic growth of Ukraine in 2010-2020

Factor features	Dependent variable		
	<i>GDP_{ukr}</i>	<i>GDP_{pc_ukr}</i>	<i>GDP_{pc_ukr}</i>
Number of observations	11	11	11
Intercept	4,604*** (0,274)	7,338*** (0,271)	9,449*** (0,200)
<i>RTch_exp</i>	-0,766*** (0,142)	-1,105*** (0,090)	-
<i>EXP_ch</i>	0,837*** (0,166)	1,178*** (0,086)	-
<i>IMPch</i>	0,378** (0,118)	-	-
<i>RTch_imp</i>	-	0,553*** (0,138)	-
<i>EXP_rus</i>	-	-	1,354*** (0,143)
<i>RTrus_exp</i>	-	-	-1,586*** (0,181)
R	0,980	0,982	0,960
R ²	0,960	0,964	0,922
Fisher Criterion	F(3,7)=56,935	F(3,7)=63,177	F(2,8)=47,496

* – statistical error rate (p-level) $\leq 10\%$; ** – statistical error rate (p-level) $\leq 5\%$; *** – statistical error rate (p-level) $\leq 1\%$. *Source: calculated by the authors.*

The impact of trade with Russia on Ukraine's GDP turned out to be statistically insignificant, but the dependence of GDP per capita on exports to Russia turned out to be significant, which is confirmed by the high value of the correlation coefficient. With an increase in the volume of exports of Ukrainian goods to Russia by 1%, Ukraine's GDP per capita increased by 1.354%, which explains the significant export dependence of the Ukrainian economy on the Russian market. According to the results of our research, an inverse relationship between the dependent variable and the share of Russia in the total volume of Ukrainian exports was revealed: an increase in the independent variable by 1% leads to a decrease in GDP per capita by 1.586%.

So, the results of the research confirmed the significant dependence of the economic growth of both Taiwan and Ukraine on trade with China. However, for the economy of Taiwan, the increase in the volume of exports and imports to China had unambiguously positive effects, and for Ukraine, positive effects for economic growth were observed only as a result of the increase in the volume of exports of goods to China, while the negative impact of the increase in the share of China in the export of goods from Ukraine on indicators of economic growth. This suggests that the main reason for such differences in the dependence of the economic growth of Taiwan and Ukraine on trade with China is the structure of exports. We will test this hypothesis in the next subsection.

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VI. The influence of the commodity structure of foreign trade of Taiwan and Ukraine on their economic development

To determine the influence of the structure of foreign trade on the economic growth of the studied countries, we will conduct a regression analysis. As independent variables, we will use statistical data on the volume of export and import of basic goods for the period from 2010 to 2020 and data on the volume of GDP and GDP per person for the same period as dependent variables (Table 6). The vector of independent variables for the regression analysis of the impact of the foreign trade structure on Taiwan's economic growth includes data on export and import volumes by the largest product groups: office and telecommunications equipment, integrated circuits and electronic components, and transport equipment.

Table 6. Export and import of major goods of Taiwan in 2010-2020

Period	Export			Import		
	Office and telecommu- nication equipment, mln USD	Integrated circuits and electronic components, mln USD	Transport equipment, mln USD	Office and telecommu- nication equipment, mln USD	Integrated circuits and electronic components, mln USD	Transport equipment, mln USD
	<i>EXPTel_eq</i>	<i>EXPint_cir</i>	<i>EXPtransp</i>	<i>IMPtel_eq</i>	<i>IMPint_cir</i>	<i>IMPtransp</i>
2010	86893	60799	10532	46531	36413	6917
2011	96441	65622	11747	48905	37229	8227
2012	92201	66161	12654	46388	34503	8769
2013	96405	70954	12071	46759	34319	8833
2014	106587	81705	13350	50305	37242	10625
2015	101054	77854	13366	46910	34540	11166
2016	111783	86118	12482	52099	39385	12333
2017	134703	105203	12690	62594	47757	12717
2018	138237	108821	13115	69526	54902	12897
2019	148757	112816	13127	73718	57580	12976
2020	178234	137278	12755	86423	67411	12692

Source: Compiled by the authors based on the data from oec.world.³⁷

According to the results of the regression analysis, a significant positive impact of the export of integrated circuits and electronic components on Taiwan's GDP was found: an increase in the independent variable by 1% contributes to an increase in the dependent variable by 0.4% (Table 7). The export of transport equipment has a somewhat smaller positive impact on GDP: with an increase in the independent variable by 1%, there is an increase

³⁷ OEC, "Chinese Taipei. Yearly Trade. Export"; OEC, "Chinese Taipei. Yearly Trade. Import."

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in the dependent variable by 0.295%. At the same time, no statistically significant relationship was found between the change in the volume of Taiwan's GDP and the volume of export and import of office and telecommunication equipment import of integrated circuits.

The study also revealed a strong positive relationship between Taiwan's GDP per capita and exports of transport equipment and imports of telecommunications equipment. Exports of transport equipment had the greatest impact on GDP per capita: when the independent variable increased by 1%, the dependent variable increased by 0.616%. With an increase in the volume of imports of telecommunications equipment by 1%, the volume of GDP per inhabitant increased by 0.395%.

Table 7. The impact of the commodity structure of foreign trade on the economic growth of Taiwan in 2010-2020

Factor features	Dependent variable		
	<i>GDP_tw</i>	<i>GDP_pc_tw</i>	<i>GDP_pc_tw</i>
Number of observations	11	11	11
Intercept	-1,042* (0,628)	-0,084* (1,031)	5,593*** (0,772)
<i>EXPint_cir</i>	0,400*** (0,020)	-	-
<i>EXPtransp</i>	0,295*** (0,077)	0,616*** (0,118)	-
<i>IMPtel_eq</i>	-	0,395*** (0,037)	-
<i>IMPint_cir</i>	-	-	0,418*** (0,072)
R	0,994	0,981	0,887
R ²	0,989	0,963	0,787
Fisher Criterion	F(2,8)=361,58	F(2,8)=106,89	F(1,9)=33,317

* – statistical error rate (p-level) $\leq 10\%$; ** – statistical error rate (p-level) $\leq 5\%$; *** – statistical error rate (p-level) $\leq 1\%$. Source: calculated by the authors.

The direct dependence of GDP per capita on the import of integrated circuits to Taiwan is somewhat weaker, as evidenced by the relatively lower value of the correlation coefficient. An increase in imports of integrated circuits and electronic components by 1% contributed to an increase in the dependent variable by 0.418%.

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Therefore, the results of the conducted research confirmed the effective structure of Taiwan's foreign trade, in which high-tech goods prevail, which has a positive effect on the country's economic growth.

We tested the hypothesis about the influence of the structure of foreign trade on the economic growth of Ukraine using a similar method, using data on exports and imports by main commodity groups in 2010-2020 as independent variables (Table 8). The dependent variable in our study is the following indicators: index of the physical volume of GDP (% to the previous year), GDP, and GDP per capita.

Table 8. Export and import of the main goods of Ukraine in 2010-2020

Period	Export			Imports		
	Agricultural products, mln USD	Chemical products, mln USD	Products of ferrous metallurgy, mln USD	Agricultural products, mln USD	Products of ferrous metallurgy, mln USD	Transport equipment, mln USD
	<i>EXP_agr</i>	<i>EXP_chem</i>	<i>EXP_metal</i>	<i>IMP_agr</i>	<i>IMP_metal</i>	<i>IMP_transp</i>
2010	10475	3423	15874	6245	2093	3652
2011	13487	5413	20370	6930	2942	6140
2012	18456	5036	17311	8036	2477	7981
2013	17763	4081	16136	8674	2394	5763
2014	17505	2824	13806	6445	1434	2605
2015	15296	1888	8398	3805	791	1686
2016	15983	1373	7631	4262	953	2683
2017	18460	1493	9139	4742	1282	3857
2018	19478	1729	10596	5512	1583	4340
2019	22891	1820	9418	6167	1453	6005
2020	22931	1934	8224	6892	1191	5594

Source: Compiled by the authors based on the data from oec.world.³⁸

According to our calculations, the relationship between the economic growth of Ukraine and the main export and import goods during 2010-2020 was revealed. The most significant positive impact on the indicators of the economic growth of Ukraine was carried out by the import of agricultural products (Table 9). With an increase in the volume of imports of agro-industrial complex products by 1%, there was an increase in

³⁸ OEC, "Ukraine. Yearly Trade. Export"; OEC, "Ukraine. Yearly Trade. Import."

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GDP by 0.751%, and increasing the import of vehicles by 1% led to an increase in GDP by 0.138%.

As a result of the regression analysis, a strong relationship between GDP per capita and volumes of export and import of agricultural products was also revealed. Imports of agricultural products had the greatest impact on the change in GDP per capita: an increase in the independent variable by 1% leads to an increase in the dependent variable by 0.796%. The export of agro-industrial products had a slightly smaller impact on the change in GDP per person: an increase in the independent variable by 1% ensured an increase in the dependent variable by 0.211%.

Table 9. The influence of the commodity structure of foreign trade on the economic growth of Ukraine in 2010-2020

Factor features	Dependent variable		
	<i>Index_GDP_ukr</i>	<i>GDP_ukr</i>	<i>GDP_pc_ukr</i>
Number of observations	11	11	11
Intercept	4,138*** (0,148)	-2,763*** (0,490)	-0,941* (0,910)
<i>EXP_agr</i>	-	-	0,211** (0,078)
<i>EXP_chem</i>	-0,137*** (0,034)	-	-
<i>IMP_agr</i>	-	0,751*** (0,085)	0,796*** (0,069)
<i>IMP_metal</i>	0,209*** (0,040)	-	-
<i>IMP_transp</i>	-	0,138** (0,047)	-
R	0,879	0,988	0,974
R ²	0,773	0,977	0,949
Fisher Criterion	F(2,8)=13,698	F(2,8)=177,69	F(2,8)=74,484

* – statistical error rate (p-level) $\leq 10\%$; ** – statistical error rate (p-level) $\leq 5\%$; *** – statistical error rate (p-level) $\leq 1\%$. Source: calculated by the authors.

As can be seen from Table 9, a relatively weaker dependence of the annual GDP growth index on changes in the volume of export of chemical industry products and the volume of import of metallurgical industry products was revealed. The dependence of the GDP index on the change in the volume of exports of chemical industry products is inverse: an increase in the

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independent variable by 1% leads to a decrease in the dependent variable by 0.137%. A direct dependence of the GDP index on changes in the volume of imports of metallurgical industry products was also revealed: an increase in the independent variable by 1% leads to an increase in the dependent variable by 0.209%.

Based on the results of our research, we can state that the structure of Ukraine's foreign trade is characterized by low efficiency in terms of impact on economic growth. The export of chemical industry products has a negative impact on economic growth due to the low level of added value and the high raw material component. The direct relationship between economic growth indicators and the volume of product imports by major commodity groups confirms the import dependence of Ukraine's economy.

VII. Conclusions

Foreign trade with China has a positive effect on the economic development of Taiwan and provides a significant share of its economic growth, which is confirmed by the results of the regression analysis (see Table 2). The greatest influence on the change in Taiwan's GDP during 2010-2020 was exerted by the change in the volume of exports to China. Also revealed is the direct dependence of Taiwan's GDP on imports from China and China's share in Taiwan's foreign trade turnover (see Table 3).

The results of the conducted research allow us to assert that trade with China is a positive factor in Taiwan's economic growth. Accordingly, we can expect that, despite the complicated political relations between the countries, China will be Taiwan's leading trade partner in the long term, provided that the economic and political risks accompany the cooperation of countries. Therefore, based on the experience of Ukrainian-Russian relations, let's agree with Bukhari S. that Taiwan should "avoid economic concentration with China and find alternatives for its economic exchanges in order to avoid any threat from China in the future, as such great interdependence can lead to an integrated unified economy, which will ultimately harm Taiwan's strategic interests."³⁹

However, the main foreign trade partner of Taiwan in our research decade is China, and for Ukraine, China has also become the main partner instead of Russia (see Table 4 and Table 5). We also realize that China has already become the main trade partner for almost all industrialized countries in the world. This would make the situation of Taiwan / China much more different from Ukraine / Russia because, in this situation, it will be very difficult for Taiwan to look for economic independence from China for national security. The only solution and an important task for Taiwan is "geographical diversification" of foreign trade, increasing the volume of trade with other countries and finding

³⁹ Bukhari, "The Dynamics of China-Taiwan Politico-Economic Interdependence: Divergence to Rapprochement", 25-37.

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new markets for goods, which will allow to weaken economic dependence on China to some extent and avoid China's intervention and influence on Taiwan's economic development to cause economic security problems for Taiwan.

Fortunately, our research results confirm that the situation in Taiwan is better than in Ukraine. First, the research results confirmed that the effective structure of Taiwan's foreign trade, dominated by high-tech goods (see Figure 3), has a positive effect on the country's economic growth (see Table 6 and Table 7). The semiconductor industry is seen as Taiwan's "silicon shield" due to the dependence of many global electronics manufacturers on Taiwanese semiconductor devices, which protects Taiwan from Chinese aggression. This is the key to Taiwan's economic security. In other words, the semiconductor industry can reduce the risk of Taiwan's economic dependence on China because, in the case of military force by China against Taiwan, it will destroy the production and logistics chains in which Taiwan is involved, leading to a chip shortage. Technological chains in the fields of radio-electronic, artificial intelligence, computer, information, and communication technologies will be destroyed, which will have negative consequences not only for these two countries but also for the global economy in general. Such negative expectations are due to the fact that more than 50% of Taiwan's exports are electronic components, information, and audiovisual products, more than 85% of exports go to Asia-Pacific Economic

Cooperation (APEC) countries and 75% of imports go to Taiwan from the specified region.

Developed countries will apply stronger sanctions against China in the event of its military aggression against Taiwan, and the consequences of the war will be more devastating for the global economy than the consequences of the Ukrainian-Russian war. From the economic point of view, due to military actions and disruption of trade relations, China will have much greater losses than Russia due to the cessation of trade with Ukraine and the introduction of economic sanctions. Thus, if the Chinese government's economic ambitions exceed its political ambitions, then a Chinese military invasion of Taiwan is unlikely.

However, we note that despite the important place of Taiwanese semiconductors in the global chains of added value, the threat of China taking over Taiwan is likely different from Ukraine's experience. The impact of trade with Russia on Ukraine's GDP for the period 2010-2020 turned out to be statistically insignificant, but the dependence of GDP per capita on exports to Russia was significant (see Table 5). In the case of Ukrainian-Russian relations, trade dependence did not become a factor of Ukraine's national security since Russia failed to return Ukraine to the integration union of post-Soviet states by political methods. Therefore, the deepening of integration in the production of goods can be used by a larger economic partner as a tool of economic dependence with the subsequent loss of political

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sovereignty of the partner country with a smaller economy. Compared with Taiwan, Ukraine's foreign trade structure is characterized by low efficiency in terms of impact on economic growth. The export of chemical industry products has a negative impact on economic growth due to the low level of added value and the high raw material component. The direct relationship between economic growth indicators and the volume of product imports by main product groups confirms the import dependence of Ukraine's economy.

After the start of hostilities in the east of Ukraine and the annexation of Crimea in 2014, the volume of Ukrainian-Russian trade decreased by almost four times. However, in some sectors, Ukraine was not able to get rid of its dependence on trade with Russia until February 2022. The share of Russian oil in the total volume of oil purchased by Ukraine has decreased significantly - from 50% to 25% in the period from 2009 to 2021. Such dependence led to significant risks for Ukraine's economy in the conditions of martial law, when after February 24, 2022, the supply of oil from Russia abruptly stopped, and Russian missiles destroyed oil depots. Therefore, in Taiwan's case, trade diversification is an important direction to ensure the stability of the economy in the event of the outbreak of war. If there is less trade dependence on a country that is a potential aggressor, then the economy's ability to adapt to martial law conditions will be higher.

In other words, concerning the economic development history, the situation in Taiwan is also better than in Ukraine. Ukraine, as a republic in the USSR in the past, had a regional division role of production for the whole communist regime. So, this national development history still influences dependent economic relations between Ukraine and Russia even after the collapse of communism. When mentioning the economic development of Taiwan, the “import substitution” was an important tool for the industrialization of Taiwan, and the main partners during the economic development were the USA and Japan. As the calculation results showed, Taiwan’s trade with the US also positively impacted economic growth in 2010-2020 (see Table 3). Thus, this makes it easier for Taiwan to diversify its foreign trade partners, thereby enhancing the country’s economic security.

Considering that semiconductor devices manufactured in Taiwan and supplied to China are more high-tech than Chinese ones, the work of Chinese firms to establish independent production of such level devices will continue to be active. This will be accompanied by industrial espionage. Therefore, from the point of view of economic security, we consider Taiwan’s investment in creating subsidiaries to produce semiconductor devices in the USA and other countries to be promising because it can diversify and reduce economic security risks. However, while Taiwan is actively reducing its dependence on China’s economy and strengthening political, economic, trade, and military

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cooperation with the United States, the competition and conflict between China and the United States is becoming more and more intense, especially the US-China trade war and US restrictions on chip exports to China. China's threat to Taiwan is rising. Accordingly, the capture by the Chinese military of Taiwanese companies that manufacture semiconductor devices can lead to the destruction of production facilities or the use by China of acquired intellectual property objects for its own purposes (strengthening the position of Chinese goods on the world market, realizing geopolitical interests by blackmailing transnational corporations-consumer semiconductor devices, etc.).

In short, despite significant similarities in the geographical and historical factors of the development of Ukrainian-Russian and Taiwan-Chinese relations, as well as the similarity of current political-economic relations and a similar disparity in military power, there are several differences that indicate a low probability of applying China's military scenario regarding Taiwan. These differences are due to the difference in the economic development, the different structure of the economy, and the degree of inclusion in the global chains of creation of added value, which is all reflected in the foreign trade of Ukraine and Taiwan with leading partner countries, as the above analysis. Taiwan is facing the same economic security issues that Ukraine faced in the past, but Taiwan's economic status has an advantage over Ukraine in facing economic security threats.

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