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Impact of US sanctions policy towards China on the structure of international trade and the resilience of global supply chains

Abstract. The research relevance is determined by the transformation of the structure of international trade as a result of the United States sanctions policy towards China, accompanied by the relocation of production, risks of fragmentation of global supply chains, and the need to determine its consequences for the stability of the world economy and the balance of power. The study aimed to determine how the US sanctions policy towards China is changing the structure of international trade flows and affecting the stability of global supply chains. To achieve this goal, the following methods were used: theoretical analysis of the factors shaping the sanctions policy; a comparative analysis using the Herfindahl-Hirschman Index calculated for China, Mexico, Canada, Japan, Germany and South Korea; and a SWOT analysis of the implementation of sanctions restrictions on the economy of the People's Republic of China and the architecture of international trade. The study identified key factors in the introduction and intensification of sanctions pressure on China by the United States: technological and economic competition, national security considerations and defence risks, human rights violations and humanitarian issues, as well as geopolitical rivalry between countries. A comparative analysis of the Herfindahl-Hirschman Index showed that the introduction of US sanctions led to a decrease in the concentration of bilateral trade between the United States and China, with a simultaneous increase in the role of third countries, mainly Mexico. The study determined that although increased sanctions pressure limits China's access to technology and slows down its expansion in the global market, it also motivates the search for ways to achieve technological self-sufficiency and geographical diversification of supply chains. The results of the study can be used to determine the impact of economic sanctions on all participants in the process and to find alternative ways to effective international cooperation and sustainable development

Keywords: fragmentation; circular economy; export; import; sustainable development; strategic planning

Introduction

The sanction policy of the United States (US) towards China is changing the structure of international trade by re-distributing production flows, encouraging the relocation of businesses to third countries, and forming new regional centres of industrial growth. Tariff increases, restrictions on technology exports, and tighter investment controls are leading to higher transaction costs and increased competition among leading economies, undermining the predictability of the global market. At the same time, such restrictions create risks of fragmentation of the world economy and vulnerability of global supply chains, especially in strategic sectors such as microelectronics, telecommunications and green technologies. Determination of the consequences of sanctions pressure highlights the need to study how the political and economic decisions of major powers transform international trade mechanisms, change the balance of power and determine the stability of global production networks in the medium and long

term. N.V. Matviichuk (2022) emphasised that the idea of imposing sanctions against individual countries became widespread after the Second World War. Scientific interest in the topic of sanctions is also due to the diversity of their impact and the possibility of their simultaneous existence in several dimensions – economic development, foreign investment, trade flows, employment and labour migration. The historical and theoretical aspects of sanctions were studied, in particular, by I. Yakoviyk & Ye. Novikov (2025) emphasising that this approach was most widespread during the Cold War, when individual states needed to demonstrate power and ability to influence behaviour of sanctioned government without resorting to military conflict. I. Bogdanova (2025) emphasised that Western countries resort to sanctions against states and non-state actors involved in conflicts, human rights violations and cybercrimes. Based on the cited studies, economic sanctions can be seen as a tool for supporting global order and

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developing international cooperation based on open and equal partnership.

Despite the widespread use of economic sanctions, the effectiveness of this instrument of pressure remains a controversial issue. Analysing the European Union's (EU) sanctions policy towards Russia, L.A. Pertiwi (2024) emphasised that the use of economic pressure tools can be seen as a way to become an active element in political and security matters without using force to fight military aggression. The imposition of sanctions can evoke an emotional response as a way of shaping public consciousness and readiness to resist global injustice. Ye. Karliuha (2024) concluded that economic pressure should be applied with restraint, as sanctions affect all parties involved in the process – both the countries against which they are imposed and the countries that impose them. Ye. Karliuha, in particular, noted that when implementing sanctions, EU member states face a lack of resources necessary to fulfil their obligations to report to the European Commission on the implementation of EU sanctions legislation, the complexity and ambiguity of EU assets in the field of restrictive measures, the vague definition of objectives, and the lack of a unified system for assessing the effectiveness of sanctions. An analysis of the ambiguous impact of US sanctions policy on China's economic development was presented in a study by S. Wang (2025). The author shared the view that the introduction of an additional 34% tariff on Chinese exports in April 2025 was a significant shock to certain segments of the national economy, especially the high-tech sector. In turn, S. Wang emphasised that the Sino-American trade war also became a stage in the promotion of the country's independent innovative technologies. X. Lin *et al.* (2025) studied the impact of sanctions on the development of 22 Chinese companies from Shanghai and Shenzhen between 2015 and 2022. Based on the data obtained, the authors concluded that US sanctions stimulate the innovative development of Chinese companies, which, under sanctions pressure, receive increased state subsidies, which increases their investment value. X. Lin *et al.* emphasised that the impact of US sanctions becomes pronounced when Chinese companies face fierce competition in product markets and gain greater access to domestic talent reserves. At the country level, the imposition of sanctions is an incentive to develop various countermeasures, as noted by J. Wang (2023). According to the author's conclusions, increased economic pressure threatens to reduce Chinese exports, and the national response to such a reduction is to strengthen the national currency, seek new export opportunities, and accelerate the development of science and technology. A similar opinion was expressed by M. Chorzempa *et al.* (2024), who analysed data from the Peterson Institute for International Economics to assess the impact of sanctions initiated by the Trump administration. According to the researchers, the first Trump administration added three times more Chinese companies to export control and sanctions lists than the four previous administrations. The introduction of new sanctions, however, carries the risk of hindering innovation for US businesses and their allies, encouraging sanctions circumvention, and accelerating Chinese innovation.

Despite analysis of sanctions as an instrument of political and economic influence, previous studies have not sufficiently addressed a comprehensive analysis of how the

US sanctions policy towards the People's Republic of China (PRC) is transforming the architecture of global supply chains and the redistribution of production in the medium and long term. The relationship between sanctions pressure, China's innovative adaptation, and systemic approaches to the stability and fragmentation of the global trading system also remains insufficiently explored. The study aimed to examine the impact of US sanctions against China on the stability of the global economy and the strategic decisions of key states and corporations. Achieving this goal involved the following tasks: researching the factors that shape US sanctions policy towards China; analysing the impact of sanctions on the structure of international trade and the redistribution of production between China, the US and third countries; identifying segments of global supply chains that have proven most vulnerable to sanctions pressure.

Materials and Methods

To study the impact of US sanctions policy towards China on the structure of international trade and the stability of global supply chains, a comprehensive methodology was applied, combining theoretical analysis of the factors shaping it and a chronological approach with the definition of periodisation. These methods were implemented based on materials such as The U.S.-China trade relationship (2025), Export controls and sanctions tracker (2025) and G. Ayres & L. Tsering (2025). The analysis of the factors shaping US sanctions policy towards China involved identifying the reasons for its introduction and assessing the impact of sanctions on individual segments of the Chinese economy. When creating the periodisation of sanctions, their type was considered, and a brief description of their content was provided. A comparative analysis of the impact of US sanctions on the trade relations of China, Mexico, Canada, Japan, Germany and South Korea was also conducted based on international statistical databases, in particular United States product imports... (n.d.) and J. Seong *et al.* (2024). Statistical data from the above sources were used to calculate the Herfindahl-Hirschman Index (HHI) for six countries: China, Mexico, Canada, Japan, Germany and South Korea. The countries for analysis were selected based on the intensity of their trade relations with the United States; thus, the six countries with the highest volumes of imports and exports with the US were included in the sample. When determining the period of comparison for the HHI, the fact that the first large-scale US sanctions against China were imposed in 2018 was addressed; 2023 was chosen as the endpoint of the analysis to assess the impact of the five-year sanctions regime and the transformation of the international economy. The HHI was calculated to assess the degree of market concentration and the level of competition to determine whether the introduction and strengthening of US sanctions against China had affected the configuration of the global market. The HHI was calculated using the following formula (1):

$$HHI = s_1^2 + s_2^2 + s_3^2 + \dots + s_n^2, \quad (1)$$

where $s_1, s_2, \dots, s_n$ – market shares of the respective countries in the global market; n – number of countries.

In addition to the above methods, a SWOT analysis was conducted as part of the study to demonstrate the

strengths, weaknesses, opportunities and threats of imposing sanctions against the Chinese economy. The identified factors were considered in terms of their impact on both the Chinese economy and the global trade architecture. Based on the analysis, the key implications of the US sanctions policy for global economic stability were identified, and recommendations were made to reduce economic pressure and increase the resilience of global supply chains.

Results

Factors shaping US sanctions policy towards China.

The US sanctions policy towards China is shaped by numerous interrelated factors. It is part of a broader strategy aimed at curbing China's growing influence in the technological, economic, geopolitical and security spheres. The main motives behind the US sanctions policy against China are presented in Table 1.

Table 1. Key factors in the US sanctions policy towards China

Factor/motive	USA goal	Examples/consequences of sanctions
Technological competition/control over technologies	Restrict access to advanced chips, artificial intelligence technologies, and microelectronics, and reduce China's potential in strategic sectors	Blacklisting Huawei, SMIC and other companies; banning exports of chips for high-performance computing; restricting cooperation between American and Chinese companies in the field of AI
Economic competition and trade strategy	Protect American industry, curb the growth of Chinese exports, and gain leverage in trade negotiations	Introduction of tariffs on steel and aluminium from China; export controls on semiconductor manufacturing equipment; restrictions on Chinese companies' investments in strategic sectors in the United States
National security and defence risks	Prevent military or repressive use of dual-use technologies	Sanctions against companies that supply drone or microelectronics technology for military applications; restrictions on the sale of American equipment for the production of missile systems to Chinese firms
Human rights violations and humanitarian issues	Condemn forced labour, violations of minority rights, repression, and pressure on freedoms	Personal sanctions against Chinese officials in Xinjiang; ban on imports of goods produced using forced labour (e.g. cotton and textiles); freezing of assets of companies linked to human rights violations
Geopolitical rivalry, strategic influence	Containing the growth of China's global influence, strengthening US alliances, and protecting strategic interests	Prohibition of Chinese companies from participating in US government tenders; restrictions on Chinese investment in key infrastructure projects; use of sanctions in coordination with allies (e.g., restrictions on Huawei in NATO countries)

Note: AI – artificial intelligence; NATO – North Atlantic Treaty Organization

Source: compiled by the author based on U.S. restrictions on Huawei... (2022), U.S. export controls and China (2022), The U.S.-China trade relationship (2025), Export controls and sanctions tracker (2025), G. Ayres & L. Tsering (2025)

According to Table 1, one of key factors is technological competition: the US seeks to maintain advantage in strategic technologies and prevent China from achieving technological dominance, especially in advanced semiconductors, artificial intelligence, and dual-use technologies. After 2020, Washington tightened export restrictions on these technologies, limiting Chinese companies' access to critical components. This is due to concerns that civilian technologies can be quickly adapted for military or repressive purposes, and includes placing individual companies on an export "blacklist", which restricts their cooperation with American firms. Such control over technology exports is becoming one of the central instruments of American policy, as it slows down the modernisation of China's military or strategic programmes. Another aspect is economic competition, as China, as an economic rival, is rapidly increasing industrial and export capacity, and the US is using sanctions not only as a security measure but also as an economic weapon to protect domestic industries and curb expansion of Chinese goods and technologies. In 2018, an active phase of trade war began, including introduction of tariffs on steel and aluminium, followed by broader restrictions on Chinese exports, which were justified on national security grounds. Sanctions are also imposed on companies that, following the United States, violate international economic or ethical norms, for example, due to suspicions of forced labour. National security and defence risks are another factor in sanctions policy, as the United States seeks to prevent use of civilian technologies for military or repressive purposes. In 2023-2024, restrictions on Chinese companies were imposed due to suspicions that dual-use

technologies could be used in military programmes and to support third countries that the US considers a threat to allies. Sanctions are also used in response to cyberattacks and espionage originating from Chinese state structures or companies associated with them. Human rights and ideological pressure issues also are also notable: the US criticises China's policies in the regions regarding autonomy, minority rights, freedom of expression and democratic freedoms. In particular, the situation emphasises the situation in Xinjiang and Hong Kong, and sanctions are often imposed on officials and companies that the US considers to be involved in human rights violations. Such measures are not only practical but also symbolic, as they send a signal to international community and create reputational risks for Chinese companies and government. In 2023-2024, the United States imposed sanctions on several Chinese companies involved in AI chips, cloud services, and IT infrastructure, fearing that these technologies would be used for military or repressive purposes (Freifeld & Shepardson, 2025). The sanctions were applied to both companies and individual officials in connection with human rights violations or support for military operations by third countries. The restrictions covered a wide range of products and technologies, from microelectronics to genetic research equipment. The geopolitical dimension is also a motive for sanctions – the US seeks to limit China's global influence, strengthen allied ties, and curb Beijing's regional expansion. Sanctions against Chinese companies that cooperate with states that violate international law serve not only as an economic tool but also as a strategic instrument of international pressure. A chronological

overview of sanctions, in turn, has traced the evolution of US policy towards China, from trade restrictions to comprehensive technological and human rights sanctions. It

demonstrates how changes in the global context and US domestic political priorities have influenced the nature and intensity of sanctions (Table 2).

Table 2. Chronology of major US sanctions against China (2018-2025)

Year	Event/type of sanctions	Characteristic
2018	Trade tariffs	Tariffs imposed on steel and aluminium, start of trade war
2019	Tariff expansion	Tariffs on Chinese goods are worth a total of USD 300 billion
2020	Blacklists of companies	Restrictions on Huawei, ZTE and other companies due to national security concerns
2021	Technological limitations	Export restrictions on high-performance AI chips and accompanying software
2022	Human rights sanctions	Personal sanctions against officials, restrictions on companies in Xinjiang
2023	Restrictions on cooperation with Russia	Sanctions against Chinese companies for supplying components with potential military applications to the Russian Federation
2024	Expansion of export controls	Restrictions on the supply of AI technologies, cloud services and critical infrastructure components (servers, network and power equipment)
2025	Sanctions initiatives	Modernised restrictions incorporating detour routes and coordination with allies

Source: compiled by the author based on U.S. restrictions on Huawei... (2022), P. Maidinuer (2024), S. Tzinieris & R. Chauhan (2024), Export controls and sanctions tracker (2025), The U.S.-China trade relationship (2025), G. Ayres & L. Tsering (2025)

The chronology showed the gradual development of the US sanctions policy, from economic and trade measures to comprehensive technological and human rights controls. It demonstrated that sanctions have become an instrument of strategic influence on the PRC and include economic, technological, human rights and geopolitical aspects that adapt to new challenges and changes in the international context. Thus, the US sanctions policy towards China is a multidimensional and dynamic tool that combines technological, economic, security, humanitarian and geopolitical pressure. Efficiency of such measures depends on the US's ability to consider China's flexibility, ability to circumvent sanctions, and readiness for a long-term strategy that combines economic pressure with diplomatic, political, and cultural factors.

The impact of American sanctions on the structure of international trade. An analysis of the impact of US sanctions and reshoring, near-shoring and friend-shoring policies on the structure of US imports and

the redistribution of production between China, the US and third countries showed changes in the concentration of suppliers. The HHI, calculated for the six main suppliers in 2018 and 2023, indicated an increase in import diversification during the escalation of trade restrictions and the implementation of production transfer policies. The total value of US merchandise imports in 2018 was approximately USD 2,611.4 billion, which was used as the denominator for 2018, while in 2023, total US imports from all countries were approximately USD 3,168.5 billion (United States product imports..., n.d.). Imports from China in 2018 amounted to approximately USD 563.2 billion. For 2023, the key figures were as follows: Mexico ≈ USD 475 billion and China ≈ USD 427 billion, meaning that Mexico surpassed China as the largest source of goods supplied to the United States (U.S. international trade..., 2024). Table 3 shows the largest suppliers by volume and their annual volumes and calculated shares of total imports in the corresponding year.

Table 3. Key suppliers and their share of total imports (in billion dollars)

Country	Import 2018	Share of 2018 (%)	Contribution to the HHI 2018	Import 2023	Share of 2023 (%)	Contribution to the HHI 2023
China	563.2	21.57	465.1	427	13.52	182.9
Mexico	349.6	13.37	178.7	475	15.05	226.5
Canada	325.4	12.47	155.5	426	13.49	182.1
Japan	145.8	5.59	31.3	152	4.80	23
Germany	128.1	4.91	24.1	161	5.10	26
South Korea	74.4	2.85	8.1	120	3.80	14.4
HHI			862.9			654.9

Source: compiled by the author based on U.S. international trade... (2024), United States imports... (2023), T. Hunnicutt & S. Holland (2024), United States product imports... (n.d.)

Introduction of American sanctions against China caused a gradual decline in trade concentration in the bilateral segment "USA-China" and a simultaneous increase in the role of third countries in the redistribution of production flows. The decrease in the HHI for high-tech goods indicates a diversification of trade routes, with some production moving to Southeast Asia, Mexico and Canada, which was a predictable response to the rise of trade barriers. The growth of the index in the group of

intermediary countries demonstrates the formation of new "production hubs" through which most of the supply chains previously focused directly on China now pass. These changes demonstrate not only the adaptability of global companies but also the structural restructuring of international trade, where sanctions act as a catalyst for the redistribution of flows and a gradual change in geography. Table 3 reflects a noticeable transformation in the structure of US imports between 2018 and 2023,

manifested in a decrease in the concentration of trade flows and a redistribution of the roles of key suppliers. Most significant change is reduction in China's share from 21.57% to 13.52%, which caused a substantial decrease in contribution to Herfindahl-Hirschman Index – from 465.1 to 182.9 points – and became a main factor in decline in overall level of import concentration. At the same time, Mexico and Canada strengthened their positions as leading trading partners of the United States, reflecting a trend towards regionalisation and reorientation of supply chains within North America. Japan and Germany maintained relatively stable shares, while South Korea showed moderate growth in importance. Collectively, this caused a decline in the HHI index for six selected countries from 862.9 in 2018 to 654.9 in 2023, indicating a more diversified and less concentrated structure of US imports amid trade restrictions and geo-economic shifts. The data obtained, in particular the changes in the HHI, demonstrate a fundamental transformation of the international trade configuration caused by US sanctions pressure on China. One of the key effects of the sanctions was an increase in the fragmentation of global supply chains, which was reflected in a decrease in the concentration of bilateral trade between the two countries. These processes mean that direct flows of goods no longer dominate the structure of mutual trade; instead, the role of the geo-economic “bypass effect” is growing, where production or part of production operations are relocated to countries not subject to sanctions restrictions. The decline in HHI in highly sensitive sectors such as electronics, semiconductors, telecommunications equipment and other technologically complex goods indicates an active restructuring of production centres. The growth of HHI among third countries, particularly Mexico, reflects the formation of new regional hubs that are taking over the functions of production sites previously located in China. This means that production is becoming “stratified”: complex components are either remaining in China or moving to other Asian countries, while final assembly is increasingly taking place in countries with more open access to US markets.

Thus, the HHI not only records the fact of diversification, but also demonstrates a change in the logic of global trade – from a linear supply chain model to a network architecture with multiple nodes. In the medium-tech goods sector, the decline in the concentration of American imports from China is accompanied by a moderate increase in HHI in Mexico, reflecting the effect

of nearshoring and friendshoring – the strategic relocation of production to countries with lower political and geo-economic risk. In response to potential threats to national security, the US is strengthening the trend towards regional localisation of production, which is also reflected in the growing share of imports of components and parts from countries that are its strategic partners. In China, on the other hand, there has been an increase in the concentration of exports in areas not related to the American market, indicating adaptation and the search for new trade niches. Another documented result is the transformation of production flows in sectors where China has traditionally had a significant competitive advantage. The data in Table 3 show that although China's absolute production volumes in several product groups remain high, their share in US imports is declining, while the share of countries that have reoriented their production strategies to the needs of the US market is growing. However, this does not mean that China is losing its leadership: rather, the form of its participation is changing – from a direct exporter to a supplier of components for more complex global chains. Thus, analysis using the HHI demonstrates the multidimensionality of the effects of US sanctions policy. They have not only affected static trade indicators but also intensified long-term structural trends, in particular the strengthening of Asia and Latin America's positions in the global manufacturing landscape, the fragmentation of global supply chains, and the acceleration of the transition to a multipolar trading system. In this system, China retains its status as a key manufacturing centre but loses its monopoly on certain segments as production is distributed among new economic centres. The US, meanwhile, gains the opportunity to reduce its dependence on China, but at the same time becomes more dependent on a wider range of partners, which changes the risk structure of its supply chains. All these changes together form a new configuration of international trade, in which multi-stage diversification and strategic geo-economic manoeuvring determine the nature of global flows of goods and capital.

Adaptation of the Chinese and international economies to American sanctions. The analysis revealed the impact of US economic sanctions on China's economy and the structure of global trade. Both the negative consequences of sanctions pressure and potential opportunities for reformatting international trade flows were identified. The main results are presented in Table 4.

Table 4. SWOT analysis of the impact of US sanctions on the development of the Chinese economy and the architecture of global supply chains

Category	Chinese economy (covering the most affected segments)	Architecture of global trade
Benefits	Accelerating technological self-sufficiency in response to sanctions. Growth in government subsidies and concentration of human capital. Formation of national innovation ecosystems in high-tech and green sectors.	Diversification of supply chains. Reducing excessive concentration of production in one country. Development of alternative production hubs (Mexico, Southeast Asia, India, Eastern Europe).
Challenges	Limited access to advanced technologies and equipment for microelectronics, telecommunications, the aerospace industry, and green technologies. Increase in transaction costs and business adaptation costs. Declining export competitiveness and increased dependence on state support.	Fragmentation of trade regimes. Increased costs for businesses and reduced market predictability. The weakening of the role of multilateral institutions, such as the World Trade Organization.

Table 4. Continued

Category	Chinese economy (covering the most affected segments)	Architecture of global trade
Opportunities	Reorientation of exports towards the markets of the Global South. Deepening economic cooperation within the Belt and Road Initiative. Strengthening the role of the national currency in international settlements. Accelerated development of proprietary technologies, particularly in microelectronics and green technologies, provides competitive advantages in the long term.	Formation of more regionalised but interconnected trading blocs. Creation of new centres of industrial growth. Reduction of systemic risks associated with excessive dependence on a single production core.
Threats	Possible technological lag in critical segments (microelectronics, telecommunications, aerospace industry, green technologies). Decline in foreign direct investment inflows. Slowdown in economic growth. Risk of technological isolation as the sanctions coalition expands.	Risk of deep fragmentation of the global economy. Instability of global supply chains. Increased volatility in financial and commodity markets. Escalation of economic confrontation between leading economies.

Source: compiled by the author based on Q. Li & J. Yao (2024), The U.S.-China trade relationship (2025), A.B. Yildirim & J.T. Chatagnier (2025)

Table 4 demonstrates comprehensive impact of US sanctions on China's economy and global trade architecture. For China, sanctions have been both restrictive and stimulating: high-tech sectors such as microelectronics, telecommunications, aerospace and green technologies were affected the most. These segments faced limited access to advanced technologies and investments, which increased transaction costs and reinforced dependence on state support. At the same time, sanctions became a catalyst for development of domestic innovation ecosystems and technological self-sufficiency. For global trade, sanctions have contributed to diversification of supply chains, increased regionalisation and emergence of new production hubs, but at the same time have increased risk of market fragmentation, reduced predictability of international trade and partially weakened the role of multilateral institutions such as the World Trade Organization. Overall, results of analysis highlight ambivalent nature of sanctions: they simultaneously create risks for economic growth and global market stability and stimulate structural restructuring and technological adaptation. The SWOT analysis also identified the segments of the economy that have been most affected by the introduction and strengthening of US sanctions against China. These segments included, in particular, the semiconductor industry, whose critical advanced stages, such as photolithography at the highest density nodes, EUV mask production, and deposition equipment, are concentrated in a few companies and countries, and therefore any restrictions on the export of equipment or materials immediately disrupt the chain for end manufacturers of mobile devices, servers, and automotive electronics. This vulnerability is exacerbated by political export control instruments and tariff/non-tariff barriers, which make this industry a prime target for geopolitical disputes. Chains related to critical materials and components, such as rare earth metals, certain chemical precursors and battery electrode materials, have also been vulnerable to US sanctions pressure. The vulnerability of these chains stems from the geographical concentration of extraction and processing, as well as the possibility of export restrictions or corresponding countermeasures being imposed. Although alternative suppliers exist, their scale and deployment time may be insufficient for immediate replacement, creating risks to produce electric vehicles, renewable energy and defence items. In addition

to the segments of the economy already mentioned, the block of highly specialised components and subcomponents for telecommunications (e.g. 5G infrastructure) and pharmaceutical ingredients, where the supply chain often depends on a narrow set of production sites and imported reagents, has also been affected.

An analysis of China's response to American sanctions pressure has revealed that the probability of a rigid, completely closed "bipolar" trading system emerging is not zero, but its scale and stability depend on many factors: the degree of technological gap, political complications in multilateral institutions, in particular the World Trade Organization, as well as the ability of third countries to maintain a balance between the blocs. In a scenario of deep fragmentation, global economy could lose between 0.2% and several percent of global gross domestic product in the long term, depending on degree and speed of fragmentation; in worst-case scenario, losses could be significantly greater (Gopinath, 2024). This implies real macroeconomic risks, such as a decline in trade flows, loss of economies of scale, increased transaction costs and heightened financial instability. Data from J. Seong *et al.* (2024) confirmed the existence of a "geometric" transformation of trade: countries are reducing the political distance in trade and seeking to shorten the geographical distance of supplies, but complete bipolarity has not yet established itself as a total replacement of one bloc by another; Instead, a multi-vector network is forming, where some countries are reorienting themselves closer to the US, others to China, and still others are trying to maintain neutral positions or become intermediaries. Thus, there is a "soft fragmentation" that reduces the risk of a simultaneous global shock, but at the same time increases the complexity of supply chain management and regularly pushes for additional diversification costs. The implications for global economic stability are twofold. The positive effect is an increase in the resilience of individual national and regional systems through diversification and risk redistribution. The negative effect is manifested in increased transaction costs, a decline in the efficiency of global value chains, a possible slowdown in global trade and investment, and political escalation, which may complicate international cooperation in crisis areas such as energy, finance and climate. Based on the results of the analysis of risk factors, possible consequences and possible responses to sanctions pressure, it

is advisable to recommend that governments and companies use scenario planning with a focus on critical nodes, invest in backup supply chains, localise key production elements and increase the transparency of logistics processes. This approach will reduce operational risks and ensure timely adaptation in the event of geopolitical shocks. It is also recommended that multilateral institutions initiate a dialogue on agreeing on “rules of conduct”, export restrictions in critical sectors, and coordination mechanisms aimed at minimising fragmentation of global trade and reducing potential economic losses in the event of adverse scenarios. The fact that manufacturing countries, including China, will gain an advantage if they combine national industrialisation strategies with open cooperation in areas where interdependence is critical, such as standards, security of supply, and research and development for environmental technologies, was considered. In addition to these recommendations, international investors and companies should balance efficiency and sustainability by investing in digital visibility of chains, multi-regional warehouses, and long-term partnerships with less risky jurisdictions. Policymakers should also consider the distribution of costs from fragmentation and develop compensatory measures for sectors and regions experiencing negative shocks.

Discussion

American sanctions against China have a complex, multi-level impact on the national economy and the global trade architecture. Analysis conducted in the study showed that the most vulnerable sectors are high-tech industries, in particular microelectronics, telecommunications, aerospace, and green technologies. Previous analytical reviews and special studies confirm this trend. For example, K. Hanhin & C. Jaehan (2024) highlighted the narrow “shaperness” of the global semiconductor manufacturing ecosystem, where a small number of key suppliers determine the speed and efficiency of global chains. In this context, even minor restrictions on the supply of critical components or equipment create imbalances in international markets, resulting in increased operational uncertainty and higher costs for companies. Research by M. Zhang *et al.* (2025) highlighted that geopolitical tensions between the US and China are negatively affecting the implementation of environmental and sustainability standards in Chinese semiconductor companies. An analysis of a comprehensive dataset for the period 2015–2020 showed that the escalation of bilateral tensions leads to a decline in investment in energy efficiency, environmental initiatives and emissions control. This is due to disruptions in global supply chains and increased operational risks, forcing companies to reallocate resources to support the production cycle and ensure basic competitiveness. Accordingly, the effect of sanctions is not only economic, but also technical and environmental, creating long-term challenges for the sustainable development of high-tech sectors. The example of Huawei presented by O. Panatiev & K. Tarasova (2025) illustrates the practical effect of sanctions on specific companies: until 2019, Huawei occupied a leading position in the global telecommunications equipment market, actively developing 4G networks and preparing for the transition to 5G. The introduction of US sanctions, in particular the ban

on the use of Google Play services and the cessation of Qualcomm chip supplies, significantly limited the company’s opportunities in foreign markets, led to a decline in production and slowed down technological expansion. The example provided by the author confirmed the results of the SWOT analysis conducted in the study, according to which sanctions are most sensitive for industries that depend on highly specialised components. At the same time, companies are adapting by developing internal technological ecosystems, which reduces external dependence and stimulates innovative progress.

The analysis also concluded that China’s strategic response to sanctions is expressed in two key areas: internal adaptation and geographical diversification. The relevance of the identified strategies has been confirmed in previous studies, in particular by F.A. Al Putra *et al.* (2024), arguing that these initiatives are interrelated and aimed at balancing domestic and external demand, supporting national industry and stimulating innovation. Within the framework of dual circulation, China emphasises import substitution at key stages of production, the development of national technologies and the accumulation of technological sovereignty. The analysis by M. Otero-Iglesias *et al.* (2025) also proved the relevance of the strategy, emphasising that the shift in strategic focus from cheap export goods to innovative products contributed to the enhancement of scientific and technical potential and the development of research and development infrastructure, which became a key factor in sustainable development in the context of external constraints. The effectiveness of the second strategic response identified – geographical diversification of supply chains – was confirmed by M. Zehri (2025). According to the author, such actions reduce the risks of direct restrictions on exports to the United States and create a more resilient multi-hub supply network. Companies are changing their risk management models, shifting from an emphasis on cost minimisation to balancing efficiency and sustainability, given geopolitical instability and potential disruptions in global supply chains, as demonstrated in particular by X. Tu & Yu. Wang (2025). The study and its semantic links to previous works demonstrate the adaptive capacity of the Chinese economy and its potential for a “new normal” in global trade. According to the results of the SWOT analysis, sanctions act as a catalyst for internal innovation processes. A similar opinion was found in the study by H. Shen *et al.* (2024), according to which, after the introduction of chip export controls, Chinese high-tech companies increased the number of patent applications by an average of ~7%. With limited access to foreign technologies, companies are actively developing closed internal ecosystems that cover the entire production cycle, from design to manufacturing. The results of the SWOT study also showed that, along with internal adaptation, sanctions also stimulate the transformation of global supply chains, which was confirmed by P. Goreczky (2025). The study noted that US sanctions motivate Western countries to diversify their supply chains, particularly for rare earth metals, to reduce their dependence on China. However, due to the slow pace of diversification, China retains its dominance in the rare earth metals market, which supports its strategic advantage in technology industries. At the same time, the high degree of US dependence on

Chinese rare earth metals remains a critical vulnerability for global trade, according to Yu, Lee & T. Dacass (2022). As of 2020, China controlled about 36.7% of the world's rare earth oxide reserves and 58.3% of their global exports, making it a key hub in the global production network. The cited works are consistent with the opinion presented in this paper that sanctions pressure leads to ambiguous results and that its intensification should only occur after studying the impact on all parties involved.

Thus, the research results demonstrate the ambivalent effect of sanctions: on the one hand, they create structural, technological and environmental constraints for Chinese companies, increase risks in global supply chains and reduce the predictability of international trade; on the other hand, they stimulate the development of domestic technologies, diversification of supply, innovative strategies and the creation of more sustainable production networks. Sanctions are becoming a catalyst for change in the architecture of global trade, forming parallel production hubs, new centres of industrial growth and risk management strategies that can increase the resilience of international chains in the medium term. US sanctions against China thus not only reduce short-term opportunities for individual companies and sectors, but also stimulate strategic transformations at both the national and global levels. This confirms the significance of considering sanctions not only as a restrictive tool, but also as a factor that shapes the new dynamics of international trade and technological development, as well as affecting the resilience of global supply chains.

Conclusions

The study determined that use of economic sanctions became most widespread in second half of the 20th century, when there was a need to support a new global order without use of force. According to chronology proposed in the study, trade war between the United States and China began in 2018 and escalated in 2024 with arrival of Donald Trump's new administration. Further analysis revealed key factors of imposition of sanctions against China, which included technological and economic competition, national security considerations, repeated human rights violations and humanitarian issues, as well as geopolitical rivalry between countries. An analysis of changes in the GII for six global suppliers (China, Mexico, Canada, Japan, Germany, and South Korea) in 2018 and 2023 showed that introduction

of US sanctions against Chinese economy decreased concentration of trade in bilateral segment "US-China" with a simultaneous increase in role of third countries in redistribution of production flows. As a result of increased sanctions pressure, trade routes are being diversified, with some production moving to Southeast Asia, Mexico and Canada. The results of the SWOT analysis demonstrated the uneven impact of US sanctions on the Chinese economy and the architecture of the global market. On the one hand, increased sanctions pressure limits access to advanced technologies, increases the risk of technological backwardness, and disrupts or leads to the disappearance of certain supply chains. On the other hand, such pressure can accelerate technological self-sufficiency, the formation of national innovation systems, and changes in the architecture of global trade through the geographical diversification of supply chains. The analysis also revealed the uneven impact of US sanctions, with the greatest damage being suffered by sectors such as the high-tech segment, the extraction and supply chains for critical materials and components, and the segment of highly specialised components and subcomponents for telecommunications. The study also concluded that the long-term existence of such a system is undesirable for all participants in the process, as further fragmentation of the global economy could lead to a loss of 0.2% of total gross domestic product. To mitigate the negative effects of sanctions pressure on economic segments, it was recommended to implement scenario planning with a focus on critical nodes and investments, initiate multilateral dialogue between institutions on development strategies and export bans in critical sectors of the economy, finding a balance between efficiency and sustainability, and considering the distribution of costs from fragmentation with the subsequent development of compensatory measures. In further studies, it is advisable to expand the geographical sample by increasing the number of countries included in the comparative analysis.

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Conflict of Interest

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