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Implications of the China-Taiwan tensions for the international economic security

Introduction

The problem of economic security of states, despite reaching ever higher stages of development, growing economic interdependence of states, progressing processes of regional integration and globalization processes, has not been solved. A characteristic feature of the modern world economy is the increase in interdependence between countries. This is due to the dynamism of such areas as international trade in services, technology, international labor flows and capital turnover, etc.

Economic security is the result of many historical, geographical, economic, and political factors, as well as the function of various internal and external relations, including international relations. According to Bolesław Balcerowicz[1] "economic security refers to threats to prosperity, free access to markets, financial resources and natural resources that ensure the maintenance of the position of the state and its development."

The category of economic security is related to security threats from the activities of states as well as resulting from the functioning of the economy.[2] The main

[1] B. Balcerowicz, *Konflikty zbrojne i wojny w zmieniającym się środowisku międzynarodowym*, Wydawnictwo AON, Warszawa 2004, p. 12 [transl. by J.L.].

[2] K.M. Księżopolski, *Ekonomiczne zagrożenia bezpieczeństwa państw*, [in:] *Problemy bezpieczeństwa wewnętrznego i bezpieczeństwa międzynarodowego*, ed. K.M. Księżopolski, Oficyna Wydawnicza ASPRA-JR, Warszawa 2009, pp. 93–108; idem, *Ekonomiczne zagrożenia bezpieczeństwa państw: metody i środki przeciwdziałania*, Kolor Plus, Warszawa 2004.

threat is an economic aggression, which takes the form of economic war or dependence. The technique of conducting an economic war is, for example, the use of a policy of economic sanctions and dependencies, for example, an energy policy or a development aid.[3] The basic forms of economic relations between enterprises (national, international), national economies and international economic organizations include material and information ties:

- material connections – international exchange of goods and services and international flows of factors of production. The importance of these links has increased over the last few decades under the influence of foreign liberalization, deregulation and the reduction of protectionism applied by states in economic policy;
- intangible connections – information flows, which include the transmission of any information necessary to organize and regulate economic activity. The importance of information links has increased in recent years under the influence of technological progress.

The international trade is the most important and oldest form of material connections. It is the concept of exchange of goods or services between people or entities in two or more different countries. Both the parties benefit from the exchange because there is a need or want of goods or services.[4] Speaking of the material connections the most important elements are global supply chain covering all the steps involved in manufacturing and delivering products or services when those steps take place in more than one country.

Taking up the subject of the article is important due to the fact that most studies on the potential Sino-Taiwan crisis focus on military aspects, omitting emerging risks in the new global context, especially the structure of the global semiconductor supply chain.

The global structure of the semiconductor supply chain, developed over the course of the past three decades, has served the industry well. However, in the last few years several new factors have emerged that could put the successful continuation of this global model at risk. It is known that there are more than 50 points across the overall supply chain where a single region (East Asia – Taiwan, South Korea, Japan, China) accounts for 65% or more of the total global supply.[5] While geographic specialization has served the industry well, the observed high degree of geographic concentration in certain activities also creates two types of vulnerabilities:[6]

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3 Idem, *Bezpieczeństwo ekonomiczne*, Dom Wydawniczy Elipsa, Warszawa 2011.

4 *Online Certifications in International Trade & Finance – ICC Academy*, EduMaritime, https://www.edumaritime.net/icc-academy [accessed: 20.11.2022].

5 A. Varas, R. Varadarajan, J. Goodrich, F. Yinug, *Strengthening the Global Semiconductor Supply Chain in an Uncertain Era*, BCG, SIA, April 2021, p. 39, https://www.semiconductors.org/wp-content/uploads/2021/05/BCG-x-SIA-Strengthening-the-Global-Semiconductor-Value-Chain-April-2021_1.pdf [accessed: 20.12.2022].

6 *Ibidem*, p. 40.

- single points of failure due to high geographic concentration of some activities that could result in large-scale supply interruptions;
- geopolitical tensions that may impair global access to suppliers or customers.

Bearing in mind the contemporary political and economic transformations which result in increased interdependence between countries, and thus affect global economic processes, in the context of increasing risk of conflict between China and Taiwan, the following questions should be asked:

- could increase tension between China and Taiwan have a negative impact on the international economy, including international economic security?
- what are the main factors determining the negative impact of the Sino-Taiwan conflict on international economic security?

Due to the limited volume of this study, the author describes the potential effects of the Sino-Taiwan conflict on international economic security, taking into account the economy and location of Taiwan, as well as conflicts between China and selected East Asian countries.

Economic importance of Taiwan

After World War II, unlike China, where Mao's policy of "great leap forward" instead of economic growth led to collapse and mass starvation, Taiwanese authorities managed to build a system that contributed to what economists later called the "Taiwan miracle." In 1953, the Taiwanese government carried out two wide-ranging reforms simultaneously: it introduced four-year plans, and it also bought a large part of the agricultural land from large farmers and gave it to the peasants under the slogan "To each ploughman his own field."[7]

Following agriculture, Taiwan began to develop light industry, using infrastructure that survived from the time of Japanese rule. The government launched a large-scale training program for professionals abroad, and also began to attract foreign investment, mainly American. The next step in building Taiwan's economy was the establishment of China Development Corporation,[8] through which World Bank funds went to small and medium-sized enterprises.

The general improvement on the standard of living of the Taiwanese people led to the emergence of a full-fledged middle class and alleviated social stratification. At the same time, the production of microelectronics began to develop on the island. The authorities stimulated the transformation of traditional industrial enterprises into innovative production. As a result of these activities, entities specializing in the

[7] J. Yueh, *Land-to-the-tiller program transformed Taiwan*, Taiwan Today, 28.08.2009, https://taiwantoday.tw/news.php?unit=10&post=15716 [accessed: 20.11.2022].

[8] *China Development Corporation Project*, The World Bank – Projects, https://projects.worldbank.org/en/projects-operations/project-detail/P003657 [accessed: 20.11.2022].

production and development of semiconductors – Taiwan Semiconductors Manufacturing Company (TSMC), MediaTek, United Microelectronic Corporation (UMC), Foxconn – were created. Manufacturers of ready-made computers and peripherals – Pegatron, Quanta Computer, Compal Electronics, Wistron also operate on the island. Parallelly, Taipei sought to maintain economic ties with Beijing: from 1991 to 2021, the volume of Taiwanese investments in Chinese companies amounted to USD 193.5 billion.[9]

The importance of Taiwanese "local companies" in the global economy can be judged by the share of their production in their markets. TSMC has around 55% of the global market for contract chip fabrication.[10] It has also made the world's digital infrastructure dependent on a small island.[11] Among TSMC's customers are Apple, NVIDIA, AMD, Sony, Intel.[12] MediaTek led the Android smartphone SoC market in 2021 with a 46% share, followed by Qualcomm with 35%. Most of the market share growth for MediaTek in 2021 came from the low-mid tier wholesale price segment (sub-USD 299), driven by strong demand for the Dimensity 700/800 series chipsets.[13] UMC is a leading global semiconductor foundry company.[14] IPad-maker Foxconn is world's 10th biggest employer with 1.2 million employees.[15] Maxxis is one of the relatively young tire manufacturers. This company are highly appreciated by the manufacturers of Volkswagen, Toyota, Chrysler, Peugeot and Ford.[16]

TSMC makes semiconductors used in F-35 fighters and a wide range of "military-grade" devices used by the U.S. Department of Defense.[17] Many U.S. defense systems use field-programmable gate arrays which are similar to commercial versions but

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9 *Cross Strait Relations*, Taiwan.gov.tw, https://www.taiwan.gov.tw/content_6.php [accessed: 20.11.2022].

10 Ch. Miller, *The Chips That Make Taiwan the Center of the World*, Time, 5.10.2022, https://time.com/6219318/tsmc-taiwan-the-center-of-the-world/ [accessed: 20.11.2022].

11 *Ibidem*.

12 P. Bajpai, *An Overview of the Top 5 Semiconductor Foundry Companies*, Nasdaq, 1.10.2021, https://www.nasdaq.com/articles/an-overview-of-the-top-5-semiconductor-foundry-companies-2021-10-01 [accessed: 28.12.2022].

13 S. Parashar, *Android Smartphone SoC Market: MediaTek Leads in Low-Mid Tiers, Qualcomm in Upper*, 11.03.2022, Counterpoint Research, https://www.counterpointresearch.com/android-smartphone-soc-market-2021/ [accessed: 20.11.2022].

14 L. Wang, *UMC to become world's No. 3 foundry: researcher*, The Taipei Times, 8.12.2020, https://www.taipeitimes.com/News/biz/archives/2020/12/08/2003748296 [accessed: 20.11.2022].

15 A. Leach, *Foxconn is world's 10th biggest employer: 1.2 MILLION on payroll*, The Register, 20.03.2012, https://www.theregister.com/2012/03/20/foxconn_tenth_biggest_employer/ [accessed: 20.11.2022].

16 *History of Maxxis*, 23.11.2021, https://autorip.ru/en/maxxis-chi-shiny-strana-proizvoditel-shin-maksis-istoriya-kompanii-maxxis/ [accessed: 20.11.2022].

17 S. McGlaun, *TSMC Under U.S. Pressure As Chip Supplier For Lockheed F-35 Lightning II: Report*, HotHardware, 16.01.2020, https://hothardware.com/news/tsmc-under-pressure-to-build-chips-in-us [accessed: 20.11.2022].

introduce certain specific militarily relevant features, such as higher levels of heat and radiation tolerance.[18] The major designers of FPGAs are U.S. firms that depend on Taiwan for much of their production. The U.S. firm Xilinx, for example, invented the FPGA, but most of its semiconductor wafers are manufactured by TSMC and United Microelectronics Co., another Taiwanese firm.[19]

Since the beginning of the twenty-first century, Taiwan with Hong Kong, Singapore and South Korea, has been one of the "East Asian tigers" – an informal club of the most dynamically developing economies of the region. Taiwan is the 21st largest economy in the world with a nominal GDP of USD 807 bn in 2021, and GDP per capita of USD 33,011.[20]

Strategic location of Taiwan – global sourcing

The conflict over Taiwan could have a serious impact on world trade, given the fact that the 180-kilometer Taiwan Strait and shipping route east of the island are the main routes for ships carrying raw materials to factories in East Asia or transporting finished goods from this region to the rest of the world. The Taiwan Strait connects the East China Sea and the South China Sea, which are of strategic importance to the global economy.

Sea routes leading through the South China Sea from Chinese ports to India, the Middle East and on to Europe are an important element of global supply chains. In addition, the importance of the South China Sea increased due to the discovery of large reserves of oil and natural gas under the seabed. The Philippines, Brunei, Malaysia, Vietnam and Singapore claim to this waters, and given the security of sea routes leading through the South China Sea, the United States is also involved in this conflict.[21] Any tensions on this sea may adversely affect the entire global electronics industry. About 84% of all the world's electronics are produced in Asia, of which 85% are made in China, and all these products are transported through the South China Sea. Professor Ramamurti points out that if there were an armed conflict in the region, the supply of goods from Asian factories would be indefinitely suspended, which

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18 S. Shivakumar, Ch. Wessner, *Semiconductors and National Defense: What Are the Stakes?*, CSIS, 8.06.2022, https://www.csis.org/analysis/semiconductors-and-national-defense-what-are-stakes [accessed: 20.11.2022].

19 *Ibidem*.

20 I. Pang, *Taiwan's economic outlook for the second half of 2022*, ING Think, 28.06.2022, https://think.ing.com/articles/taiwan-economic-outlook-2h22 [accessed: 26.11.2022].

21 K. Winkler, *Konflikt na Morzu Południowochińskim w perspektywie rywalizacji chińsko-amerykańskiej*, Teologia Polityczna, 11.01.2021, https://teologiapolityczna.pl/krzysztof-winkler-konflikt-na-morzu-poludniowochinskim-w-perspektywie-rywalizacji-chinsko-amerykanskiej [accessed: 20.11.2022].

would mean disaster for companies which only suppliers are Asian companies.[22] Professor Sitaraman estimates that goods worth a total of USD 5.3 trillion a year are currently transported through the South China Sea. About 20% of this goes to the U.S. The economic impact of a major maritime conflict in the region could be so great that it would change our way of life.[23] In the case of the East China Sea, the parties to the conflict are China and Japan, which have been engaged in a border dispute over the strategically located Senkaku Islands since 1970.[24]

To ensure resilient supply chains, it is essential that they be globalized. However, the search for low-cost production, combined with the effective industrial policy of key nations, has led to geographic concentrations of key supply chains in a few countries, increasing vulnerabilities for United States and global producers. Such concentration leaves companies vulnerable to disruption, whether caused by a natural disaster, a geopolitical event, a global pandemic or indeed hostile actions. The Department of Commerce's report shows that the United States is dangerously dependent on specific countries for parts of the value chain of all of these products[25] – e.g. the global economy depends on Taiwanese firms for 92% of leading-edge semiconductor production. China has over 75% of global cell fabrication capacity for advanced batteries, as noted in the Department of Energy's report.[26]

Concluding the analysis of Taiwan's strategic location, it is worth emphasizing that according to Bloomberg Intelligence, in the first seven months of 2022, about 48% of the global container ship fleet passed through the Taiwan Strait. In addition to the elements cited above, the reason for choosing the strait as the most convenient route for sailing is the weather. Circumnavigation of Taiwan, on the other hand, is longer, and also involves the risk of exposing the ship to cyclones, which occur in the Philippines from June to September.[27]

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22 P. Thibodeau, *South China Sea conflict could be IT's Black Swan*, Computerworld, 15.08.2016, https://www.computerworld.com/article/3107217/south-china-sea-conflict-could-be-it-s-black-swan.html [accessed: 20.11.2022].

23 *Ibidem*.

24 A. Makowski, K. Kubiak, *Współczesne spory morskie – na przykładzie zatargów o archipelagi na Morzu Wschodniochińskim i Morzu Japońskim*, „Prawo Morskie" 2005, t. 21, s. 61–73, https://journals.pan.pl/Content/114260/PDF/document%20-%202019-10-05T115827.699.pdf [accessed: 20.11.2022].

25 R. Cronin, *Semiconductors and Taiwan's "Silicon Shield"*, Stimson Center, 16.08.2022, https://www.stimson.org/2022/semiconductors-and-taiwans-silicon-shieldA/ [accessed: 15.01.2023].

26 *Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-based Growth*, A Report by The White House, Washington, June 2021, https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf [accessed: 10.01.2023].

27 T. Burdzik, *Cieśnina Tajwańska: czy Chiny zagrażają światowemu transportowi morskiemu?*, GospodarkaMorska.pl, 11.08.2022, https://www.gospodarkamorska.pl/ciesnina-tajwanska-czy-chiny-zagrazaja-swiatowemu-transportowi-morskiemu-65891 [accessed: 20.11.2022].

Effects of the blockade of Taiwan

The blockade or tensions over Taiwan will be of great importance from the point of view of disrupting the global security architecture. As recently as 1990, the United States accounted for 37% of global chip production. Currently, it is about 12%.[28] Supply problems caused by potential tensions would affect all technology companies: from Apple, which is the largest customer of Taiwan's TSMC, through companies specializing in military and medical technologies, to software and IT hardware manufacturers such as NVIDIA and AMD.

The conflict in the Taiwan Strait will force the search for new markets for obtaining chips. The problem, however, is that today Taiwan cannot be replaced. Taiwanese giant TSMC operates largely as a contract manufacturer – it produces semiconductors that have been developed by other manufacturers, such as South Korea's Samsung, which holds 17% of the global chip sales market,[29] however, its production capacity is not able to balance Taiwanese production. Another aspect is the type of semiconductors itself – the most advanced 7 nm and 5 nm components are manufactured by TSMC and Samsung, with TSMC and Samsung already preparing to produce next-generation 3 nm chips.[30]

It is worth noting that only South Korea's Samsung, Japan's Toshiba, America's Intel and China's SMIC have manufacturing facilities outside Taiwan. What's more, their capabilities are clearly not enough to replace TSMC and MediaTek. A possible conflict between China and Taiwan will cause another shortage of components for global industry, especially since SMIC will not be able to supply products to "enemies" in the West. The situation is aggravated by the fact that part of the production capacity of Taiwanese companies is located in mainland China, where cheaper labor and necessary resources are concentrated.[31]

If China succeeded in pressuring Taiwan to grant Beijing access to TSMC factories, the United States and Japan would certainly respond by imposing new restrictions on the export of advanced machinery and materials, but it would take years

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[28] A. Varas, R. Varadarajan, J. Goodrich, F. Yinug, *Government Incentives and US Competitiveness in Semiconductor Manufacturing*, BCG, SIA, September 2020, https://www.semiconductors.org/wp-content/uploads/2020/09/Government-Incentives-and-US-Competitiveness-in-Semiconductor-Manufacturing-Sep-2020.pdf [accessed: 20.11.2022].

[29] A. Kharpal, *Samsung aims to make the world's most advanced chips in 5 years, as it plays catch up with TSMC*, CNBC, 4.10.2023, https://www.cnbc.com/2022/10/04/samsung-aims-to-triple-production-for-most-advanced-chips-by-2027.html [accessed: 20.11.2022].

[30] J. Porter, *Samsung beats TSMC to production of 3nm chips*, The Verge, 30.06.2022, https://www.theverge.com/2022/6/30/23189362/samsung-3nm-chips [accessed: 20.11.2022].

[31] R. Jennings, K. Wong, *Quitting China isn't easy for Taiwanese companies, even if the mainland is 'a lot of trouble'*, South China Morning Post, 6.08.2022, https://www.scmp.com/economy/article/3187910/quitting-china-isnt-easy-taiwanese-companies-even-if-mainland-lot-trouble [accessed: 12.01.2023].

to replicate Taiwan's chip-making capabilities in other countries, while the entire world would still be dependent on Taiwan. Such a scenario would be disastrous for the economic and geopolitical situation of the United States.[32] It would be even worse, if TSMC's factories were destroyed as a result of any conflict. The scale of the threat is shown by the losses suffered by the computers and semiconductors global market, after the cessation of production at TSCM as a result of the earthquake in Taiwan in 1999.[33]

Notably, in the event of the destruction (isolation) of Taiwan's economy, about one-third of PC processor production, including chips designed by Apple and AMD, would be halted until new factories are built elsewhere. Data center capacity growth would slow drastically, especially for servers focused on AI algorithms, which are more dependent on Taiwan-made chips from companies like NVIDIA and AMD. There would be an almost complete halt in the implementation of the 5G network.[34] In the event of any conflict, the Chinese infrastructure currently used for electronics assembly would be isolated. Manufacturers would have to find other entities to assemble phones and computers for which they would have components. The total cost of a semiconductor deficiency would be measured in trillions of USD. It would take at least half a decade to rebuild the lost chip making capacity.

The world economy and supply chains that cross Asia and the Taiwan Strait are based on this precarious peace. The global chip industry, as well as the assembly of all electronic circuits, depend more on the Taiwan Strait and the coast of southern China than on any other piece of the world's territory.

Taking into account these risks, the West has intensified work on the development of its own production of microcircuits. The United States and the European Union have been talking for several years about the need to ensure technological independence from Asian countries in this area.

A June 2021 White House report on supply chains indicated that the entire U.S. economy is dependent on Taiwan's TSMC and Korea's Samsung, which is "a threat to U.S. national security and critical infrastructure in the United States."[35] Accordingly, on August 9, 2022, President Biden signed the CHIPS and Science Act, which aims to strengthen the U.S. semiconductor supply chain and promote high-tech research and development in the United States.[36]

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[32] Ch. Miller, *op. cit*.

[33] B. Crothers, *PC industry hit by Taiwan quake aftershocks*, CNET, 2.01.2002, https://www.cnet.com/culture/pc-industry-hit-by-taiwan-quake-aftershocks/ [accessed: 20.11.2022]; S. Robinson, *Taiwan's Chip Plants Left Idle by Earthquake*, New York Times, 22.09.1999, https://www.nytimes.com/1999/09/22/business/taiwan-s-chip-plants-left-idle-by-earthquake.html [accessed: 20.11.2022].

[34] Ch. Miller, *op. cit*.

[35] *Building Resilient Supply Chains…*, *op. cit*.

[36] J. Badlam *et al.*, *The CHIPS and Science Act: Here's what's in it*, McKinsey & Company, 4.10.2022, https://www.mckinsey.com/industries/public-and-social-sector/our-insights/

The European Union took similar actions. In her 2021 State of the Union speech, European Commission President Ursula von der Leyen set the vision for Europe's chip strategy, to jointly create a state-of-the-art European chip ecosystem. This will include production, as well as connecting the EU's world-class research, design and testing capacities[37]. The base for this activities were analysis of European Chips Report, based on findings of the European Chips Survey.[38]

Conclusions

Taking into account the arguments presented in the article, it should be stated that potential tensions between Taiwan and China may cause huge disruptions in global supply chains. These risks result from two main elements – the strategic location of Taiwan (Taiwan Strait) and the location of the semiconductor, chips and similar components industry, which in the event of a crisis in Taiwan-China relations will have a negative impact not only on the economies of the United States and the European Union, but also on East Asia.

It is worth noting that the inclusion of the United States as a party to a potential Sino-Taiwanese tensions may cause a military conflict, which may create large losses. According to the report of the Center for Strategic & Internal Studies,[39] a war for Taiwan would likely result in a victory for the coalition defending the island, but the enormity of each side's losses would weaken their military power for years. Depending on scenario the United States and Japan lose dozens of ships, hundreds of warplanes and thousands of troops. Such losses would damage the global position of the U.S. for many years.[40] China and Taiwan would also be severely affected by this conflict.[41]

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the-chips-and-science-act-heres-whats-in-it [accessed: 04.12.2022]; E.M. Jacobs, *Challenges and Opportunities for the "Chip 4" Group*, Global Taiwan Institute, 2.11.2022, https://globaltaiwan.org/2022/11/challenges-and-opportunities-for-the-chip-4-group/ [accessed: 20.11.2022].

[37] *European Chips Act*, European Commission, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-chips-act_en [accessed: 12.01.2023]; *2021 State of the Union Address by President von der Leyen*, European Commission, 15.08.2021, https://state-of-the-union.ec.europa.eu/state-union-2021_en [accessed: 12.01.2023].

[38] *European Chips Survey*, European Commission, 04.08.2022, https://digital-strategy.ec.europa.eu/en/library/european-chips-survey [accessed: 12.01.2022].

[39] M.F. Cancian, M. Cancian, E. Heginbotham, *The First Battle of the Next War: Wargaming a Chinese Invasion of Taiwan*, CSIS, Washington, January 2023, https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/230109_Cancian_FirstBattle_NextWar.pdf?WdEUwJYWIySMPIr3ivhFolxC_gZQuSOQ [accessed: 12.01.2023].

[40] *Ibidem*, p. 88.

[41] *Ibidem*.

To sum up, it is in the interest of global economic security to avoid tensions in Taiwan-China relations, and in the event of tensions, all parties to the conflict, as well as other stakeholders, should make every effort to achieve a peaceful solution, because in the case of military attempts to resolve the "Taiwan issue", from an economic security point of view, there will be no winners.

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Implications of the China-Taiwan tensions for the international economic security

Abstract

The economy of Taiwan began to take shape after the occupation of the island by Japan under the peace treaty with the Chinese Qing Empire in 1895. After that, Tokyo began to actively invest in the development of a new territory: railroads, factories and defense enterprises were built. In this way, an industrial base was created that Taiwan uses to this day. After Japan's defeat in World War II, the island briefly returned to the Republic of China. However, there was a civil war in the country between the communists and nationalists, who rallied around Chiang Kai-shek, who eventually lost and withdrew to Taiwan with his associates. Taipei officially named the new state the "Republic of China" and has declared and continues to declare claims against the entire territory of China. Beijing, on the other hand, regularly declares that Taiwan is part of the People's Republic of China and has announced its reunification with the "rebellious island". The article deals with the economic consequences for the world economy resulting from the potential crisis between China and Taiwan. The subject is inspired by the dependence of the economies of many countries, including the United States and the European Union, on products supplied from the region of East Asia, especially by Taiwan, which in the event of a crisis in relations between conflicted countries may create threats to the international economic security.

Keywords: China, Taiwan, economic security, supply chain, value chain, semiconductors, Taiwan Strait