

## **The Battle for Semiconductor Technology: The Tense China-US-Taiwan Triangle and Escalation's Hidden Threat**

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### **Abstract**

It will not be an exaggeration to say that the 21st century is hard to imagine without modern computers, cell phones or "smart technologies", the role of which and the dependence of people on them in everyday life is growing rapidly. Besides, the world is unimaginable without largely discussed 5G technology and its impact on industry or labor market, which together with the economic activity is closely linked to the military industry, the development of which is impossible without free access to microchips or modern high-tech components. Yet, while using different technologies, we rarely think about the ABCs of the production of its components. If we take a closer look at the situation in the current market, we will be convinced that they bear not just economic, but the greatest geopolitical and strategic load as well, that may be compared with oil and gas, however, the difference is the semiconductors can't be substituted by the alternative sources. These seemingly small squares hold a mysterious power so crucial to our civilization that stopping their production for any reason paralyzes the economy across the planet. In that respect it became especially obvious after the end of the Covid-19 pandemic, when microchip shortages have disrupted manufacturing processes and global supply chains; what's more, a number of high-tech industries were completely paralyzed.

Therefore, the leading countries while engaged in the technological competition and marathon spare no effort and trying to expand their spheres of influence in the global production chain of semiconductors and micro or nano technologies.

This article reviews the current situation in the world in that respect and how it is changing not only the world of microelectronics, but also politics. It focuses on how the pandemic and chip shortages have turned Taiwan's largely anonymous services company TSMC (Taiwan Semiconductor Manufacturing Company) into the center of a global battle for future technologies. It also shows the tense situation between China and the United States and Taiwan, and how acute and sensitive it is for China to "return" Taiwan to become the absolute leader in the production of microchips, not to mention security, because in the event of the deployment of Chinese military bases there, the entire chain of islands and the nearest water Space control will be secured.

The modern trends of globalization are complexly changing the security environment and the future will show what happens tomorrow, however, we want to believe that all countries involved in the above-mentioned processes will still be able to find common ground, which will ultimately ensure the prevention of new military conflicts and innocent life loss.

**Keywords:** Semiconductors, "Smart Technologies", China, Taiwan, Microchip Manufacturing, "Silicon Shield".

### **Introduction**

About two years ago, the world started discussing the tense situation between China, the United States, and Taiwan. Some assumed that World War III would begin soon, others appealed to the adequacy of the two superpowers, and some did not understand what was happening. The situation is complicated, murky, and confusing indeed. What does the relationship between the US and China have to do with this? How did the conflict between the two countries begin, and why is Taiwan so important?

If we recall history, in 1949 Taiwan separated from Communist China and lived under the patronage of the United States, however, it considers Taiwan to be the territory of the People's Republic of China and just like the vast majority of countries in the world, does not recognize its independence.

In the 80s, the Taiwanese government came up with a scheme of protection against the attack on the island, so began producing semiconductors and thus not dependent on anyone.

The West has not resisted much, as manufacturing is a troublesome business, and Taiwan has not been seen as a competitor, as it is considered to be able to only manufacture microchips, but not design them. In general, the following production scheme emerged - the West puts pressure on, Taiwan produces, and the process is completed in China.

The main focus was on profit. Everyone thought that if people pooled their funds, the war could be avoided. That's so naive, isn't it? For decades, technology, engineers, and vast sums of money flowed to Taiwan, where tens and hundreds of billions of dollars worth of semiconductor manufacturing equipment were accumulated, which is a primary resource for virtually every processor or circuit today. They are so small that we don't even notice them even though they are everywhere: without them, there are no computers, modern household appliances, cars, space satellites, telecommunications - including mobile communications and the Internet, no modern weapons systems - from airplanes to missiles.

The chips cost pennies and are produced in the millions. Who would think of starting a war over them? Nobody. But the United States and China are already fighting, although they are not shooting yet... Since those who have microchips - own the future. Never before have wars started for such insignificant reasons. But, this is the most important thing in the world - turn it off and everything stops.

The issue is quite pressing, which has become especially acute after the end of the covid-19 pandemic, when a shortage of microchips arose, which caused disruptions in production processes and supply chains worldwide, and several high-tech industries were completely paralyzed.

Everyone has realized how narrow and sensitive this supply chain is. Therefore, leading countries are sparing no effort and trying to expand their spheres of influence in the global production chain of semiconductors and micro or nano technology in the conditions of technological competition and marathons.

Research methodology:

The work is based on the qualitative method of social research. In particular, for data collection and analysis, the research was carried out based on process tracing, case study, and qualitative content analysis methods. Also, during the study, secondary scientific-literary sources were analyzed to create a basis for continuing the research related to the subject under study.

### **1. Taiwan is the leader in the modern world semiconductor microchip manufacturing market**

Although microchips are a key component of the global economy, as strange as it may sound, there is no single country, - or even a powerful state, that is the absolute leader in the manufacturing of microchips.

It should be noted, that from the technological point of view, the most expensive and complex component at the moment is the logic chips, which are manufactured by Qualcomm, Nvidia, Apple, and other companies. This enables „intelligence“ to computers or smartphones, but the fact is that these Silicon Valley companies are not involved in the production of these processors themselves, but are limited only to their design. And physical production takes place in foundries. About 55% of the world's most advanced semiconductor chips are made on the island of Taiwan.

For example, only one Taiwanese semiconductor and chip making company, TSMC (Taiwan Semiconductor Manufacturing Company), is the most significant company in this sector, controlling about 60% of the world market and being the main supplier of semiconductors for such corporations as Huawei, Realtek, AMD, NVIDIA, Qualcomm, Apple, Intel and about ten of the world's largest brands.

This circumstance naturally gives the Taiwanese tech giant the greatest geopolitical and economic power.

The market capitalization of the company TSMC is estimated at almost half a trillion dollars. It controls about half the market of specialized chips, and most importantly, according to some experts, it has even tighter control over the most advanced processors, with more than 90% of the market share<sup>1</sup>. This circumstance certainly strikes hard at the most sensitive area of the world, and therefore, in view of the above story, when the world realized what it had actually done, everyone became afraid, and not without reason.

If we recall the Russia-Ukraine war of 2022, the first thing that the servicemen experienced a shortage of was not shells or missiles, but microchips. The West and its allies immediately stopped supplying it to Russia, but the Russians resorted to trickery and tried to get them by any means necessary. In the first months after the introduction of sanctions, the Western press reported that Russians were buying up foreign household appliances en masse - coffee makers, washing machines, and vacuum cleaners, disassembling them, and using the chips removed from the household appliances for other purposes. In particular, they were installed on combat missiles and drones<sup>2</sup>. Some perceived this view as reality, while others considered it as a conspiracy theory, emphasizing the fact that nothing was known about how chips removed from household appliances were reprogrammed so that they could be used to destroy the enemy on the battlefield. But, at the same time, in the summer of 2020, Kazakhstan and Armenia purchased a record number of breast pumps (milk pumps) for nursing mothers, while none of the countries experienced an increase in the birth rate. Therefore, according to the West, this device went to Russia<sup>3</sup> in this way, but there has been no increase in the birth rate there either. That's why Western experts have spoken of a cunning approach on the part of Russia regarding its use for military purposes. But even in this case, several questions arise: what kind of function can it have? What can it do? They cannot transmit GPS signals and most importantly, they do not have the ability to navigate - they do not provide information. What is all this for? There are no answers to these questions and they remain a mystery.

### 1.1. TSMC (Taiwan Semiconductor Manufacturing Company) as the center of the global battle for the technologies of the future

In any case, the pandemic and the chip shortage have turned Taiwan's largely anonymous services company TSMC (Taiwan Semiconductor Manufacturing Company) into the center of a global battle for the technologies of the future. Americans call its production critical, and in Japan and South Korea, because of its importance, the government even compares it to rice. To say that a country with a population of 23 million people owns the world is to say nothing.

Taiwan has been and remains the formal leader in the field of electronics, which, although not directly producing goods (household/consumer), but provides a presence for other large corporations. Hence the race for confrontation or friendship with Taiwan. Some states want to make a profitable political deal with an unrecognized state, while others, for a number of historical reasons, are trying to appropriate it.

Therefore, the temptation to start a war is great for China, as it actually considers Taiwan its own rebel province and is rumored to be preparing an army to retake the island to become the absolute leader in microchip production. Not to mention the security, as China's deployment of military bases there would ensure control over the entire chain of islands and the nearby waters, preventing the American fleet from approaching. And if US military forces would deploy there, America will be able to control China's fleet and trade routes. Moreover, the probability of military intervention in case of exhausting the

<sup>1</sup> "All about chip giant TSMC that crossed \$1 trillion market cap", The Economic Times, News, 07.2024, [rb.gy/ca1nbz](https://www.economictimes.com/news/technology/all-about-chip-giant-tsmc-that-crossed-1-trillion-market-cap) [L. s.05.08.24].

<sup>2</sup> Tagler, E., "Is Russia Really Buying Home Appliances To Harvest Computer Chips For Ukraine-Bound Weapons Systems?" 2023, [rb.gy/14mijm](https://www.rbc.com/news/technology/russia-buying-home-appliances), [L. s. 05.08.24].

<sup>3</sup> Nardelli, A., Baschuk B., and Champion M., "Putin Stirs Worry that Russia is Stripping Home-Appliance Imports For Arms", Bloomberg, 2022, [https://bitly.cx/o8tyZ](https://www.bloomberg.com/news/articles/2022-08-04/putin-stirs-worry-that-russia-is-stripping-home-appliance-imports-for-arms) [L.s. 05.08.24].

possibility of joining the island "peacefully" is officially enshrined in the legislation of the People's Republic of China.

However, a Chinese attack on Taiwan could have far-reaching consequences, not only in terms of potential conflict with the US or the use of nuclear weapons, but also in terms of incredible economic losses. Given all the military might of China, it is unlikely that it would be able to take Taiwan without firing a shot. No, and fighting in the densely populated western part of the island could destroy microelectronics factories.

The demand for microchips is huge and exceeds the supply. If a major manufacturer like Taiwan suddenly leaves the market, there will be a huge deficit.

## 1.2. Microchips as Taiwan's "Silicon Shield"

How do these chips protect Taiwan from war?

Just a small disruption at TSMC would be enough to paralyze a range of industries (from electronics and telecommunications to equipment manufacturing, healthcare, and utilities), leaving millions of people out of work. However, many fields, such as the development of artificial intelligence and the deployment of 5G networks, will be completely stopped. It will be difficult to buy a new car, smartphone, or household appliance. Moreover, there may be the supply chain disruption of critical equipment, such as medical and industrial apparatus and appliances.

But it takes a lot of money and decides to set up chip production in other countries. In a recent interview with *The Economist*, the former US Secretary of State and diplomat Henry Kissinger said that a military conflict over Taiwan could destroy the entire global economy.

The COVID-19 pandemic has already partially shown what could happen if the semiconductor industry comes to a standstill. Closing the borders and shutdowns at the factory have led to a microchip shortage around the world and have hit the automotive market hard. This is partly why the United States supports Taiwan, even though it does not officially recognize its sovereignty.

Therefore, Chinese leaders are forced to refrain from even thinking about war, since China itself is highly dependent on Taiwanese products. As long as Taiwan remains the leader in manufacturing the microchips, it will ensure its security. It is no coincidence that the country's president, Tsai Ing-wen, even called a "silicon shield" to manufacturing the Chips.

## **2. Extreme Ultraviolet Lithography (EUV) - The Most Important Machine in the World, that cannot be copied**

Is it possible to find a simpler way, like Taiwan, and Countries start producing semiconductors themselves? Is it possible to repeat the same thing again? This is where things get complicated. Taiwan currently manufactures the most advanced 2-nanometer chips. To put it more clearly, it is much narrower than a strand of human hair, which is about 50 to 100,000 nanometers<sup>4</sup>. Taiwan knows how to make microchips, and, to put it figuratively, it has mastered the production of the most advanced 2 nanometer semiconductor models, and there is only one machine in the World that can make such microchips. This is Extreme Ultraviolet Lithography (EUV – Extreme Ultraviolet Lithography), which is made only in Netherlands at the ASML factory<sup>5</sup>. ASML is one of the world's leading manufacturers of chip-making equipment. In particular, it is the only company in the world that makes EUV lithography machines for producing these tiny chips at scale. As they say, this is the most perfect human-made creation in the history of our civilization, which cannot be copied in principle. This is a machine that is assembled piece by piece by the world's leading engineers. According to the ASML Company,

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<sup>4</sup> Gabriele, M., "TSMC: Semiconductors and Borders of Light", 2022, <https://www.generalist.com/briefing/tsmc>, [L. s. 05.08.24].

<sup>5</sup> Gil, D., Tirapu-Azpiroz J., Deschner R., Brunner T., "Characterization of imaging performance for immersion lithography at NA=0.93", Fonseca 2006.

it has 5,000 suppliers from Europe, Asia, and America<sup>6</sup>. However, only machine parts and materials are made from them, and for coping all of this, you need to replace the whole world with yourself. For example, the company ASML does not have the necessary competence in making optics, unlike the company CAIS (Central American Integration System), which supplies it with all kinds of optical items, etc.

In fact, there is only one company in the world that is ready to supply equipment for the production of semiconductors using five-nanometer technologies, and this is the Dutch ASML. This is the exact same equipment that TSMC uses in the production of its five-seven- nanometer products, as well as Samsung Corporation.

TSMC's growing dominance has caught the attention of policymakers in the U.S. and Europe, who are calling for domestic chip manufacturing to protect the supply chain from geopolitical influences or unexpected, unforeseen factors, such as the Covid-19 pandemic, which has triggered a chip shortage. Most factories were idle and stopped during the quarantine, after which an avalanche of orders came, for example, from car manufacturers. Therefore, manufacturers could no longer cope with the volume of production.

### 2.1. China as the largest supplier of microelectronics and US sanctions

China is also the world's largest supplier of electronics. Judging only by the data of 2021, he purchased millions of chips and then successfully sold them to foreigners as part of their smartphones or laptops. China spent more money for buying this incredible number of chips than it did an oil<sup>7</sup>. The Chinese company "Huawei" has destroyed such giants as "Apple" and "Samsung" in terms of sales of smartphones. In 2019, it took first place and its market share was 18%. China has crushed its competitors numerically. In addition, it should be noted that Samsung, Apple, and Huawei got their chips in Taiwan.

Thus, China ruthlessly destroyed its competitors using their own technologies. This obviously has caused concern in the United States. In 2019, President Trump imposed crippling sanctions on the Chinese company Huawei, which at that time was the world's leading supplier of telecommunications equipment<sup>8</sup>.

"We convinced many countries — many countries — and I did this myself, for the most part — not to use Huawei because we think it's an unsafe security risk. It's a big security risk,"<sup>9</sup> he said. He banned the Chinese giant from doing almost everything: receiving chips that contained even a portion of American technology, programming chips using American software, etc. Basically, anything that contained even one American patent was inaccessible for China. At first glance, Huawei seemed doomed.

President Biden has continued to clamp down on China's high tech. In 2022, the United States banned companies from supplying China with the advanced chips and the equipment needed to make them<sup>10</sup>. He also pressured European and Asian allies to do the same, and banned American citizens from helping China in any way with chip production.

In 2020, the company TSMC, under pressure from the US government, committed to building two \$12 billion factories in Arizona, which will involve an investment of \$40 billion<sup>11</sup>.

<sup>6</sup> ASML Annual Report 2022, „Small Patterns. Big Impact“, <https://bitly.cx/R8ALfo>, pdf [L. s.05.08.24].

<sup>7</sup> Sheng, W., "China spends more importing semiconductors than oil, The Numbers", 2021, <https://bitly.cx/T6nM/>, [L. s. 05.08.24].

<sup>8</sup> Morris, I., "US still makes billions in China chip sales, and it's all at risk", 2024, <https://bitly.cx/hNDe2>, [Last seen 05.08.24];

<sup>9</sup> Kimball S., "Trump says he doesn't want to do business with Huawei due to national security concerns", 2019, <https://bitly.cx/oG1DR>, [L.s.05.08.24].

<sup>10</sup> Duffy, C., "Trump said he'd ease up on Huawei. Questions remain about what that means", 2019, <https://bitly.cx/CLpNS>, [L. s. 05.08.24].

<sup>11</sup> Kinery, E., "TSMC to up Arizona investment to \$40 billion with second semiconductor chip plant", 2022, <https://bitly.cx/XWvRCg> [L. s. 05.08.24].

"Huge amounts of money are needed to produce all this. But we live in a turbulent world, and all the big players are trying to set up semiconductor production in their own countries. Yes, it's expensive, but it's more expensive to be without them,"<sup>12</sup> - Biden said. According to him, it is planned to create a subsidiary of TSMC in Japan, which will be engaged in the research of new semiconductor materials. In particular, the company TSMC will build factories in Japan for 20 billion, among which the first will produce 40-nanometer simple chips along with 12-nanometer semiconductors, and in three years another factory is expected to open, where 7-nanometer chips will be produced. But the most unique 2-nanometer semiconductors TSMC does not going to exported abroad yet<sup>13</sup>. However, according to industry experts, the government's desire to transfer TSMC's production could fail, as it will require billions of dollars of continued investment to stay at the forefront of progress.

The company also plans to build a factory in Germany, particularly, in Germany - Dresden, where 28-nanometer semiconductors are planned to be produced. Although the Germans are not thrilled about it, as they consider it outdated, especially after three years and \$10 billion, they think it will be useful for the auto industry. The Indian approach is interesting in this regard. They are willing to spend \$10 billion and ask a company to build a factory in Gujarat, but they have no experience, no specialists, just sheer enthusiasm, but they are trying to attract foreign specialists with tripled pay.

Among all the players, China has spent the most money to build up its own semiconductor industry. Hundreds of billions of dollars have been invested, but it's not just about money. It is also incredibly complex, requiring high-quality chemistry and a stable supply of high-quality parts. Decades of experience and qualified engineering and technical personnel which is in demand all over the world.

## 2.2. The United States and China as a key players in chain of supply the semiconductor technology

The United States has begun restricting high-tech trade with China, despite the fact that such moves cause significant harm to American companies. The United States and China are major players in the global semiconductor supply chain. China is the world's largest semiconductor market, accounting for 36 percent of U.S. companies' sales, according to the American Semiconductor Industry Association. Growing tensions between the US and China create both short and long-term risks to the resilience of the supply chain, market access, and ultimately the competitiveness of the US semiconductor industrial base. U.S. industry officials estimate that the global semiconductor market will shrink 10% in 2023, with sales reaching about \$515 billion, down from \$574 billion in 2022, due to reduced demand from lockdowns and higher interest rates in developed economies<sup>14</sup>. The willingness of American politicians to sacrifice the semiconductor industry's own interests is explained by the fact that the Biden administration considers maintaining its own technological superiority to be critically important to US interests and national security.

Such a tough stance may be largely due to China's policies, which are causing serious concern among the American establishment. According to the US administration, military-civil integration is a large-scale national project aimed at transforming China's technological and scientific industries in such a way that innovations in these areas have a direct and immediate impact on military development<sup>15</sup>. Part of this strategy is recognizing and exploiting the fact that most semiconductor technologies are dual-use: that is, they have both defense and commercial applications<sup>16</sup>. Therefore, collaboration with

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<sup>12</sup> Thorbecke, C., "The US is spending billions to boost chip manufacturing. Will it be enough?", 2022 <https://bitly.cx/q6xCGe>, [L. s.05.08.24].

<sup>13</sup> Toh, M., "TSMC says its \$40 billion chip project in Arizona faces a further delay", 2024, <https://bitly.cx/9UenE>, [L. s. 05.08.24].

<sup>14</sup> "Taiwan and The Global Semiconductor Supply Chain: 2023 In Review", Bumper Issue, April/May 2024, Edited by Chen-Tung, Ph.D. Representative, Taipei Representative Office in Singapore, p.47, Pdf.

<sup>15</sup> Stone, A., and Wood, P., "China's Military-Civil Fusion Strategy: A view from Chinese strategists," (Montgomery AL, China Aerospace Studies Institute, n.d.) p. 36.

<sup>16</sup> "U.S.-China Economic and Security Review Commission", 2019 Annual Report to Congress (Washington DC, US Government Publishing Office, 2019) Chapter 3 Section 2 "Emerging Technologies and Military Civil Fusion—Artificial Intelligence, New Materials and New Energy" p. 205.

industry allows them to freely direct the achievements of their own technology companies to strengthen the national security infrastructure. Significantly, the first package of export restrictions was adopted in October 2022, and in March 2023, the Netherlands, where the headquarters of the world's largest manufacturer of lithographic equipment, the ASML (Advanced Semiconductor Materials Lithography) holding is located, joined the supply restrictions. It is worth noting that Japan, where a significant share of chemical reagents are produced, is home to the headquarters of Canon and Nikon, which also produce lithography equipment.

### 2.3. Restrictions on export of lithographic equipment and their consequences

The restrictions imposed by the Netherlands took into account a long transition period, which was supposed to last until January 1, 2024. On the first day of the year, the Dutch company published a press release announcing that it was forced to cancel several deliveries because the license to supply lithographic systems had been partially revoked by the Dutch authorities in 2023. The mentioned circumstance also affected a small part of Chinese users. Therefore, during 2023, Chinese companies attempted to make large-scale purchases of lithographic equipment. According to statistics from the Customs Administration of the People's Republic of China, 42 units of lithographic systems worth about \$817 million were imported into the country in November 2023<sup>17</sup>. China exported 16 Dutch projection systems worth \$763 million - 10 times more than in November 2022. By comparison, in October 2023, the Netherlands exported 21 lithography systems worth \$6,725 million<sup>18</sup>.

The nearly 1.5-fold increase in the average unit price of a lithography system indicates that Chinese firms have been scrambling to acquire more advanced production lines as the technological iron curtain has come down once again. Another 15 lithography systems arrived in the country from Japan in November 2023, making almost all of the country's chip manufacturing equipment imports from these two countries<sup>19</sup>.

Manufacturing of microchips is like untying endless knots. It is clear that no one wants to depend on someone else, but how do you organize production independently? How do you produce new-generation semiconductors without experience? Well, let's say you started producing outdated previous-generation semiconductors, but their sale will be associated with problems, since no one needs the outdated version anymore. As a result, we get unprofitable production. If so, how should they be modernized? With what amount? This is a race for turnover of funds. If everything is limited by one country, how do we achieve production of scale? As for China, everything is different there. It has a billion users in the country. Therefore, China was able to get one of its companies out of a difficult situation - Huawei, which holds its place. Moreover, at the end of 2023, it presented a new smartphone Mate 60 Pro with a 7-nanometer processor<sup>20</sup>, which was an unpleasant shock for the United States, as it was assumed that China would not be able to switch to this technology due to sanctions. But it looks like the Chinese modified existing ASML lithography. But that's not important. The main thing is that "Huawei" tore off from the American technologies and brought to the light of day the Chinese inventors who replaced them with foreigners and created a completely Chinese smartphone. They installed the operating system "harm" on it, as Android was not available to them, and 300 million devices were loaded with it. The company did this for a year and somehow managed to find \$24 billion to fund for the research.

Therefore, the reason for the decision to tighten export restrictions in October 2023 was the incident related to the Huawei Mate 60 Pro smartphone. In particular, the start of sales of the mentioned model on August 29, 2023, coincided with the visit of US Secretary of Commerce Gina Raimondo to Beijing and Shanghai. The Mate 60 Pro has dominated the US news cycle for two weeks after a teardown of

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<sup>17</sup> "China's imports of Dutch chip-making equipment surged tenfold in November after Washington tightened restrictions, South China Morning Post", 2023; <https://bitly.cx/mlBFJZ> [L. s. 05.08.24].

<sup>18</sup> Trend Force [News] "Surge in Chip Manufacturing Equipment Imports from the Netherlands to China, Soaring Tenfold After U.S. Tightens Restrictions", 2023, <https://bitly.cx/st7UQ/>, [L. s.05.08.24].

<sup>19</sup> Ibid.

<sup>20</sup> see Footnote 14.

the phone revealed it was powered by a Kirin 9000s chip<sup>21</sup> made by Semiconductor Manufacturing International Corporation (SMIC) in China. Huawei has shown that China can make chips using advanced manufacturing processes despite U.S. restrictions, causing panic in Washington and raising questions about the effectiveness of U.S. efforts to combat restrictions on China's microelectronics industry.

However, the likelihood that the Chinese company will be able to mass-produce such chips is low, as evidenced by the sales of the Mate 60 Pro smartphone in question, which sold out almost immediately and appeared to be available in limited quantities, which itself implies a limited supply.

According to recent press reports, Huawei is likely to launch its P70 series the best flagship smartphone later this year with the new Kirin 9010 chip<sup>22</sup>. However, there are signs that some models may use older Kirin 9000 models. However, the technical analysis researchers also found that, with the exception of the Kirin 9000s, between half and two-thirds of the chips used in Huawei's new phones were made in China. In 2021, that share was only a third. Likewise, four of the eight central processing units - the Mate 60 Pro's GPU and neural processing system - have been redesigned and customized by Huawei according to its own needs.

Previously, all of these components were based entirely on the British company ARM (Advanced RISC Machines and originally Acorn RISC Machine), which specializes in the development of semiconductors and software.

### **3. China's attempt to establish its own production of microchips. A new wave of US sanctions and its consequences**

The supply of next-generation lithographs has been banned in China. So China was forced to establish its own production, but how? On imported lithographs? However, it managed to acquire previous generation cars and is trying to copy them. True, despite its extensive experience and efforts, nothing worked out, but it is obvious that China is becoming increasingly independent and is rapidly developing its own semiconductor manufacturing capabilities.

The retention of SMIC's (Semiconductor Manufacturing International Corporation) capacity to manufacture semiconductors using a seven-nanometer process has prompted the United States to introduce a new round of export restrictions to ensure that Chinese companies do not expand their capacity further.

The 3nm process will likely remain out of reach for China because it is prohibited from purchasing extreme UV lithography machines from ASML, the world's only manufacturer.

A year after the introduction of export controls, and after the existing measures were found to be ineffective, the United States Bureau of Industrial Security issued a new set of regulations on October 17, 2023, aimed at strengthening the 2022 controls by clarifying their parameters<sup>23</sup>. Which means closing the created "loopholes" and, in some cases expanding the list of technologies and equipment subject to licensing requirements and restrictions.

The second newly introduced rule concerns semiconductor manufacturing equipment. Many new items have been added to the original list of controlled manufacturing systems, including specialized equipment for the production of logic circuits for processes below 16 nanometers. In addition, the number of countries covered by the FDI rules has increased to 20. Additionally, 13 new Chinese companies have been added to the sanctions list, with which American entities cannot do business. These companies, which include Beijing Biren Technology Development and Light Cloud (Hangzhou) Technology, are believed by U.S. lawmakers to be involved in developing artificial intelligence for military purposes, thereby threatening U.S. national security.

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<sup>21</sup> Ibid.

<sup>22</sup> Li D., "Huawei launches Kirin 9010 chipset with optimized performance", 2024, <https://bitly.cx/E7TLQo> [L. s. 05.08.24].

<sup>23</sup> Rajagopalan, R., "AI Chips for China Face Additional US Restrictions", 2024, <https://thediplomat.com/2024/04/ai-chips-for-china-face-additional-us-restrictions/> [L. s. 05.08.24].



China's semiconductor imports have fallen sharply, according to the latest official data, indicating the effectiveness of U.S. export controls and China's efforts to become more self-sufficient in microelectronics.

### 3.1. China moves in response to US restrictions

Taiwan's chip exports to China are set to fall nearly 18% to \$50 million in 2023 amid weaker demand for semiconductors from China, according to Taiwanese official data. While China has not sought to impose restrictions on the scale of its rival, the United States, it has limited itself to a few key sanctions on American industry. In May 2023, China banned the use of Micron chips in major infrastructure projects in the country, citing security risks. According to the Cyberspace Administration of China, Micron products pose a serious threat to network security, threatening the security of China's critical information infrastructure supply chain and affecting the country's national security. Just two months later, in July, China announced that it would impose export restrictions on 38 items from August, including two chemical elements: Gallium and Germanium, which are critical in the semiconductor manufacturing process<sup>24</sup>. Any Chinese company wishing to export these substances must obtain a license from China's Ministry of Commerce. However, it is important to note that potential exporters must specify the end user in their applications to obtain permission.

In October, China also imposed export controls on graphite, a key material for electric vehicle batteries. Germanium is a key component of fiber-optic cables and is also used in high-speed computer chips and plastics. The metal and its oxides have military applications, such as night-vision goggles and infrared sensors for spy satellites. It's also important for low-carbon technologies like solar cells. While advanced semiconductors, such as the 8-nanometer or smaller chips used in smartphones, supercomputers and data centers, are mostly made in Taiwan and South Korea, China is focusing on increasing production of basic chips, also known as "mature" chips. These use technology that is 10 to 20 years old, but is still used in a wide range of products, including some military equipment.

### 3.2. China's ambitious plans to introduce and optimize new semiconductor production lines

In an April 2023 report published by Rhodium Group, noted that China and Taiwan together will account for about 80% of the world's chip manufacturing capacity at 20-45 nanometer standards in the next three to five years. In the 50- to 180-nanometer range, China currently controls about 30% of the market and could increase its share to nearly half of the world's manufacturing capacity within a decade, according to the group's report<sup>25</sup>.

According to the International Semiconductor Association, China will add 18 new factories in 2024. There are even more aggressive forecasts. Looking at the plans of 48 Chinese chip makers, Barclays analysts believe China could increase chip production capacity by 60% over the next three years<sup>26</sup>.

However, despite media reports of expansion plans by companies such as SMIC, Nexchip, and CXMT, most of the new capacity will be put into operation by second-tier Chinese companies. Much of the new capacity will be focused on older technologies, such as 28 nanometers and above. While such manufacturing is not at the forefront of innovation, the products are used in a wide range of products, from home appliances to cars. So demand for them will remain high. The expected growth of semiconductor manufacturing using older processes is raising concerns about the potential for

<sup>24</sup> "Deloitte. Tax Newsflash, China imposes export controls on gallium and germanium related Items", 2023, <https://www2.deloitte.com/cn/en/pages/tax/articles/china-export-controls-on-gallium-and-germanium-related-items.html>, [L. s. 05.08.24].

<sup>25</sup> Kleinhans J., P., Goujon R., Hess J., and Dudley L., Running on Ice: "China's Chipmakers in a Post-October 7 World", Rhodium Group, 2023, <https://rhg.com/research/running-on-ice/>, [L. s. 05.08.24].

<sup>26</sup> News: "China's Chip Production Capacity Reportedly Set to Grow 60% in 3 Years, Doubling in 5 Years", 24.01.15, <https://www.trendforce.com/news/2024/01/15/news-chinas-chip-production-capacity-reportedly-set-to-grow-60-in-3-years-doubling-in-5-years/>, [L. s. 05.08.24].

oversupply in the market. According to analysts at Barclays, this could become a serious problem for existing chipmakers, but not until 2026, when new factories come and prove that they can produce high-quality chips.

At present, China continues to use imported lithography machines to create semiconductors using modern technological processes. Chinese companies are intensifying their efforts to attract foreign specialists. Most of the effort will primarily focus on the emigrating ethnic Chinese electronics specialists from the United States and European countries. The Chinese government, according to the representatives of the country's Ministry of Trade, is ready to further tighten the control over the export of rare earth metals - graphite and other raw materials necessary for the production of semiconductors and other high-tech products<sup>27</sup>.

#### **4. Taiwan as the main source of tension between the US and China and the threat of escalation the confrontation into a global conflict**

It should be noted here that TSMC is not the only reason why the island is so important for China. As mentioned above, it plays an important role in its security, therefore, it wants to return to the island of Taiwan under the principle of "one country - two systems", which would ensure Taiwan's self-government and broad autonomy<sup>28</sup>. Significantly, China did the same with Hong Kong earlier, but such development of events is certainly not in the interests of the United States, where China is considered the main competitor on the world stage. Therefore, they do not want to strengthen China by including Taiwan, which has a developed economy and a leading position in the world microchip market. Moreover, it is ideologically disadvantageous for the United States. Taiwan is under its protection and is an example of an alternative development path for China. Therefore, Washington has imposed a veiled ban on any talks on reunification between Taiwan and China. Taiwan is of great economic importance to the United States<sup>29</sup>. That is why Washington has already promised him that it will not abandon the Taiwanese. After all, without Taipei's chips, America will return to the eighties of the last century. That is why the US has put the issue of arming the island on the agenda at a new level. The US House of Representatives is going to introduce a bill on arms supplies to Taiwan. And the Republicans are planning to grant the president the authority to supply weapons and equipment to Taiwan under the Lend-Lease program<sup>30</sup>. According to preliminary information disseminated by the media, both sides support the initiative.

According to experts in this field, a direct clash between China and the United States in the fight for Taiwan threatens to escalate into a global military conflict, as Beijing considers the island as its own separatist territory. The talks between the United States and China ended with the latter warning: "He who plays with fire will certainly get burned," said Xi Jinping<sup>31</sup>. Before that, the media discussed several scenarios for China's military action - from the occupation of Taiwan's remote islands to a blockade - closed skies or an all-out attack<sup>32</sup>. In addition, the Chinese government has repeatedly stated that the visits of American politicians and officials to the island will undermine the "One China" policy, and such moves would be considered a violation of Beijing's sovereignty. Chinese journalists do not hesitate to suggest preparations for war. Japan's Ministry of Defense speculated that China could launch a military landing operation in Taiwan amid the massive use of multiple-launch missile systems in the Taiwan Strait, as the use of such systems was part of the Chinese People's Liberation Army's extraordinary military exercises near Taiwan's approaches.

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<sup>27</sup> Umbach, F., "The Escalating Chip War Between China and the West", 2024, <https://bitly.cx/ImzGn>, [L. s. 05.08.24].

<sup>28</sup> Malinowski, H., "Why Can't We Be Friends: The Significance of Sovereignty and China's "One Country, Two Systems"", New York, 2020, Pdf.

<sup>29</sup> Yang, P., "Doubly Dualistic Dilemma: US strategies towards China and Taiwan", Published By: Oxford University Press, 2006, pp 209-225.

<sup>30</sup> Abramson, J., "Arms Control Today, U.S. Offering More Arms To Taiwan", 2022, <https://bitly.cx/qB3Xza>, [L. s. 05.08.24].

<sup>31</sup> "Xi warns Biden against 'playing with fire' over Taiwan, Two hour call between the two leaders comes amid escalating tensions over a potential Taiwan visit by US House Speaker Nancy Pelosi", News/Politics, Al Jazeera and news agencies, <https://bitly.cx/ZUmM> [L. s. 05.08.24].

<sup>32</sup> See Footnote 35.

“If mainland China somehow gains control of Taiwan's factories, it would likely gain power over the global economy. So, the United States and its allies will never allow these factories to fall into the hands“of the Chinese,” said former Trump national security adviser Robert O'Brien in 2023<sup>33</sup>. This means that if the Communists land on the island and take control of it, the United States is prepared to destroy the most high-tech manufacturing on Earth to prevent it from falling into Chinese hands. A similar statement was made by Democratic Party congressman Moulton: “We must make it clear to China that if you invade Taiwan, we will blow up TCMS.”<sup>34</sup>

According to Bloomberg agency, if China launches a military operation in Taiwan, the US plans to pull engineers out of chip factories<sup>35</sup> and has probably even conducted such exercises. Taiwan denies all this. Even if Beijing were to seize the factories unscathed, production would grind to a halt because suppliers would stop offloading materials and there would be no replacements. In any case, the military campaign to chip in Taiwan is turning into a campaign against chipping, and no one will get the spoils.

## Conclusion

So, to sum it up, microchips are a key component of the world economy, which is currently produced in Taiwan, and if China starts a war for Taiwan, it will most likely destroy the factories, and the sooner this process starts, the stronger the blow to the global economy will be, as without semiconductors All will remain. Yes, the world has already understood and realized that it was a huge mistake to give this insignificant production to only one island. Does all this mean that there will be no war for Taiwan? Of course not. China has other reasons for stationing troops on the island. The situation is like a powder keg that no one knows when it will explode.

We want to believe that all the countries involved will still be able to come to an agreement with each other, which will ultimately avoid a new military conflict and innocent victims.

And Taiwan, with its unique identity, has long deserved universal recognition of its independence status. And China and the United States will probably have to reconsider their demands. What will actually happen, the future will show.

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<sup>33</sup> Clemons, S., “The U.S. would destroy Taiwan’s chip plants if China invades, says former Trump official”, SEMAFOR, 2023, <https://bitly.cx/LOG2>, [L. s. 05.08.24].

<sup>34</sup> McKinney, J.M., “TSMC's fate will indeed be at stake if China attacks Taiwan”, 2023, <https://bitly.cx/gXnjA>, [L. s.05.08.24].

<sup>35</sup> “US Threatens to Shut Down TSMC’s EUV if China Reunifies with Taiwan by Force”, The China Academy, 2024, <https://bitly.cx/glaSZ>, [L.s. 05.08.24].

## Bibliography

1. Abramson, Jeff. Arms Control Today, U.S. Offering More Arms To Taiwan, 2022, <https://bitly.cx/qB3Xza>, [Last seen 05.08.24];
2. Article: “All about chip giant TSMC that crossed \$1 trillion market cap”, The Economic Times, News, 07.2024, [rb.gy/ca1nbz](https://bitly.cx/ca1nbz) [Last seen 05.08.24];
3. Article: China's imports of Dutch chip-making equipment surged tenfold in November after Washington tightened restrictions, South China Morning Post, 2023; <https://bitly.cx/mlBFJZ>, [Last seen 05.08.24];
4. Article: Xi warns Biden against ‘playing with fire’ over Taiwan, Two hour call between the two leaders comes amid escalating tensions over a potential Taiwan visit by US House Speaker Nancy Pelosi, 2022, News/Politics, Al Jazeera and news agencies, <https://bitly.cx/ZUmM>, [Last seen 05.08.24];
5. ASML Annual Report 2022, Small Patterns. Big Impact, <https://bitly.cx/R8ALfo.pdf> [Last seen 05.08.24];
6. lemons, Steve. The U.S. would destroy Taiwan’s chip plants if China invades, says former Trump official, SEMAFOR, 2023, <https://bitly.cx/LOG2>, [Last seen 05.08.24];
7. Duffy, Clare. Trump said he’d ease up on Huawei. Questions remain about what that means, 2019, <https://bitly.cx/CLpNS>, [Last seen 05.08.24];
8. Deloitte. Tax Newsflash, China imposes export controls on gallium and germanium related Items, 2023, <https://bitly.cx/zhXol>, [Last seen 05.08.24];
9. Gabriele, Mario. TSMC: Semiconductors and Borders of Light, 2022, <https://www.generalist.com/briefing/tsmc>, [Last seen 05.08.24];
10. Gil, Dario. Jaione Tirapu-Azpiroz, Ryan Deschner, Timothy Brunner, Carlos Fonseca, Jennifer Fullam, Dan Corliss, K. Auschnitt, Peter Vanoppen. Characterization of imaging performance for immersion lithography at NA=0.93, 2006;
11. Kleinhans, Jan-Peter, Goujon, Reva, Hess, Julia, and Dudley, Lauren, Running on Ice: China’s Chipmakers in a Post-October 7 World, Rhodium Group, 2024, <https://bitly.cx/92MC>, [Last seen 05.08.24];
12. Kinery, Emma. TSMC to up Arizona investment to \$40 billion with second semiconductor chip plant, 2022, <https://bitly.cx/XWvRCg>, [Last seen 05.08.24];
13. Li, Deng. Huawei launches Kirin 9010 chipset with optimized performance, 2024, <https://bitly.cx/E7TLQo> [Last seen 05.08.24];
14. Malinowski, Harry. Why Can’t We Be Friends: The Significance of Sovereignty and China’s “One Country, Two Systems”, New York, 2023, Pdf;
15. Morris, Iain. US still makes billions in China chip sales, and it's all at risk, 2024, <https://bitly.cx/hNDe2>, [Last seen 05.08.24];
16. McKinney, Jared M. TSMC's fate will indeed be at stake if China attacks Taiwan, 2023, <https://bitly.cx/gXnjA>, [Last seen 05.08.24];
17. News: China’s Chip Production Capacity Reportedly Set to Grow 60% in 3 Years, Doubling in 5 Years. 24.01.15 <https://bitly.cx/Pn7IKa/>, [Last seen 05.08.24];
18. Nardelli, Alberto. Baschuk, Bryce. and Champion, Marc. Putin Stirs Worry that Russia is Stripping Home-Appliance Imports For Arms, Bloomberg, 2022, <https://bitly.cx/o8tyZ>, [Last seen 05.08.24];
19. Rajagopalan, Rajeswari, Pillai. AI Chips for China Face Additional US Restrictions, 2024, <https://bitly.cx/JoGgNX>, [Last seen 05.08.24];
20. Sheng. Wei. China spends more importing semiconductors than oil, The Numbers, 2021, <https://bitly.cx/T6nM/>, [Last seen 05.08.24];
21. Stone, Alex. and Wood, Peter “China’s Military-Civil Fusion Strategy: A view from Chinese strategists,” (Montgomery AL, China Aerospace Studies Institute, n.d.), 2020;
22. Spencer, Kimball. Trump says he doesn’t want to do business with Huawei due to national security concerns, 2019, <https://bitly.cx/oG1DR>, [Last seen 05.08.24];
23. Thorbecke, Catherine. The US is spending billions to boost chip manufacturing. Will it be enough? 2022, <https://bitly.cx/q6xCGe>, [Last seen 05.08.24];

24. Toh, Michelle. TSMC says its \$40 billion chip project in Arizona faces a further delay, 2024, <https://bitly.cx/9UenE>, [Last seen 05.08.24];
25. Trend Force [News] Surge in Chip Manufacturing Equipment Imports from the Netherlands to China, Soaring Tenfold After U.S. Tightens Restrictions, 2023, <https://bitly.cx/st7UQ/>, [Last seen 05.08.24];
26. Tagler, Eric. Is Russia Really Buying Home Appliances To Harvest Computer Chips For Ukraine-Bound Weapons Systems? 2023 [rb.gy/14mijm](https://rb.gy/14mijm), [Last seen 05.08.24];
27. The China Academy. US Threatens to Shut Down TSMC's EUV if China Reunifies with Taiwan by Force, 2024, <https://bitly.cx/glaSZ/>, [Last seen 05.08.24];
28. Taiwan and The Global Semiconductor Supply Chain: 2023 In Review, Bumper Issue, April/May 2024, Edited by Chen-Tung, Ph.D. Representative, Taipei Representative Office in Singapore, pdf;
29. Umbach, Frank. The Escalating Chip war Between China and the West, 2024, <https://www.gisreportsonline.com/r/escalating-chip-war/>, [Last seen 05.08.24];
30. U.S.-China Economic and Security Review Commission, 2019 Annual Report to Congress (Washington DC, US Government Publishing Office, 2019) Chapter 3 Section 2 "Emerging Technologies and Military Civil Fusion—Artificial Intelligence, New Materials and New Energy";
31. Yang, Philip. Doubly Dualistic Dilemma: US strategies towards China and Taiwan, Published By: Oxford University Press, 2006.