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GEOPOLITICAL DYNAMICS AND THE MICROCHIP VALUE

Navigating the United States-China rivalry

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Abstract

This article examines the deepening strategic rivalry between the United States (US) and China through the lens of international political economy (IPE) and geoeconomics, focusing on the semiconductor sector as a critical arena of technological and geopolitical competition. By integrating insights from structural power, weaponized interdependence, and global value chain (GVC) governance, the study analyzes how the transition from the 2018 trade war to a comprehensive technology war reconfigured state strategies, supply-chain dependencies, and patterns of industrial policy. Special attention is given to Taiwan, whose dominance in advanced microchip fabrication simultaneously enhances its strategic value and exposes systemic vulnerabilities in the global semiconductor ecosystem. The article combines policy analysis, trade data, and regulatory measures to assess how export controls, subsidies, and alliance-building have reshaped the competitive landscape. A Strengths, Weaknesses, Opportunities and Threats (SWOT) and Threats, Opportunities, Weaknesses, and Strengths (TOWS) frameworks are applied to evaluate the industry under conditions of heightened geopolitical tension. The findings show that despite efforts at decoupling, the US and China remain bound by dense technological and production interdependencies, reinforcing strategic dilemmas for governments and firms. The article concludes with a set of policy recommendations aimed at improving resilience, promoting constructive engagement, and reducing systemic risks within the semiconductor supply chain.

Keywords

China; United States; Taiwan; microchips; technology competition; global value chains.

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DINÁMICAS GEOPOLÍTICAS Y LA CADENA DE VALOR DE LOS MICROCHIPS

Navegando la rivalidad entre Estados Unidos y China

Resumen

Este artículo examina la creciente rivalidad estratégica entre Estados Unidos (EE.UU.) y China desde la perspectiva de la economía política internacional (EPI) y la geoeconomía, con un enfoque en el sector de semiconductores como un ámbito crítico de competencia tecnológica y geopolítica. Al integrar aportes sobre poder estructural, interdependencia armada y gobernanza de las cadenas globales de valor (CGV), el estudio analiza cómo la transición desde la guerra comercial de 2018 hacia una guerra tecnológica integral reconfiguró las estrategias estatales, las dependencias de las cadenas de suministro y los patrones de política industrial. Se presta especial atención a Taiwán, cuya dominancia en la fabricación de microchips incrementa su valor estratégico a la vez que expone vulnerabilidades sistémicas dentro del ecosistema global de semiconductores. El artículo combina análisis de políticas, datos comerciales y medidas regulatorias para evaluar cómo los controles a la exportación, los subsidios y la construcción de alianzas han redefinido el panorama competitivo. Se realizan análisis de Fortalezas, Oportunidades, Debilidades y Amenazas (FODA y matriz TOWS) para evaluar la industria bajo condiciones de tensión geopolítica creciente. Los hallazgos muestran que, a pesar de los esfuerzos de desacoplamiento, EE.UU. y China permanecen vinculados por densas interdependencias tecnológicas y productivas, reforzando dilemas estratégicos tanto para los gobiernos como para las empresas. El artículo concluye con un conjunto de recomendaciones de política orientadas a mejorar la resiliencia, promover un compromiso constructivo y reducir los riesgos sistémicos dentro de la cadena de suministro de semiconductores.

Palabras Clave

China; Estados Unidos; Taiwán; microchips; competencia tecnológica; cadenas globales de valor.

DINÂMICAS GEOPOLÍTICAS E A CADEIA DE VALOR DOS MICROCHIPS

Navegando a rivalidade entre Estados Unidos e China

Resumo

Este artigo examina a intensificação da rivalidade estratégica entre os Estados Unidos (EUA) e a China a partir da perspectiva da economia política internacional (EPI) e da geoeconomia, com foco no setor de semicondutores como um campo crítico de competição tecnológica e geopolítica. Integrando contribuições sobre poder estrutural, interdependência armada e governança das cadeias globais de valor (CGV), o estudo analisa como a transição da guerra comercial de 2018 para uma guerra tecnológica abrangente reconfigurou as estratégias estatais, as dependências das cadeias de suprimentos e os padrões de política industrial. Atenção especial é dada a Taiwan, cuja dominância na fabricação avançada de microchips aumenta simultaneamente seu valor estratégico e expõe vulnerabilidades sistêmicas no ecossistema global de semicondutores. O artigo combina análise de políticas, dados de comércio e medidas regulatórias para avaliar como controles de exportação, subsídios e a construção de alianças remodelaram o panorama competitivo. Os frameworks de Forças, Oportunidades, Fraquezas e Ameaças (análise SWOT e matriz TOWS) para avaliar a indústria em condições de crescente tensão geopolítica. Os resultados mostram que, apesar dos esforços de desacoplamento, EUA e China permanecem interligados por densas interdependências tecnológicas e produtivas, reforçando dilemas estratégicos para governos e empresas. O artigo conclui com um conjunto de recomendações de políticas voltadas para fortalecer a resiliência, promover um engajamento construtivo e reduzir riscos sistêmicos na cadeia de suprimentos de semicondutores.

Palavras-chave

China; Estados Unidos; Taiwan; microchips; competição tecnológica; cadeias globais de valor.

INTRODUCTION

China's rise as an economic and technological power has reshaped the global balance of power and redefined the architecture of international competition. Since joining the World Trade Organization (WTO) in 2001, the country has steadily expanded its share in global trade, particularly in strategic sectors such as advanced technology. This evolution has intensified its competition with the US, giving rise to a multifaceted confrontation (commercial, technological, geopolitical, and institutional).

Within this context, the so-called trade war launched in 2018 under the Trump administration marked a turning point. A succession of tariffs, countermeasures, and restrictions on investment and technology transfer reflected a break with the cooperative engagement that had characterized bilateral relations in previous decades. Under President Biden, this approach has evolved into a broader structural rivalry, combining protectionism, strategic subsidies, and selective alliances with regional partners.

A critical but often underexplored component of this rivalry is the semiconductor sector, where GVCs hinge on hyper-specialized production networks and geographically concentrated bottlenecks. Taiwan plays a uniquely important role in this landscape. As the world's leading producer of advanced microchips and a politically contested territory, it embodies both the technological interdependencies and the geopolitical frictions that define contemporary US-China relations.

Grounded in IPE and geoeconomic theory, this article analyzes how structural power, weaponized interdependence, and GVC governance shape state strategies in the microchip sector. The analysis also clarifies the conceptual relevance of SWOT and TOWS frameworks for assessing strategic vulnerabilities and formulating responses under conditions of geopolitical tension. Crucially, the policy recommendations are formulated from the standpoint of states and international organizations seeking to mitigate systemic risks and enhance supply-chain resilience, rather than from the perspective of private firms. The analysis does not advocate for a particular national position but aims to identify structural dynamics relevant for policymakers, firms, and scholars.

The structure of the article is as follows. The next section outlines the theoretical framework. Section 3 synthesizes the shift from trade war to technology war. Section 4 discusses Taiwan's strategic centrality. Section 5 presents the SWOT and TOWS analyses. Section 6 offers policy recommendations, and Section 7 concludes with broader implications for global geopolitical and technological order.

INTERNATIONAL POLITICAL ECONOMY, GEOECONOMICS, AND TECHNOLOGICAL POWER

The technological rivalry between the US and China has increasingly been interpreted through the lenses of IPE, particularly the strands that examine the intersection of geoeconomics, interdependence, and security. From a structural perspective, technology (especially cutting-edge technologies such as advanced semiconductors) functions as a form of structural power in the sense defined by Strange (2015): the capacity to shape the frameworks within which other states operate. Control over technological standards, intellectual property, and supply chains, provides states not only economic advantage but also strategic leverage, shaping global outcomes well beyond the commercial domain (Ding, 2024; Farrell & Newman, 2019; Wu, 2020).

The US–China competition is frequently conceptualized as a form of geoeconomic rivalry, where economic instruments (trade restrictions, export controls, subsidies, and investment screening) are deployed for geopolitical purposes (Blackwill & Harris, 2016). Contemporary IPE literature argued that the international system has shifted from “benign interdependence” to weaponized interdependence, in which states strategically manipulate chokepoints in global networks to extract concessions or constrain rivals (Farrell & Newman, 2019). Advanced semiconductors exemplify such chokepoints: although production is globally fragmented, a handful of firms (TSMC, ASML, and a small set of US design companies) control irreplaceable technologies.

For realists and neo-realists, this dynamic has represented a classic case of security competition under anarchy, where relative gains, technological supremacy, and national survival guide state behavior (Mearsheimer, 2003). Liberals, meanwhile, emphasize institutional constraints, cross-border interdependence, and the role of multinational firms in buffering conflict (Keohane & Nye, 1973). Constructivist approaches also highlight the ideological framing of technology, where innovation ecosystems, national identity, and strategic narratives shape state preferences (Katzenstein, 1996). Together, these perspectives underscore that technological competition is not simply a market struggle but a contest over national power, autonomy, and global order.

A second pillar of the theoretical framework concerns GVC governance and the politics of critical dependencies. The semiconductor supply chain is the paradigmatic example of a hyper-specialized GVC, where design, equipment, fabrication, and packaging are distributed across multiple jurisdictions (Baldwin, 2016). While specialization enhances efficiency, it also generates hierarchies of vulnerability, particularly when a single firm or territory occupies a systemic bottleneck.

The case of Taiwan illustrates this asymmetry. TSMC’s dominance in advanced fabrication creates both strategic deterrence and systemic risk, a phenomenon described in the

literature as “silicon shield” politics (Hörster, 2025; Weil, et al., 2025). The US seeks to mitigate these vulnerabilities by reshoring production, diversifying suppliers, and restricting China’s access to high-end chips and manufacturing equipment (Bu, 2024; Jia, et al., 2025; Yoon, 2023). Meanwhile, China’s industrial policy emphasizes technological self-reliance, guided by the logic of escaping structural dependence on foreign technology (Tan, et al., 2025; Yilmaz, 2025). These strategies reflect the broader political economy of industrial upgrading, state capacity, and strategic autonomy.

FROM TRADE WAR TO TECHNOLOGY WAR: THE STRATEGIC RECONFIGURATION OF US-CHINA ECONOMIC STATECRAFT

The evolution of US–China economic conflict since 2018 illustrates a structural shift from commercial protectionism toward a technologically driven form of strategic competition. Rather than representing two separate phases, the trade war initiated under the Trump administration and the subsequent technology war intensified under Biden constitute a continuous process shaped by neo-mercantilist logics and the breakdown of complex interdependence. This section synthesizes these developments by emphasizing the strategic patterns that underpin policy choices, rather than reproducing a detailed chronology.

THE TRADE WAR AS THE BREAKDOWN OF COMMERCIAL INTERDEPENDENCE

Since China's accession to the WTO in 2001, this country has become a major player in global trade, increasing from 6.5% in 2004 to 17.6% in 2023 in the case of goods exports, and from 6.0% to 13.1% in goods imports (Trade Map, 2024).

As China transitioned to a new development model, no longer solely reliant on attracting investments and exports based on its relative labour advantages, but also focusing on producing cutting-edge technology through local companies, expanding domestic consumption, services, and accelerating investments in other countries, relations with the US shifted from cooperation to confrontation, a trend that has deepened (Ortiz Velásquez, 2017).

The 2018–2019 tariff confrontation marked the first major rupture in the bilateral economic relationship. Although initially presented as a response to trade imbalances and intellectual-property violations, these measures reflected a broader reassessment of China’s rise and of the vulnerabilities associated with asymmetric interdependence. The first action taken by the US involved increasing tariffs on imports of washing machines and solar panels. This move negatively affected China, as it was one of the major suppliers (US Trade Representative, 2018). In March 2018, tariffs were announced on steel and aluminium at 25% and 10%, respectively, which also particularly affected China (Li, 2018).

Under a neo-mercantilist lens, tariffs functioned not only as commercial instruments but also as tools to constrain China's technological catching-up process. The erosion of confidence in the liberal trade order, combined with bipartisan concern over supply-chain dependence, laid the groundwork for a more systemic rivalry.

China's retaliatory actions swiftly followed suit. In April 2018, China imposed tariffs of up to 25% on the import of 128 American products, which were later expanded to include another 106 products. Both governments continued to release lists of products for which tariffs would be raised. Additionally, China filed complaints against the US with the WTO (in August 2018), alleging that US safeguard measures on solar panels and renewable energy were inconsistent with certain GATT articles (WTO, 2018).

Yet, the trade war alone did not substantially alter the technological foundations of interdependence. Despite the imposition of hundreds of billions of dollars in tariffs, Chinese access to advanced US technology, software, and manufacturing equipment remained relatively intact. This strategic misalignment contributed to the emergence of a more targeted approach that sought to limit China's ability to upgrade its innovation ecosystem.

THE TECHNOLOGY WAR AS STRATEGIC INDUSTRIAL POLICY

Beginning in 2019 and accelerating under President Biden, the US shifted from broad commercial confrontation to a granular set of export controls, investment restrictions, industrial subsidies, and alliances intended to weaken China's capacity to develop cutting-edge technologies (most notably semiconductors, artificial intelligence, and advanced computing). Semiconductor technology serves as the backbone of modern electronics and is vital for advancements in numerous fields, from consumer electronics to military applications. This point is central in the dispute for global leadership, since although the US remains the major military player worldwide, China has demonstrated remarkable technological advances in this sector (Liang, et al., 2024). This shift reflects what Farrell & Newman (2019) described as "weaponized interdependence," whereby states leverage their central position in global networks to impose structural constraints on rivals.

The placement of Chinese firms such as Huawei and Semiconductor Manufacturing International Corporation (SMIC) on the Entity List, the tightening of licensing requirements for US-origin semiconductor equipment, and the restrictions introduced in the October 7, 2022 export-control package exemplify this transformation (Library of Congress 2017; Public Law 115-91, section 1,656; White House, 2019). These measures progressively targeted China's entire semiconductor supply chain (from fabrication and lithography to Electronic Design Automation, EDA, software and high-end Graphics Processing Unit, GPU, access) effectively forming an integrated regime of technological containment. Unlike tariffs, these controls directly impede China's indigenous innovation capacity. Moreover, these accusations also had an impact on other countries that followed Trump's recommendations and investigated the company (Woo & O'Keeffe, 2018). For example, British Telecom blocked

Huawei devices from its 3G and /4G infrastructure and limited their use for 5G (De Castañeda, 2018).

Simultaneously, the CHIPS and Science Act institutionalized a new industrial policy paradigm geared toward reshoring manufacturing, subsidizing domestic capabilities, and limiting outbound investment in Chinese high-tech sectors (White House, 2022). This law involves investments of \$280 billion allocated to research and development and construction of microchip manufacturing companies (Library of Congress, 2022a). Industrial policy, once considered incompatible with US economic ideology, has become a central pillar of strategic competition.

Herman (2022) highlights that while this law is part of US industrial policy; it is linked to competition with China in the military realm given the importance of microchips not only for the digital economy, development of artificial intelligence, robotics, or autonomous vehicles but also as a basic component of the defense system.

CONTINUITY ACROSS ADMINISTRATIONS AND IMPLICATIONS FOR THE SEMICONDUCTOR GEOPOLITICAL LANDSCAPE

While the tone of US policy changed from Trump's unilateral, tariff-centric approach to Biden's alliance-based and institutionally coordinated strategy, the underlying logic remained consistent: safeguarding technological dominance as a matter of national security. Far from reversing Trump-era measures, the Biden administration expanded and formalized them through multilateral coordination with Japan, the Netherlands, South Korea, and Taiwan (key nodes in the semiconductor ecosystem). This continuity underscores that the conflict transcends partisan politics and reflects a deeper reorientation of US grand strategy.

The convergence of trade and technology restrictions reshapes the global semiconductor industry by fragmenting supply chains and reinforcing geopolitical blocs. Taiwan's pivotal role, through TSMC's dominance in leading-edge fabrication, becomes even more strategically sensitive. The US increasingly views semiconductor resilience as inseparable from national security, while China accelerates efforts to substitute imported technologies despite persistent structural bottlenecks.

By synthesizing both phases of the conflict, this section highlights a broader analytical trajectory: the transformation of interdependence from a stabilizing force to a contested arena of strategic statecraft. The U.S.–China rivalry in semiconductors is therefore not merely a commercial dispute but a struggle over the architecture of the twenty-first century technological order.

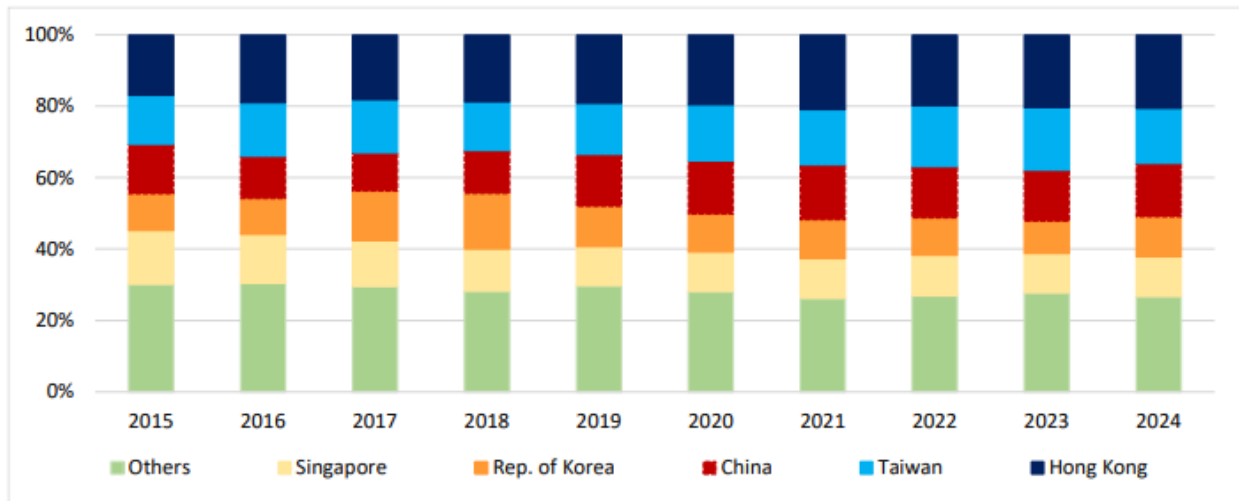
TAIWAN AS A MICROCHIP PROVIDER

Although the primary focus of this study is the strategic competition between the US and China, the geopolitical dimension of Taiwan warrants explicit attention. Taiwan is not only the world’s most critical producer of advanced semiconductors (particularly through TSMC) but also a politically contested territory whose status lies at the core of Sino-American rivalry. While China considers Taiwan a renegade province destined for eventual reunification, the US maintains an ambiguous strategic policy, recognizing the People’s Republic of China diplomatically but preserving unofficial relations with Taipei through the Taiwan Relations Act.

This framework effectively positions Taiwan as a de facto partner of the US in the broader technological and security contest, even without formal diplomatic recognition. As a result, Taiwan plays a dual role: it is simultaneously the indispensable hub of global microchip manufacturing and a geopolitical flashpoint, where questions of sovereignty, defense commitments, and control over critical technologies intersect. Ignoring this dimension would overlook how semiconductor supply chains, territorial disputes, and alliance structures mutually reinforce the centrality of Taiwan in the unfolding US-China technological confrontation.

Figure 1:

Main global suppliers of microchips (Harmonized System, HS, Heading Code 8542) in the last decade



Source:

Own elaboration based on Trade Map (2024)

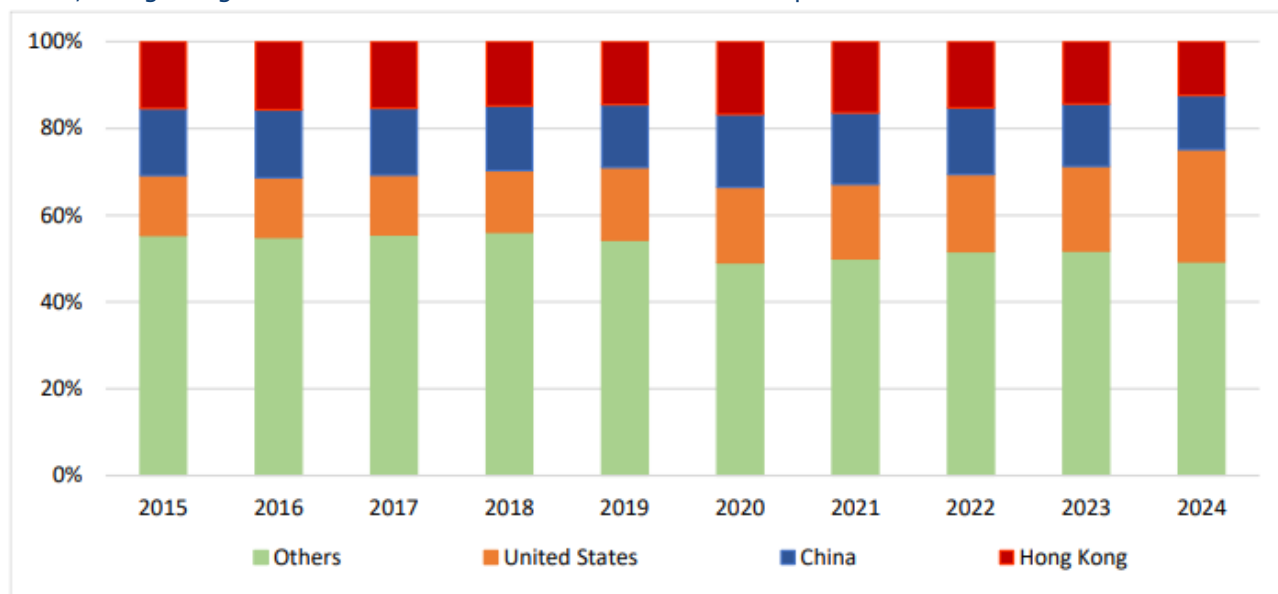
Figure 1 shows that Taiwan is one of the leading global producers and exporters of this essential product in the value chains of high-tech sectors such as the automotive industry, aerospace, data processing machines, telecommunications, video game consoles, among others. It is worth noting that China is also among the major exporters of this product (ranking third in 2024) and the US ranked seventh in 2024, further deepening tensions

between the two powers in the face of a potential conflict in Taiwan will affect the global supply of these products.

Moreover, the major powers currently exhibit significant dependence on the supply of certain strategic products, such as microchips (Figure 2). For instance, in the US, in August 2022, a law supporting the production of this commodity was passed. The Chips and Science Act provides funding to drive research and manufacturing of semiconductors. It entails subsidies and tax incentives to encourage increased production and attract new investments in this sector (White House, 2022). This development could be interpreted as an effort to reduce the dependency that the US has on both China and Taiwan, although given the current scenario, this would be a medium to long-term objective.

Figure 2:

China, Hong Kong and the US as destinations for Taiwan’s exports



Source:

Own elaboration based on Trade Map (2024)

Furthermore, at the international level, the US is promoting the so-called Chip 4 Alliance, aiming to establish a mega network of microchip producers with Taiwan, South Korea, and Japan, while excluding China.

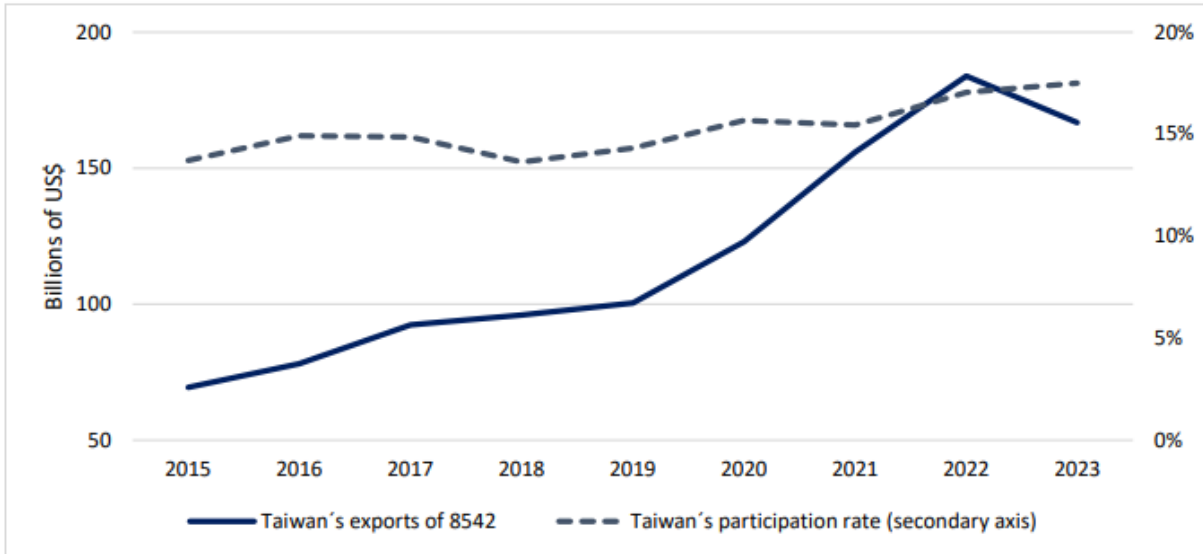
On the other hand, the US, China and Hong Kong are the primary destinations for Taiwan's total goods exports, accounting for 23.5%, 20,4% and 11,3% in 2024, respectively.

Considering only integrated circuits and electronic microstructures and their parts (HS heading code 8542), Taiwan exported US\$ 164,90 million in 2024 (Figure 3). It represented 15.4% of global exports of this product in 2024 and it increased by 10.1% in the period 2015-2024.

Given the debate generated regarding the logistical implications that a conflict between the US and China over Taiwan could bring, it is relevant to consider the destinations of Taiwan's exports, where once again a significant concentration in China and Hong Kong is observed (Figure 4). In 2024, only these two destinations accounted for 54.3% of Taiwanese sales of integrated circuits and electronic microstructures and their parts. In seventh place is the US, with a share of 2.1%.

Figure 3:

Taiwan's exports of integrated circuits and electronic microstructures

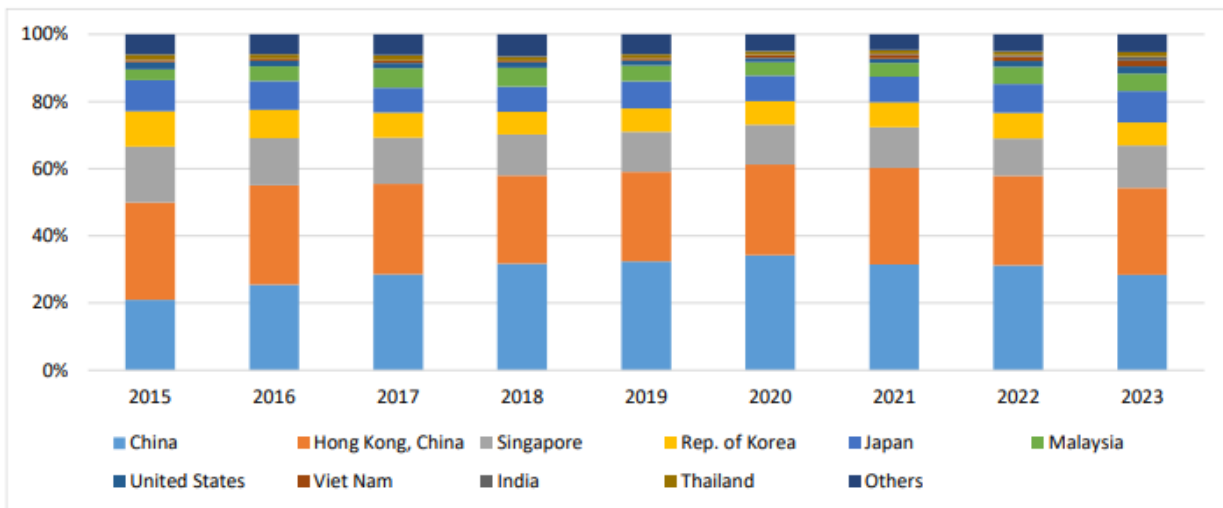


Source:

Own elaboration based on Trade Map (2024)

Figure 4:

Taiwan's exports of integrated circuits and electronic microstructures: main destinations



Source:

Own elaboration based on Trade Map (2024)

Therefore, trade dependencies do not adjust at the same pace as geopolitical tensions; the case of the war in Ukraine over gas and the supply of cereals and other foodstuffs is also evidence of this. Having the capacity to not rely on supplies from a historical supplier entails adjustments that require a significant period and present structural difficulties such as labour availability, access to inputs and technology, as well as an increase in production costs that are later passed on to the selling price and could result in welfare losses.

SWOT AND TOWS IN GEOPOLITICAL ANALYSIS: THE CASE OF THE MICROCHIP INDUSTRY

Although SWOT and TOWS analyses originate in the field of strategic management, their adaptation to international political economy is both conceptually coherent and analytically productive when examining technologically contested industries. In the context of geoeconomic rivalry, states and firms face evolving combinations of internal capabilities and external constraints (precisely the type of environment for which these diagnostic frameworks were designed). Building on IPE approaches that conceptualize technological sectors as arenas of strategic interaction shaped by industrial capacity, institutional embeddedness, and exposure to geopolitical pressures, SWOT provides a structured way to evaluate how domestic assets and vulnerabilities condition national strategies (Strange, 2015; Farrell & Newman, 2019).

Applied to the semiconductor sector, SWOT allows the identification of strengths such as innovation ecosystems, research infrastructure, or privileged access to high-end supply chains, as well as weaknesses like fabrication gaps or dependence on foreign intellectual property. Meanwhile, opportunities and threats capture exogenous factors central to IPE and geoeconomic scholarship (including export control regimes, alliance dynamics, and technological chokepoints). By systematically mapping these dimensions, SWOT helps translate the abstract principles of structural power and strategic interdependence into an operational analytical matrix.

The subsequent use of TOWS deepens this analysis by moving from diagnosis to strategy formulation. TOWS explicitly connects internal attributes with exogenous geopolitical dynamics, revealing the strategic pathways available to states seeking to enhance technological autonomy or mitigate exposure to coercive dependencies. This logic is consistent with the growing literature on state industrial upgrading, techno-nationalism, and geoeconomic statecraft, which emphasizes how governments craft adaptive strategies under conditions of uncertainty (Baldwin, 2016; Bu, 2024; Jia, et al., 2025; Yılmaz, 2025; Yoon, 2023). In this sense, TOWS serves not as a managerial tool transplanted into geopolitics, but as a complementary heuristic that helps articulate theoretically grounded interpretations of state behavior in competitive technological environments.

SWOT ANALYSIS OF THE MICROCHIP INDUSTRY

SWOT analysis is a strategic planning tool used to identify and evaluate Strengths, Weaknesses, Opportunities, and Threats related to a particular industry or organization. By systematically examining these four dimensions, stakeholders can gain a comprehensive understanding of the internal and external factors that influence performance and competitiveness. This analytical framework not only aids in decision-making but also facilitates the development of strategies that leverage strengths and opportunities while addressing weaknesses and mitigating threats.

By applying a SWOT analysis (Table 1), stakeholders can identify Taiwan’s pivotal role as a microchip provider, recognize the implications of supply chain vulnerabilities, and explore potential growth avenues in emerging technologies such as artificial intelligence and 5G. Furthermore, this analysis can inform strategic decisions that enhance resilience in the face of external challenges, ensuring the industry’s continued relevance and sustainability. Overall, a SWOT analysis provides a structured approach to navigating the complexities of the microchip industry, enabling informed decision-making and strategic planning.

Table 1:
SWOT analysis of the global semiconductor industry

Strengths	Weaknesses
<ol style="list-style-type: none"> 1. Technological leadership concentrated in a highly specialized hub. 2. Continuous innovation. 3. Strategic partnerships and production interdependence. 4. Global demand. 5. Government support. 	<ol style="list-style-type: none"> 1. Systemic dependence on a single geographical hub. Dependence on Taiwan. 2. High production costs. 3. Exposure to segment-specific market volatility. 4. Shortage of skilled labor. 5. Regulatory challenges.
Opportunities	Threats
<ol style="list-style-type: none"> 1. Supply chain diversification. 2. Investment initiatives. 3. Emerging technology growth. 4. Government support. 5. Global market expansion. 	<ol style="list-style-type: none"> 1. Geopolitical tensions. 2. Cybersecurity risks. 3. Global competition. 4. Regulations and sanctions. 5. Supply chain disruptions.

Source:
Own elaboration

Strengths

- Technological leadership concentrated in a highly specialized hub: leadership in cutting-edge fabrication is anchored in Taiwan (particularly through TSMC) which enables the global semiconductor industry to achieve unparalleled levels of efficiency

and technological advancement. At the industry level, this concentration is a strength because it allows for rapid innovation and scale.

- Continuous innovation: the semiconductor industry is in a state of constant technological evolution, allowing for advancements in efficiency and capacity.
- Strategic partnerships and production interdependence: the semiconductor industry benefits from strong research and supply-chain collaborations among the United States, Japan, South Korea, and Taiwan. In parallel, despite the absence of a political alliance, Taiwan maintains deep production and trade interdependence with China, which reinforces global manufacturing scale and market demand. Together, these relationships support innovation, specialization, and supply-chain efficiency at the industry level.
- Global demand: The increasing reliance on microchips across diverse sectors, including technology, automotive, and defense, drives sustained demand.
- Government support: both the US and Taiwan are investing in semiconductor initiatives to bolster domestic production and reduce reliance on foreign sources.

Weaknesses

- Systemic dependence on a single geographical hub: for major powers such as the United States, China, Japan, and the European Union (EU), the heavy reliance on Taiwan's fabrication capacity constitutes a vulnerability. This dependence exposes national supply chains to geopolitical, military, and natural-disaster risks, despite the global industry's technological strength.
- High production costs: semiconductor manufacturing is capital and technology-intensive, which may limit the capacity of new entrants.
- Exposure to segment-specific market volatility: although long-term demand for semiconductors is structurally rising—driven by AI, 5G, automotive electronics, and cloud computing—the industry remains vulnerable to short-term volatility in specific segments such as consumer electronics and memory chips. These fluctuations can lead to temporary overcapacity, price corrections, and financial stress, particularly for firms heavily concentrated in cyclical market niches.
- Shortage of skilled labor: a lack of qualified personnel in the sector may hinder growth and innovation.
- Regulatory challenges: increasing regulations and trade policies, especially those imposed by the US on China, can disrupt the supply chain.

Opportunities

- Supply chain diversification: geopolitical tensions may prompt companies to diversify their sources of microchips, opening opportunities for other producers.
- Investment initiatives: a growing number of governments (such as the CHIPS and Science Act in US, the EU Chips Act, Japan's semiconductor revitalization program, South Korea's K-Semiconductor Belt initiative, and India's Production-Linked

Incentive) are deploying large-scale subsidies and industrial strategies to expand domestic chip production. These coordinated investment waves create opportunities for new manufacturing capacity, supply-chain diversification, and technological collaboration across multiple regions.

- Emerging technology growth: increased demand for microchips for artificial intelligence, IoT, and 5G creates new market opportunities.
- Government support: governments are increasingly interested in securing local semiconductor production for national security reasons.
- Global market expansion: the rising demand for microchips in developing countries offers avenues for growth and market penetration.

Threats

- Geopolitical tensions: increasing tensions between the US and China may disrupt supply chains and affect market stability.
- Cyberattacks and security risks: the industry is an attractive target for cyberattacks, which may compromise data and technology security.
- Global competition: countries like China are heavily investing in their own semiconductor industries, increasing competition.
- Regulations and sanctions: changes in trade policies and sanctions may affect the ability to export and import critical technology.
- Supply chain disruptions: natural disasters, trade disputes, and political instability can disrupt the supply chain, impacting production and delivery.

The SWOT analysis reveals that the microchip industry faces a complex landscape filled with strengths and opportunities, as well as significant weaknesses and threats. This analysis can serve as a basis for developing strategies that maximize opportunities and mitigate risks associated with the current geopolitical environment.

TOWS ANALYSIS OF THE MICROCHIP INDUSTRY

The TOWS analysis (Table 2) serves as an extension of the traditional SWOT framework, facilitating the formulation of strategic actions by linking internal strengths and weaknesses with external opportunities and threats. This analysis is particularly pertinent in the context of the microchip industry, where geopolitical dynamics and technological advancements play a crucial role. It describes: 1) the use of strengths to maximize opportunities, 2) how to overcome weaknesses by taking advantage of opportunities, 3) the use of strengths to minimize threats and 4) how to minimize weaknesses and avoid threats.

Table 2:

TOWS matrix for strategic responses in the semiconductor industry

	Strengths	Weaknesses
Opportunities	<ol style="list-style-type: none"> 1. Leverage technological leadership to enter emerging markets. 2. Form strategic alliances to diversify supply chains. 	<ol style="list-style-type: none"> 1. Address labor shortages through education partnerships. 2. Utilize government support to strengthen domestic production.
Threats	<ol style="list-style-type: none"> 1. Invest in cybersecurity to mitigate risks. 2. Engage in diplomatic efforts to navigate geopolitical tensions. 	<ol style="list-style-type: none"> 1. Develop contingency plans for supply chain disruptions. 2. Conduct risk assessments to prepare for regulatory changes.

Source:

Own elaboration

Maxi-Maxi strategies (strengths-opportunities)

- **Leverage technological leadership to enter emerging markets:** Taiwan's status as a leader in microchip production allows it to capitalize on the increasing global demand for advanced technologies such as artificial intelligence, IoT, and 5G. By investing in research and development, Taiwanese companies can innovate and create tailored solutions for these burgeoning sectors.
- **Form strategic alliances to diversify supply chains:** the existing collaborations with nations like the US and Japan can be expanded to include more players in the semiconductor value chain. This diversification can mitigate risks associated with over-reliance on a single market and enhance resilience against geopolitical tensions.

Mini-Maxi strategies (weaknesses-opportunities)

- **Address labor shortages through education partnerships:** to combat the shortage of skilled labor, the industry can establish partnerships with educational institutions to develop specialized training programs. This initiative can create a pipeline of talent equipped to meet the demands of the evolving microchip sector.
- **Utilize government support for domestic production:** with increasing government interest in securing local semiconductor production, companies can advocate for policies that incentivize domestic manufacturing. This approach can reduce dependency on foreign supply chains and enhance national security.

Maxi-Mini strategies (strengths-threats)

- **Utilize technological innovations to mitigate cybersecurity risks:** by leveraging its technological expertise, the microchip industry can invest in advanced cybersecurity measures to protect against potential cyberattacks. Developing robust security protocols can safeguard sensitive data and maintain consumer trust.

- **Engage in diplomatic and multilateral efforts to manage geopolitical tensions:** building on its technological strengths, the semiconductor industry can work jointly with national governments and international organizations to reduce uncertainty in the global trade environment. Beyond bilateral diplomacy, multilateral institutions such as the World Trade Organization (WTO), the OECD, and regional forums (such as the Asia-Pacific Economic Cooperation, APEC, or the Association of Southeast Asian Nations, ASEAN-led mechanisms) play a critical role in establishing transparent rules, facilitating dispute resolution, and promoting confidence-building measures among major powers. Strengthening cooperation through these venues can help mitigate trade frictions, harmonize technical standards, and support coordinated responses to supply chain risks. By actively participating in these multilateral frameworks, stakeholders can contribute to a more stable and predictable environment, reducing exposure to geopolitical volatility.

Mini-Mini strategies (weaknesses-threats)

- **Develop contingency plans for supply chain disruptions:** given the high concentration of production in Taiwan, companies should develop contingency plans to address potential supply chain disruptions. This could involve identifying alternative suppliers or investing in localized production capabilities.
- **Conduct risk assessments to prepare for regulatory changes:** the industry should conduct regular risk assessments to identify potential regulatory changes and their implications. By staying informed and adaptable, companies can better navigate the complexities of international trade regulations and minimize adverse effects.

The TOWS analysis highlights the strategic pathways available to the microchip industry considering its internal strengths and weaknesses, as well as external opportunities and threats. By adopting a proactive approach that aligns its capabilities with market dynamics, the industry can enhance its resilience and sustain its competitive advantage in an increasingly complex global landscape. This analysis serves as a foundation for informed decision-making and strategic planning, essential for navigating the challenges and opportunities that lie ahead.

POLICY RECOMMENDATIONS ON US-CHINA DISPUTES, TAIWAN, AND THE SEMICONDUCTOR INDUSTRY

The persistent tensions between the US and China, particularly those involving Taiwan and the global semiconductor supply chain, highlight the need for a comprehensive policy approach that integrates economic, technological, and geopolitical considerations. The following recommendations outline a set of multi-actor policy options relevant for governments, international organizations, and private-sector stakeholders involved in the semiconductor ecosystem. Their purpose is to promote strategic stability, enhance

cooperation where possible, and strengthen the resilience of semiconductor production and distribution networks.

First, all parties (including the US, China, and Taiwan) should intensify diplomatic engagement to manage the geopolitical sensitivities surrounding the Taiwan Strait. Regular high-level dialogues, confidence-building measures, and transparent communication channels on supply chain issues would help reduce misperceptions and the risk of escalation. Multilateral actors such as the United Nations, WTO, ASEAN, and APEC can play a constructive role in facilitating dialogue, promoting regional stability, and encouraging rule-based cooperation. Avoiding the creation of exclusive or adversarial coalitions directed at any specific country would help mitigate further polarization and maintain space for collaboration.

Second, governments and firms across the semiconductor value chain should pursue supply chain diversification to reduce exposure to potential disruptions. This applies not only to the US but also to allies in East Asia and Europe, as well as to China, which continues seeking greater technological self-reliance. Partnerships with semiconductor-producing countries such as Japan, South Korea, and increasingly India whose emerging capabilities may make it a relevant producer of specific chip categories (Dholera, 2025) can help foster distributed resilience rather than dependence on any single production hub.

Third, like-minded economies (including the US, Taiwan, South Korea, Japan, and the EU) could expand cooperation through existing frameworks such as the Chip 4 initiative or other open, inclusive platforms that promote shared standards, R&D cooperation, and mutual supply chain security. Such mechanisms should remain transparent and avoid the perception of forming exclusive blocs, as this risks deepening mistrust and intensifying Sino-American rivalry.

Fourth, all major semiconductor actors should prioritize investment in research and development, advanced manufacturing capabilities, and workforce training. Public-private partnerships can accelerate innovation in areas such as AI, advanced lithography, and quantum technologies. Strengthening domestic innovation ecosystems is relevant not only for the US but also for China, Taiwan, and other Asian and European economies seeking to upgrade their technological competitiveness.

Fifth, supporting Taiwan's economic and technological stability is beneficial for the entire global semiconductor system given its central role in advanced chip manufacturing. International cooperation in R&D, infrastructure, and capacity-building (when grounded in respect for status-quo stability) can contribute to reducing systemic vulnerabilities and reinforcing predictability for all actors.

Sixth, multilateral cooperation remains essential to navigate China's technological ambition and the broader restructuring of global value chains. International institutions (including the

WTO, OECD, and regional organizations) can help promote transparency, mediate disputes, encourage regulatory convergence, and reduce the systemic uncertainty associated with technological decoupling.

Finally, strengthening cybersecurity is a shared priority across all economies. Joint initiatives, information-sharing mechanisms, and coordinated resilience planning can help protect semiconductor fabrication facilities, proprietary technologies, and critical infrastructure from espionage or cyberattacks.

In sum, navigating the complexities of US-China tensions (particularly regarding Taiwan and semiconductor production) requires a multi-actor and multilevel policy approach. Through a combination of strengthened international cooperation, diversified supply chains, sustained technological investment, and robust crisis-management mechanisms, governments and industry stakeholders can help promote long-term stability, predictability, and competitiveness within the global semiconductor ecosystem.

CONCLUSIONS

This analysis demonstrates that the intensifying US-China rivalry marks a structural transformation of the global economic and technological order. What began as a dispute over tariffs and market access has evolved into a comprehensive competition for control over critical technologies, supply chains, and strategic industries. The semiconductor sector (particularly microchips) has emerged as the core battleground in this confrontation, reflecting the growing fusion of geoeconomics, national security, and industrial policy.

Despite the political push toward decoupling, trade data and supply-chain patterns reveal persistent and asymmetric interdependencies between both powers. The case of Taiwan is particularly illustrative. Its dominance in cutting-edge fabrication makes it indispensable to the global digital economy, yet it also constitutes a major geopolitical flashpoint. The structural reliance of both the US and China on Taiwanese production underscores the challenges of reshoring, diversification, and technological self-reliance.

The SWOT and TOWS analyses show that the microchip industry is characterized by profound vulnerabilities (geopolitical, technological, and logistical) alongside opportunities generated by innovation, strategic alliances, and emerging applications in artificial intelligence, telecommunications, and defense. Policymakers therefore face a dual challenge: reducing exposure to systemic risks while avoiding policies that exacerbate geopolitical tensions or undermine the stability of global value chains.

Looking ahead, semiconductors will remain central to the broader US–China strategic rivalry. The ability of states to innovate, safeguard critical technologies, and coordinate with allies will determine their relative position in the emerging technological order. The proposed policy recommendations (ranging from supply-chain diversification and R&D investment to

diplomatic engagement and cybersecurity) highlight the need for multidimensional strategies that align economic resilience with geopolitical stability.

Ultimately, the future of the semiconductor industry will depend on how states navigate a world in which technological leadership, national security, and global interdependence are increasingly intertwined. The findings of this study underscore that sustaining stability and competitiveness requires not only investment and innovation but also calibrated diplomacy, institutional cooperation, and long-term strategic planning. As the contest for technological dominance deepens, the ability to manage risks without fragmenting the global system will be a defining challenge for policymakers in the years ahead.

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