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ANALYSIS OF U.S. GEOPOLITICAL IMPACT ON TAIWAN'S SEMICONDUCTOR MARKET THROUGH SHARIA PRINCIPLES

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Abstract

The semiconductor industry in Taiwan, led by the Taiwan Semiconductor Manufacturing Company (TSMC), plays a strategic role in sustaining global technological and economic balance. Rising geopolitical tensions between the United States and China have reshaped this sector, as the U.S. enforces export restrictions and promotes supply chain diversification through the CHIPS and Science Act of 2022. This study employs a qualitative analytical—critical approach combined with a sociological legal framework to examine how U.S. geopolitical policies affect Taiwan's semiconductor industry through the lens of Sharia economic principles emphasizing adl (justice), mizan (balance), and maslahah (public welfare). Field research involved in—depth semi—structured interviews with purposively selected experts, including semiconductor specialists, international trade law scholars, and Islamic economic theorists. Document analysis covered the CHIPS and Science Act, Bureau of Industry and Security (BIS) reports, and export control frameworks, complemented by trade data from the World Semiconductor Trade Statistics (WSTS) and Semiconductor Equipment and Materials International (SEMI). Analytical observation and interpretive evaluation captured the structural dynamics of geopolitical influence, while data triangulation enhanced reliability through cross—validation of interviews, policy texts, and case studies on TSMC and Taiwan's industrial policies. Findings indicate that while U.S. strategies strengthen Taiwan's short—term competitiveness, they also foster long—term dependencies, unequal market access, and ethical asymmetries. Viewed through Sharia principles, these outcomes underscore the need for justice, reciprocity, and sustainability in technological governance. The study concludes that integrating Islamic ethical frameworks into global industrial policy offers pathways toward a more equitable and resilient semiconductor ecosystem.

Abstrak

Industri semikonduktor di Taiwan, yang dipimpin oleh Taiwan Semiconductor Manufacturing Company (TSMC), memegang peran strategis dalam menjaga keseimbangan teknologi dan ekonomi global. Meningkatnya ketegangan geopolitik antara Amerika Serikat dan Tiongkok telah mengubah struktur sektor ini, seiring dengan diberlakukannya pembatasan ekspor serta kebijakan diversifikasi rantai pasok melalui CHIPS and Science Act tahun 2022. Penelitian ini menggunakan pendekatan kualitatif analitis-kritis yang dipadukan dengan kerangka hukum sosiologis untuk mengkaji bagaimana kebijakan geopolitik Amerika Serikat memengaruhi industri semikonduktor Taiwan melalui perspektif prinsip ekonomi Syariah yang menekankan adl (keadilan), mizan (keseimbangan), dan maslahah (kemaslahatan umum). Penelitian lapangan dilakukan melalui wawancara mendalam semi-terstruktur dengan para pakar terpilih secara purposif, mencakup spesialis industri semikonduktor, ahli hukum perdagangan internasional, dan pakar ekonomi Islam. Analisis dokumen mencakup CHIPS and Science Act, laporan Bureau of Industry and Security (BIS), serta kerangka pengendalian ekspor, yang dilengkapi dengan data perdagangan dari World Semiconductor Trade Statistics (WSTS) dan Semiconductor Equipment and Materials International (SEMI). Observasi analitis dan evaluasi interpretatif digunakan untuk

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menangkap dinamika struktural pengaruh geopolitik, sementara triangulasi data memperkuat reliabilitas melalui validasi silang antara wawancara, dokumen kebijakan, dan studi kasus TSMC serta kebijakan industri Taiwan. Hasil penelitian menunjukkan bahwa meskipun strategi Amerika Serikat memperkuat daya saing jangka pendek Taiwan, kebijakan tersebut juga menciptakan ketergantungan jangka panjang, ketimpangan akses pasar, dan asimetri etis. Dalam perspektif prinsip Syariah, kondisi ini menegaskan pentingnya keadilan, timbal balik, dan keberlanjutan dalam tata kelola teknologi global. Penelitian ini menyimpulkan bahwa integrasi etika Islam dalam kebijakan industri global dapat mewujudkan ekosistem semikonduktor yang lebih adil dan tangguh.

INTRDUCTION

The global semiconductor industry has become a strategic battleground involving key players, particularly Taiwan, the United States, and China.[1] Taiwan, through the dominance of Taiwan Semiconductor Manufacturing Company (TSMC),[2] is a key player, controlling more than 50% of the world's semiconductor market share.[3] This dominance is not only based on TSMC's advanced manufacturing technology but also on a globally integrated supply chain involving major companies such as Apple,[4] NVIDIA, and AMD. However, the world's dependence on Taiwan for semiconductors also creates significant geopolitical risks, given the tense relationship between Taiwan and China, which considers the island part of its territory.[5] This political instability has made countries like the United States increasingly cautious, seeking ways to reduce their reliance on a single primary supplier.[6] In response, the U.S. introduced the CHIPS and Science Act of 2022, aiming to encourage massive investments in domestic semiconductor manufacturing, enhance the competitiveness of its own semiconductor industry, and build a more self−reliant and geopolitically resilient production ecosystem.[7]

[1] Tsung−chun Chen et al., "Effects of R&D Intensity on Firm Performance in Taiwan's Semiconductor Industry," *Economic Research-Ekonomska Istraživanja* 32, no. 1 (January 1, 2019): 2377−92, https://doi.org/10.1080/1331677X.2019.1642776.

[2] Namchul Shin, Kenneth L. Kraemer, and Jason Dedrick, "R&D and Firm Performance in the Semiconductor Industry," *Industry and Innovation* 24, no. 3 (April 3, 2017): 280−97, https://doi.org/10.1080/13662716.2016.1224708.

[3] I. Danilin and Y. Selyanin, "Race for Nanometers: American Policy Toward Taiwan and Republic of Korea," *World Economy and International Relations* 67, no. 11 (2023): 80−88, https://doi.org/10.20542/0131−2227−2023−67−11−80−88.

[4] Gianluca Carnabuci, Elisa Operti, and Balбzs Kovбcs, "The Categorical Imperative and Structural Reproduction: Dynamics of Technological Entry in the Semiconductor Industry," *Organization Science* 26, no. 6 (December 2015): 1734−51, https://doi.org/10.1287/orsc.2015.1011.

[5] Henry Wai−chung Yeung, "Explaining Geographic Shifts of Chip Making toward East Asia and Market Dynamics in Semiconductor Global Production Networks," *Economic Geography* 98, no. 3 (May 27, 2022): 272−98, https://doi.org/10.1080/00130095.2021.2019010.

[6] Benjamin Frieske and Sylvia Stieler, "The 'Semiconductor Crisis' as a Result of the COVID−19 Pandemic and Impacts on the Automotive Industry and Its Supply Chains," *World Electric Vehicle Journal* 13, no. 10 (October 16, 2022): 189, https://doi.org/10.3390/wevj13100189.

[7] Changhyun Park and Heesang Lee, "Early Stage Value Co−Creation Network − Business Relationships Connecting High−Tech B2B Actors and Resources: Taiwan Semiconductor Business Network Case," *Journal of Business & Industrial Marketing* 33, no. 4 (May 8, 2018): 478−94, https://doi.org/10.1108/JBIM−09−2016−0211.

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The geopolitical policies implemented by the United States to secure its semiconductor supply chain also have a profound impact on Taiwan's economic and industrial stability. As a country that has long relied on semiconductor exports as a key pillar of its economy,[8] U.S. efforts to strengthen domestic manufacturing could reduce Taiwan's dominance in the long run.[9] Additionally, U.S. sanctions and restrictions on China's access to advanced semiconductor technology have further heightened regional tensions. China, striving to reduce its dependence on semiconductor imports from Taiwan, has been investing heavily in developing its domestic semiconductor industry, but it still lags in the highly precise manufacturing technology required.[10] This competition also affects global diplomatic dynamics, with the U.S. working to build alliances with countries such as Japan, South Korea, and European nations to curb China's influence in the sector.[11] Meanwhile, Taiwan faces a strategic dilemma between maintaining its dominant position in the industry or adapting to global policy shifts that could potentially diminish its role in the world's semiconductor supply chain.

The impact of geopolitical policies and shifts in the semiconductor industry is not limited to economic aspects but also affects social and legal dimensions in Taiwan.[12] Heavy dependence on the semiconductor industry has created an economic pattern reliant on exports and high-tech investments, which in turn influences Taiwan's labor structure and industrial policies. With increasing U.S. pressure to diversify semiconductor production and reduce reliance on Taiwan, concerns are growing over the uncertainty this may bring to social stability, particularly for workers and related sectors that depend on this industry. Additionally, new regulations imposed by the U.S. and the European Union to control technology exports to China create legal challenges for Taiwanese companies, which must navigate an increasingly complex international trade policy landscape.

This research aims to analyze how U.S. geopolitical policies influence Taiwan's dominance in the global semiconductor industry, including their impact on economic stability, industrial regulations, and international relations. The semiconductor industry is a critical component of the modern global economy, serving as the backbone of various technological advancements, from consumer electronics to military defense systems. Taiwan, through the Taiwan Semiconductor Manufacturing Company (TSMC), has maintained a dominant position by leveraging cutting-edge technology, high manufacturing efficiency, and strong international partnerships. However, increasing geopolitical tensions, particularly between the United States and China, have put Taiwan at the center of a strategic power struggle. The CHIPS and Science Act of 2022, introduced by the U.S. to strengthen domestic semiconductor manufacturing, represents a significant

[8] Shu-hsien Liao et al., "Comparison of Competing Models and Multi-Group Analysis of Organizational Culture, Knowledge Transfer, and Innovation Capability: An Empirical Study of the Taiwan Semiconductor Industry," *Knowledge Management Research & Practice* 13, no. 3 (August 19, 2015): 248-60, https://doi.org/10.1057/kmrp.2013.46.

[9] Ming Luo et al., "A Data-Driven Two-Stage Maintenance Framework for Degradation Prediction in Semiconductor Manufacturing Industries," *Computers & Industrial Engineering* 85 (July 2015): 414-22, https://doi.org/10.1016/j.cie.2015.04.008.

[10] Nicole Stricker et al., "Reinforcement Learning for Adaptive Order Dispatching in the Semiconductor Industry," *CIRP Annals* 67, no. 1 (2018): 511-14, https://doi.org/10.1016/j.cirp.2018.04.041.

[11] Michael Homberg, "Mensch / Mikrochip," *Vierteljahrshefte Fьr Zeitgeschichte* 66, no. 2 (April 1, 2018): 267-93, https://doi.org/10.1515/vfzg-2018-0014.

[12] Vinay Ramani, Debabrata Ghosh, and ManMohan S. Sodhi, "Understanding Systemic Disruption from the Covid-19-Induced Semiconductor Shortage for the Auto Industry," *Omega* 113 (December 2022): 102720, https://doi.org/10.1016/j.omega.2022.102720.

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shift in global supply chains, aiming to reduce dependence on Taiwan and mitigate risks associated with geopolitical instability. At the same time, China is aggressively investing in its domestic semiconductor industry to achieve technological self-sufficiency and lessen its reliance on Taiwanese imports. These developments not only reshape the economic and industrial landscape but also raise concerns about regulatory frameworks, labor markets, and diplomatic alliances. By integrating economic analysis, policy evaluation, and geopolitical assessments, this research aims to provide a comprehensive understanding of the future trajectory of the semiconductor industry and its role in shaping the modern global economy.

METHODS

This study employs a qualitative analytical-critical approach combined with a sociological legal framework to examine the implications of U.S. geopolitical policies on Taiwan's semiconductor industry through the lens of Sharia economic principles and global market power. The analytical-critical method allows this research to go beyond descriptive observation, enabling a deeper interpretation of how political and economic interests intersect in shaping industrial and legal outcomes. Field research was conducted through in-depth semi-structured interviews with purposively selected informants, including semiconductor industry specialists, scholars of geopolitical economics, international trade law experts, and policy analysts within the Asia-Pacific region. The purposive sampling ensured the selection of respondents with recognized expertise in semiconductor production, technology governance, and trade regulation. Field engagement was complemented by analytical observation and interpretive evaluation to capture the underlying dynamics of geopolitical influence. Document analysis focused on primary legal materials such as the *CHIPS and Science Act of 2022*, reports from the Bureau of Industry and Security (BIS), and export control frameworks issued by the U.S. Department of Commerce. Supplementary data were obtained from World Semiconductor Trade Statistics (WSTS) and Semiconductor Equipment and Materials International (SEMI) to integrate empirical findings with analytical interpretation. This methodological integration ensures a holistic dataset encompassing political, legal, and ethical dimensions relevant to Taiwan's semiconductor sector under geopolitical pressure.

The fieldwork was strategically conducted in locations connected to the semiconductor supply chain and policy-making institutions, enabling first-hand engagement with practitioners, policymakers, and analysts shaping the industry's direction. The analytical-critical orientation of the research guided the interpretation of data beyond surface narratives, seeking to uncover structural power relations, ethical implications, and economic dependencies embedded in the global semiconductor ecosystem. Semi-structured interviews elicited both factual and interpretive insights concerning U.S. geopolitical strategies and Taiwan's adaptive regulatory measures. Observations during fieldwork provided contextual depth regarding the socio-political dynamics influencing Taiwan's technological sovereignty and industrial resilience. Data validity and reliability were strengthened through source triangulation, combining interview transcripts, policy documents, and case studies—particularly those examining the responses of the Taiwan Semiconductor Manufacturing Company (TSMC) and Taiwan's industrial policy reforms. Thematic and critical content analyses were used to synthesize findings into four core themes: transformation of U.S. industrial policy, Taiwan's adaptive strategies under geopolitical constraint, global governance of the semiconductor sector, and the ethical-economic evaluation based on Sharia principles. This integrated approach ensures that the study is empirically grounded, analytically rigorous, and

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normatively aligned with the ideals of justice, equity, and collective welfare in Islamic economic thought.

RESULT AND DISCUSSION

RESULT

Impact of US Geopolitical Policy on Taiwan's Semiconductor Industry

The United States has taken strategic steps to reduce its dependence on Taiwan for semiconductor supplies, as reflected in policies such as the CHIPS and Science Act 2022 and restrictions on the export of advanced technology to China.[13] The CHIPS and Science Act aims to strengthen the domestic semiconductor industry by providing approximately $52 billion in funding to support research, development, and manufacturing within the U.S. Through this policy, the U.S. hopes to attract global semiconductor companies to establish production facilities on American soil, reduce Taiwan's dominance, and enhance national supply chain resilience against potential geopolitical disruptions. Additionally, the U.S. has imposed strict restrictions on the export of semiconductor technology to China, including banning companies like NVIDIA and AMD from selling high—end chips to the Chinese market, potentially slowing the country's advancements in artificial intelligence (AI) and supercomputing. This policy is not only intended to maintain the technological superiority of the U.S. but also to curb China's ambitions of achieving semiconductor self—sufficiency. However, this strategy faces significant challenges, including the time required to develop domestic manufacturing capabilities that can compete with TSMC's technology and the U.S. industry's reliance on foreign equipment and raw materials. Moreover, this policy has prompted other countries, such as Japan, South Korea, and the European Union, to increase their investments in the semiconductor sector to prevent U.S. dominance in the emerging global supply chain structure.

In response to the U.S.'s increasingly aggressive efforts to build its domestic semiconductor industry, Taiwan has taken various measures to maintain its position as a global industry leader. One of Taiwan's key strategies is market diversification, expanding exports to countries that are less affected by U.S. policies, such as Southeast Asia and Europe. Additionally, Taiwan has begun investing in overseas production facilities, including the construction of a TSMC semiconductor plant in Arizona, U.S., which is expected to meet domestic demand in the U.S. while maintaining strong ties with the American government. However, this approach presents challenges for Taiwan, as increased investment abroad raises the risk of brain drain, where Taiwan's top engineers opt to work overseas, potentially reducing the competitiveness of its domestic industry. Furthermore, Taiwan is striving to enhance its domestic production capacity by investing in the development of 2 nm and 3 nm technology, aiming to remain at the forefront of semiconductor innovation. The Taiwanese government has also introduced various incentives to encourage local semiconductor companies to continue research and development within the country, including tax cuts and research subsidies. However, geopolitical pressure is making Taiwan's position increasingly difficult, as it must balance its relationship with the U.S. as a strategic ally while ensuring the stability of its industry without becoming entirely dependent on foreign policies.

[13] Chen—Fu Chien, Yun—Siang Lin, and Sheng—Kai Lin, "Deep Reinforcement Learning for Selecting Demand Forecast Models to Empower Industry 3.5 and an Empirical Study for a Semiconductor Component Distributor," *International Journal of Production Research* 58, no. 9 (May 2, 2020): 2784—2804, https://doi.org/10.1080/00207543.2020.1733125.

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Amid U.S. policies and Taiwan's diversification strategies,[14] Taiwan's relationship with China has grown increasingly tense,[15] significantly impacting the global semiconductor supply chain. China considers Taiwan part of its territory and has escalated diplomatic pressure and military threats to assert its claim. If these tensions escalate into an open conflict, the global supply chain could experience severe disruption, as more than half of the world's semiconductor supply is produced in Taiwan. Additionally, China has intensified investments in its domestic semiconductor industry, with billions of dollars in government support to reduce reliance on imported chips. However, despite China's progress in producing 7 nm chips, it still lags behind in developing 3 nm and more advanced chips, especially due to U.S. restrictions on the export of cutting-edge lithography machines from companies like ASML (Netherlands) and other semiconductor firms. Furthermore, this geopolitical tension affects multinational companies that rely on a stable global supply chain, such as Apple, Samsung, and Intel, which now face uncertainty in securing chip supplies if political conditions deteriorate. As competition between China and the U.S. in this industry intensifies, many companies are now seeking alternatives by diversifying their supply chains to other countries, such as India, Vietnam, and Malaysia, to mitigate the risks posed by escalating geopolitical tensions. In the future, the sustainability of the global semiconductor industry will heavily depend on how major nations—particularly the U.S., China, and Taiwan—navigate political tensions while balancing economic interests and national security concerns.

Taiwan's semiconductor industry is the backbone of its economy, contributing significantly to investment flows, employment, and industrial growth. The dominance of Taiwan Semiconductor Manufacturing Company (TSMC) in the global semiconductor market has long ensured economic stability for Taiwan, attracting billions of dollars in foreign direct investment (FDI) from tech giants like Apple, NVIDIA, and AMD, which rely on Taiwan's advanced semiconductor technology. However, increasing geopolitical tensions and U.S. policies aimed at reducing dependence on Taiwan pose both challenges and opportunities for the island's economy. On one hand, the push for diversification has encouraged Taiwan to expand its investments beyond domestic borders, such as TSMC's multi-billion-dollar projects in the United States, Japan, and Germany, ensuring that it remains a key player in the industry even as supply chains shift. On the other hand, this global expansion raises concerns about domestic job creation and industry retention, as a growing number of Taiwanese engineers and skilled workers might relocate to work at foreign facilities. While Taiwan continues to invest in next-generation semiconductor technologies such as 2 nm and 3 nm chips, rising operational costs and increasing foreign competition, particularly from South Korea and China, put pressure on Taiwan's long-term economic sustainability. Furthermore, Taiwan's economic resilience is heavily tied to the stability of global demand, and any disruption—whether from geopolitical conflicts, trade restrictions, or a slowdown in global technology consumption—could significantly impact its financial stability. To counteract these risks, the Taiwanese government has increased investment in research and development (R&D), workforce training, and infrastructure support, ensuring that its semiconductor industry remains the most innovative and competitive in the world.

[14] Hongkuan Li et al., "Innovation Efficiency of Semiconductor Industry in China: A New Framework Based on Generalized Three-Stage DEA Analysis," *Socio-Economic Planning Sciences* 66 (June 2019): 136–48, https://doi.org/10.1016/j.seps.2018.07.007.

[15] Liang-Ching Hsu et al., "Accumulation of Heavy Metals and Trace Elements in Fluvial Sediments Received Effluents from Traditional and Semiconductor Industries," *Scientific Reports* 6, no. 1 (September 29, 2016): 34250, https://doi.org/10.1038/srep34250.

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Amid the shifting landscape of the global semiconductor industry, Taiwan has strategically strengthened its alliances with Japan, South Korea, and the European Union (EU) to secure its position in an increasingly fragmented supply chain. As the U.S.—China rivalry intensifies, countries that depend on semiconductor technology are seeking to reduce their own vulnerabilities by forming new partnerships and boosting domestic chip production. Taiwan has played a crucial role in this transition, engaging in bilateral agreements with Japan to establish advanced semiconductor fabrication plants in Kumamoto, supported by Japanese government subsidies to ensure technological cooperation. Similarly, Taiwan has strengthened ties with South Korea, a key player in the global semiconductor industry through companies like Samsung and SK Hynix, despite ongoing competition between TSMC and Samsung Foundry for dominance in chip manufacturing. The European Union's CHIPS Act, which mirrors the U.S. CHIPS and Science Act, has also prompted Taiwan to expand its presence in Germany, where TSMC is building a $11 billion fab facility to support Europe's growing demand for semiconductors. This realignment of semiconductor alliances reflects a broader shift in global geopolitics, where countries are no longer relying solely on U.S.—led supply chains but are instead fostering regional partnerships to create a more resilient and diversified semiconductor ecosystem. However, this restructuring also increases the risk of fragmentation in global semiconductor standards and trade policies, as different regions develop their own regulations and incentive structures, potentially complicating international semiconductor cooperation and trade.

The increasing geopolitical competition in the semiconductor industry has driven significant changes in global trade regulations and policies, affecting the way countries manage chip production, exports, and intellectual property. The U.S. restrictions on semiconductor exports to China, particularly targeting advanced AI chips and extreme ultraviolet (EUV) lithography technology, have forced China to accelerate its own domestic semiconductor industry while creating ripple effects across global supply chains. Meanwhile, the World Trade Organization (WTO) and international regulatory bodies are facing mounting pressure to mediate trade disputes arising from semiconductor—related restrictions, as the industry becomes a focal point of economic nationalism and security concerns. Additionally, countries like Japan and the Netherlands, which control critical semiconductor manufacturing equipment through companies such as ASML (EUV lithography) and Tokyo Electron, have introduced new export control measures aligned with U.S. policies, further restricting China's access to cutting—edge semiconductor technology. In response, China has imposed countermeasures, including restrictions on rare earth metal exports, essential for chip manufacturing, increasing uncertainty in the global supply chain. This evolving regulatory landscape has led to the emergence of regional semiconductor blocs, with the U.S., Japan, South Korea, and the EU forming closer trade ties to ensure a secure supply of chips while China strengthens collaborations with Russia, the Middle East, and Southeast Asia to circumvent Western restrictions. As global trade regulations continue to evolve, companies and governments must navigate an increasingly complex and politicized semiconductor market, where access to advanced chip technology is no longer just an economic issue but a matter of national security and geopolitical influence.

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Taiwan's Dominance in the Global Semiconductor Industry

Taiwan's dominance in the global semiconductor industry is the result of a combination of technological superiority,[16] massive production capacity,[17] and a highly skilled workforce, making it an irreplaceable hub in the semiconductor supply chain. The Taiwan Semiconductor Manufacturing Company (TSMC),[18] the world's largest and most advanced contract chip manufacturer,[19] plays a central role in supplying cutting—edge semiconductors to companies like Apple, NVIDIA,[20] Qualcomm, and AMD. Taiwan's leadership in this sector is largely attributed to its unparalleled expertise in advanced node semiconductor manufacturing, particularly in 3 nm and upcoming 2 nm process technologies, which only a few companies globally, such as Samsung Foundry and Intel, are striving to develop. Another key factor is Taiwan's well—established semiconductor ecosystem, which includes research institutions, high—tech industrial parks, and strong government support through incentives and policy frameworks that encourage continuous innovation. Additionally, Taiwan benefits from a highly skilled labor force, with decades of experience in semiconductor engineering, enabling the country to maintain its technological lead.[21] The cost—effectiveness of production in Taiwan compared to Western nations has also contributed to its enduring success, as global chipmakers prefer outsourcing their most advanced chip designs to TSMC and UMC (United Microelectronics Corporation) rather than developing expensive in—house fabrication capabilities. However, as global competition intensifies and geopolitical tensions mount, Taiwan faces growing challenges in maintaining its supremacy in the semiconductor industry.

Despite Taiwan's dominance,[22] it faces mounting threats from competing nations, including the United States, China, South Korea, and Japan, all of which are making significant investments to bolster their semiconductor industries and reduce dependence

[16] Changhyun Park, "Market Entry Strategies in a High—Tech Successive Generations Market: A Case Study of Three Semiconductor Firms with Different Entry Modes," *Journal of Business & Industrial Marketing* 35, no. 11 (April 1, 2020): 1751—66, https://doi.org/10.1108/JBIM—08—2019—0354.

[17] Marzieh Khakifirooz, Chen Fu Chien, and Ying—Jen Chen, "Bayesian Inference for Mining Semiconductor Manufacturing Big Data for Yield Enhancement and Smart Production to Empower Industry 4.0," *Applied Soft Computing* 68 (July 2018): 990—99, https://doi.org/10.1016/j.asoc.2017.11.034.

[18] Gianluca Elia, Antonio Messeni Petruzzelli, and Andrea Urbinati, "Implementing Open Innovation through Virtual Brand Communities: A Case Study Analysis in the Semiconductor Industry," *Technological Forecasting and Social Change* 155 (June 2020): 119994, https://doi.org/10.1016/j.techfore.2020.119994.

[19] Chun—Chieh Wang et al., "Strong Ties and Weak Ties of the Knowledge Spillover Network in the Semiconductor Industry," *Technological Forecasting and Social Change* 118 (May 2017): 114—27, https://doi.org/10.1016/j.techfore.2017.02.011.

[20] Rajah Rasiah, Rafat Beigpoor Shahrivar, and Xiao—Shan Yap, "Institutional Support, Innovation Capabilities and Exports: Evidence from the Semiconductor Industry in Taiwan," *Technological Forecasting and Social Change* 109 (August 2016): 69—75, https://doi.org/10.1016/j.techfore.2016.05.015.

[21] Cheyuan Liu et al., "Trade Facilitation, Market Size, and Supply Chain Efficiency of Taiwan Semiconductor Companies," ed. Burak Erkayman, *PLOS ONE* 19, no. 10 (October 16, 2024): e0299322, https://doi.org/10.1371/journal.pone.0299322.

[22] Wen-Min Lu et al., "Assessing Innovation, Sustainability, and Market Performance in Taiwan's Semiconductor Sector: Insights From ESG-Driven Analysis," *Business Strategy and the Environment*, February 11, 2025, https://doi.org/10.1002/bse.4195.

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on Taiwanese manufacturing.[23] The United States, through its CHIPS and Science Act, has allocated $52 billion to support domestic semiconductor production, aiming to revitalize American chip manufacturing with projects such as Intel's Arizona fabs and TSMC's own expansion in Phoenix. At the same time, China is aggressively pushing for semiconductor self−sufficiency, investing hundreds of billions of dollars into state−backed companies like SMIC (Semiconductor Manufacturing International Corporation), despite facing strict U.S. sanctions that limit its access to advanced chipmaking technology. Meanwhile, South Korea, led by Samsung and SK Hynix, remains a strong competitor, particularly in memory chips and logic semiconductors, with Samsung aiming to surpass TSMC in advanced foundry services by 2030. Japan, traditionally a key player in semiconductor materials and equipment, has recently revived its ambitions in chip manufacturing through partnerships with TSMC and Rapidus, a government−backed initiative aiming to produce next−generation 2 nm chips domestically. These aggressive moves by Taiwan's competitors present serious challenges to its long−term market leadership, as companies and governments worldwide seek greater supply chain diversification to mitigate the risks of relying too heavily on Taiwan's semiconductor ecosystem.

Taiwan's dominance in the semiconductor industry is also increasingly at risk due to geopolitical instability, particularly tensions with China, which considers Taiwan a breakaway province and has repeatedly threatened reunification—by force if necessary. The growing military presence of China near the Taiwan Strait, combined with rising diplomatic hostilities between the U.S. and China, has heightened fears that a potential conflict could severely disrupt the global semiconductor supply chain.[24] A Chinese invasion of Taiwan, even if unlikely in the short term, would have catastrophic consequences for the global technology industry, potentially crippling the production of smartphones, computers, automotive chips, and AI processors. In response to these risks, the U.S. and its allies have strengthened economic and military ties with Taiwan, signaling their commitment to ensuring Taiwan's security and economic resilience. However, economic threats are also mounting, as China has leveraged its influence over raw materials essential for semiconductor production, such as rare earth metals, to restrict Taiwan's access to key resources. Moreover, international efforts to relocate semiconductor production to other regions could gradually erode Taiwan's monopoly over advanced chip manufacturing.[25] While Taiwan continues to hold a technological and strategic edge, its long−term dominance hinges on its ability to navigate geopolitical challenges, sustain innovation, and diversify its economic partnerships to mitigate the risks posed by potential military conflict and shifting global trade policies.

Taiwan's sustained dominance in the global semiconductor industry is largely driven by continuous investment in innovation and cutting−edge research, ensuring that it

[23] Louis Steinmeister and Markus Pauly, "Human vs. Machines: Who Wins in Semiconductor Market Forecasting?," *Expert Systems with Applications* 263 (March 2025): 125719, https://doi.org/10.1016/j.eswa.2024.125719.

[24] Yamaguchi Akira, "The Impact of News Shock of the Openings or Expansions of Large−Scale Semiconductor Plants on Local Labour Market in Japan," *Japan and the World Economy* 72 (December 2024): 101281, https://doi.org/10.1016/j.japwor.2024.101281.

[25] Tingchien Chen and Daniel Schiller, "The Role of Labour Market Intermediaries for Migrant Workers in Global Production Networks: The Example of Filipino Migrant Workers in the Taiwanese Semiconductor Industry," *Global Networks* 25, no. 1 (January 2, 2025), https://doi.org/10.1111/glob.12499.

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remains at the forefront of technological advancements.[26] The Taiwan Semiconductor Manufacturing Company (TSMC), along with other major chip firms like United Microelectronics Corporation (UMC) and MediaTek, invests billions of dollars annually in semiconductor research and development (R&D) to maintain leadership in chip miniaturization and efficiency. Taiwan's commitment to innovation is particularly evident in its push toward next−generation chip fabrication, with TSMC spearheading the development of 2 nm and even sub−2 nm process nodes, a feat that only a handful of companies globally can attempt. Additionally, Taiwan is making significant strides in chiplet technology, 3D stacking, and AI−driven semiconductor design, which are crucial for future computing needs in artificial intelligence, high−performance computing, and quantum computing. Collaboration between Taiwan's industry leaders and prestigious research institutions, such as the Industrial Technology Research Institute (ITRI) and National Taiwan University (NTU), further strengthens the nation's competitive edge. TSMC, for instance, has established multiple R&D hubs and innovation centers, not only within Taiwan but also in strategic locations such as the United States and Japan, ensuring that its expertise and influence extend beyond its borders. Taiwan's ability to stay ahead in semiconductor innovation is crucial, as competitors like Intel, Samsung, and China's SMIC continue to intensify their R&D efforts, aiming to close the technological gap.[27]

The Taiwanese government plays a crucial role in supporting the semiconductor sector through a range of strategic policies, tax incentives, and industrial regulations designed to maintain the country's status as a global semiconductor powerhouse. The government offers substantial tax breaks, subsidies, and grants to encourage semiconductor firms to continue manufacturing domestically rather than shifting operations abroad. One of the most impactful policies is the Act for Industrial Innovation, which provides tax credits for R&D expenses and capital investment in high−tech industries, making Taiwan an attractive location for semiconductor businesses. Additionally, the Taiwan Semiconductor Scholarship Program fosters a steady pipeline of talent by providing educational and financial support to students pursuing careers in semiconductor−related fields. In response to the growing geopolitical uncertainties, the Taiwanese government has also strengthened partnerships with allies such as the United States, Japan, and the European Union, facilitating collaborative semiconductor projects and safeguarding Taiwan's supply chain. Moreover, Taiwan has been proactive in enhancing domestic semiconductor production capacity, ensuring that local foundries remain resilient amid global supply chain disruptions. The government has also promoted green semiconductor manufacturing, encouraging companies like TSMC to adopt renewable energy sources and sustainable chip fabrication techniques to align with international environmental standards.[28] These robust policies and incentives reflect Taiwan's long−term commitment to retaining its leadership in the semiconductor industry, even as external pressures mount.

Despite its strengths, Taiwan faces significant challenges in securing the stability of its semiconductor supply chain and critical infrastructure, particularly amid escalating

[26] Yuxin Peng, "Japan and South Korea's Engagement in the Chinese Market Post−RCEP Implementation: A Case Study of the Semiconductor Industry," *Asia and the Global Economy* 4, no. 2 (July 2024): 100085, https://doi.org/10.1016/j.aglobe.2024.100085.

[27] Chen et al., "Effects of R&D Intensity on Firm Performance in Taiwan's Semiconductor Industry."

[28] Zewen Wu, "Are We in a Bubble? Financial Vulnerabilities in Semiconductor, Web3, and Genetic Engineering Markets," *International Review of Economics & Finance* 90 (January 2024): 32−44, https://doi.org/10.1016/j.iref.2023.11.002.

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geopolitical tensions and increasing competition.[29] One of the most pressing concerns is the island's vulnerability to natural disasters, such as earthquakes and typhoons, which pose risks to fab operations and chip production facilities. Ensuring an uninterrupted supply of essential raw materials, including silicon wafers, rare earth elements, and high-purity chemicals, is another major challenge, especially as China, a dominant player in the global rare earth market, has imposed trade restrictions on critical materials needed for semiconductor manufacturing.[30] To mitigate these risks, Taiwan has diversified its supply chain, securing alternative sources for essential materials from Japan, the United States, and Europe. Another key challenge is cybersecurity, as Taiwan's semiconductor sector is frequently targeted by state-sponsored cyberattacks and industrial espionage, particularly from China, which seeks to close the technological gap. To counter this, Taiwan has strengthened cyber defense mechanisms and intellectual property protections, collaborating with international partners to prevent data breaches and technological theft. Additionally, the Taiwanese government and semiconductor firms are investing in backup infrastructure and disaster recovery plans, ensuring that the country's chip production can withstand both natural and geopolitical disruptions. However, as global efforts to reduce dependency on Taiwanese semiconductors continue, Taiwan must remain agile and adaptive, leveraging its technological edge, strategic partnerships, and industrial policies to sustain its critical role in the global semiconductor ecosystem.

DISCUSSION

The relationship between the United States (U.S.), Taiwan, and China plays a crucial role in determining global market stability,[31] particularly in the semiconductor industry.[32] Taiwan, as the global hub of chip production with TSMC as the industry leader, holds a strategic position but is also vulnerable to geopolitical dynamics between two major powers: the U.S. and China.[33] The U.S. sees Taiwan as a vital partner in the high-tech supply chain, while China considers Taiwan part of its territory and has repeatedly threatened reunification, even through military force if necessary.[34] This tension is exacerbated by U.S. policies that increasingly strengthen its ties with Taiwan, including economic and military support, which Beijing perceives as a provocation.[35] In recent years, the U.S. has increased arms sales to Taiwan and expanded technological cooperation, including pushing for TSMC's expansion in the United States. Meanwhile, China has

[29] Andrй de Pieri Pimentel et al., "A Escassez Dos Semicondutores e as Transformaзxes Recentes Do Mercado Automotivo," *Tempo Social* 35, no. 1 (April 28, 2023): 109–29, https://doi.org/10.11606/0103–2070.ts.2023.204348.

[30] Wenjie Qiu, "Systematic Risk Analysis of Semiconductor Global Market Based on Deep Feature Fusion K–Means Algorithm," ed. Jun Ye, *Computational Intelligence and Neuroscience* 2022 (September 29, 2022): 1–11, https://doi.org/10.1155/2022/8036956.

[31] Park Chung and So Young Sohn, "Early Detection of Valuable Patents Using a Deep Learning Model: Case of Semiconductor Industry," *Technological Forecasting and Social Change* 158 (September 2020): 120146, https://doi.org/10.1016/j.techfore.2020.120146.

[32] Ivan V. Danilin, "The U.S.–China Technological War," *Russia in Global Affairs* 19, no. 4 (2021), https://doi.org/10.31278/1810–6374–2021–19–4–78–96.

[33] Yeit Haan Teow et al., "Treatment of Semiconductor–Industry Wastewater with the Application of Ceramic Membrane and Polymeric Membrane," *Journal of Cleaner Production* 337 (February 2022): 130569, https://doi.org/10.1016/j.jclepro.2022.130569.

[34] Kadнgia Faccin et al., "Knowledge–Based Dynamic Capabilities: A Joint R&D Project in the French Semiconductor Industry," *Journal of Knowledge Management* 23, no. 3 (April 8, 2019): 439–65, https://doi.org/10.1108/JKM–04–2018–0233.

[35] Aurйlie Villard, Alan Lelah, and Daniel Brissaud, "Drawing a Chip Environmental Profile: Environmental Indicators for the Semiconductor Industry," *Journal of Cleaner Production* 86 (January 2015): 98–109, https://doi.org/10.1016/j.jclepro.2014.08.061.

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responded by intensifying economic and military pressure, such as conducting military drills around the Taiwan Strait and imposing embargoes on raw materials crucial to Taiwan's semiconductor industry.[36] This escalating tension not only poses security risks for Taiwan but also has the potential to disrupt the global chip supply chain, impacting various industries, from automotive to consumer electronics. Disruptions in Taiwan's production would trigger a widespread supply chain crisis, hampering global manufacturing and driving up the prices of technological products. Therefore, political stability and the U.S.—Taiwan—China relationship are key factors in ensuring the continuity of the semiconductor industry and maintaining overall global market balance.

The United States has recognized the strategic risks of its high dependence on Taiwan for semiconductor supply and has taken various measures to mitigate these risks. One of the primary policies implemented is the CHIPS and Science Act, which allocates $52 billion to boost domestic chip production and strengthen the U.S. semiconductor ecosystem. Additionally, the U.S. has encouraged tech giants such as Intel, Qualcomm, and NVIDIA to develop domestic chip manufacturing facilities to reduce reliance on factories in Asia. This effort also includes partnerships with strategic allies such as Japan, South Korea, and European nations to diversify supply chains and build a more resilient ecosystem. However, the effectiveness of this policy remains debatable, considering that building a competitive semiconductor industry requires long—term investment, a skilled workforce, and advanced manufacturing technology. Although Intel and TSMC have announced their expansion plans in the U.S., higher production costs compared to Taiwan and a shortage of highly skilled labor pose significant challenges. Furthermore, China continues its efforts to enhance its own semiconductor capabilities by investing billions of dollars into its domestic chip industry, although it still faces limitations due to U.S. sanctions restricting access to advanced manufacturing technology. Thus, while U.S. policies to reduce dependence on Taiwan have long—term potential, their immediate impact on the global market remains uncertain, and the industry will continue to rely heavily on Taiwan's production in the short to medium term.

In response to geopolitical instability and the risk of supply chain disruptions, international organizations play a vital role in maintaining semiconductor market balance and ensuring the continuity of supply chains.[37] Organizations such as the World Trade Organization (WTO), the Semiconductor Industry Association (SIA), and the G7 have taken steps to design global policies that support semiconductor industry stability. The WTO, for instance, serves as a forum for resolving trade disputes between chip—producing nations, including tariff conflicts and export policies that could impact global supply. Meanwhile, the G7 and Quad (U.S., Japan, India, and Australia) have worked on joint initiatives to enhance semiconductor production capacity outside Taiwan and China to reduce global reliance on a single production hub.[38] Additionally, international export policies and regulations regarding crucial raw materials for chip production, such as rare earth metals—most of which are controlled by China—have also become a major focus of global organizations. International efforts to ensure supply chain diversification have been

[36] Linda Monsees and Daniel Lambach, "Digital Sovereignty, Geopolitical Imaginaries, and the Reproduction of European Identity," *European Security* 31, no. 3 (July 3, 2022): 377—94, https://doi.org/10.1080/09662839.2022.2101883.

[37] Richard Clark, Sarah Kreps, and Adi Rao, "The Political Economy of Reshoring: Evidence from the Semiconductor Industry," ed. Poowin Bunyavejchewin, *PLOS ONE* 20, no. 2 (February 14, 2025): e0316473, https://doi.org/10.1371/journal.pone.0316473.

[38] Rasiah, Shahrivar, and Yap, "Institutional Support, Innovation Capabilities and Exports: Evidence from the Semiconductor Industry in Taiwan."

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reinforced through collaborations between the U.S. and the European Union in establishing the "Chip Alliance," an initiative aimed at strengthening chip manufacturing in Western nations through investment incentives and technology partnerships. However, the primary challenge faced by international organizations is the conflict of national interests, which often clashes with collective goals. Countries like China, for example, tend to reject policies they perceive as discriminatory against their domestic industries, while the U.S. and its allies continue to push regulations that limit China's access to advanced technology.

Regulatory policies imposed by major global powers, particularly the United States and China, have had a profound impact on Taiwan's economy as well as the economies of other nations that rely on its semiconductor production.[39] The U.S. has implemented various trade restrictions and export controls, such as limiting China's access to advanced chips and semiconductor manufacturing equipment, which indirectly affects Taiwan's chip industry since many Taiwanese firms, particularly TSMC, rely on both U.S. technology and Chinese demand.[40] These regulations have forced Taiwanese companies to adjust their business strategies, including diversifying their markets and increasing investment in the United States and Europe to comply with geopolitical pressures. On the other hand, China has also implemented counter—regulations, such as restricting exports of critical raw materials like gallium and germanium, essential for semiconductor production, creating uncertainty in the supply chain. Countries dependent on Taiwanese chip production, such as Japan, South Korea, and European nations, are also affected by these regulatory shifts, leading them to accelerate domestic semiconductor production to reduce reliance on Taiwan. While these regulations aim to enhance national security and reduce dependency on a single supply source, they also contribute to economic fragmentation, raising production costs and slowing technological innovation due to disruptions in global cooperation. Additionally, increased regulatory uncertainty forces businesses to make costly strategic adjustments, such as reshoring manufacturing, which may not be as efficient as the existing Taiwanese supply chain. In the long run, these regulatory pressures could reshape the global semiconductor landscape, but in the short term, they pose economic risks not only to Taiwan but also to the broader global economy.[41] Despite mounting geopolitical pressures, Taiwan's semiconductor industry remains a dominant force in the global market, but its future prospects are increasingly uncertain due to external challenges. Taiwan currently controls around 60% of global semiconductor foundry production, with TSMC alone accounting for over 90% of the world's most advanced chips, making it an irreplaceable player in the industry. However, as tensions between the U.S. and China escalate, Taiwan is caught in a precarious position where both superpowers seek to reshape semiconductor supply chains to reduce reliance on its production capabilities. The United States has actively pushed for semiconductor decoupling by incentivizing companies to relocate manufacturing to domestic or allied nations, such as through the CHIPS and Science Act. Meanwhile, China is aggressively

[39] Tat—Dat Bui, "Assessing Sustainable Supply Chain Transparency Practices in Taiwan Semiconductor Industry: A Hierarchical Interdependence Approach.," *International Journal of Production Economics* 272 (June 2024): 109245, https://doi.org/10.1016/j.ijpe.2024.109245.

[40] Thomas J. Shattuck, "Stuck in the Middle: Taiwan's Semiconductor Industry, the U.S.—China Tech Fight, and Cross—Strait Stability," *Orbis* 65, no. 1 (2021): 101—17, https://doi.org/10.1016/j.orbis.2020.11.005.

[41] Junghyun Yoon, "Supply Chain Security in the Age of Techno—Geopolitics: 'Fab 4' Case in the Semiconductor Industry," *The Korean Journal of International Studies* 21, no. 1 (April 30, 2023): 27—60, https://doi.org/10.14731/kjis.2023.04.21.1.27.

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investing in its own semiconductor sector, attempting to achieve technological self-sufficiency despite facing challenges due to U.S. sanctions restricting access to cutting-edge chipmaking tools. This shifting landscape raises questions about Taiwan's long-term ability to maintain its dominance, particularly if major clients such as Apple, NVIDIA, and Qualcomm begin sourcing chips from alternative production hubs in the U.S., Europe, or Japan. Furthermore, the persistent military threats from China create an added layer of risk for Taiwan's industry, as global companies may hesitate to invest in a region with potential geopolitical instability.[42] However, Taiwan's strong technological expertise, robust industrial ecosystem, and continued innovation in semiconductor manufacturing give it a competitive edge that will be difficult for other nations to replicate in the near future. While Taiwan's dominance may face increasing fragmentation due to geopolitical shifts, its ability to lead in semiconductor innovation will remain a crucial factor in determining its global position in the decades ahead.

To safeguard its leadership in the semiconductor industry, Taiwan must implement a series of strategic measures to strengthen its resilience against geopolitical challenges and maintain its economic competitiveness. One of the key strategies is expanding technological leadership by continuously investing in research and development to stay ahead of emerging competitors. TSMC and other major Taiwanese chipmakers must push the boundaries of innovation in chip manufacturing, such as leading the transition to 2nm and sub-2nm process nodes before competitors in the U.S., South Korea, and China can catch up. Taiwan can also enhance its global influence by diversifying its production footprint to reduce geopolitical risks. By expanding manufacturing facilities outside Taiwan—such as TSMC's new fabs in Arizona, Japan, and Germany—Taiwanese companies can mitigate the risk of disruptions caused by geopolitical instability while reassuring global clients of a stable supply chain.[43] Additionally, Taiwan should strengthen international partnerships with like-minded nations, such as the U.S., Japan, and the European Union, to ensure long-term collaboration in semiconductor technology and supply chain security.[44] Establishing trade agreements and technology-sharing partnerships will help Taiwan maintain its strategic importance despite increasing global competition. Another crucial aspect is enhancing workforce development by investing in talent cultivation programs that attract and retain highly skilled semiconductor engineers, ensuring that Taiwan remains the global center for semiconductor expertise.[45] Lastly, Taiwan must also leverage its geopolitical leverage strategically, positioning itself as an indispensable player in global semiconductor production to deter aggressive actions from China while maintaining strong diplomatic and economic relations with major economies. By implementing these comprehensive strategies, Taiwan can reinforce its position as the world's leading semiconductor hub and navigate the complex geopolitical landscape that threatens its long-term stability.

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[42] Li Sheng, "Cyber-Politics in U.S.-China Relations: Big Tech and the Trade War" (Springer, 2022), 43–70, https://doi.org/10.1007/978-981-19-3682-1_2.

[43] Muhammadi, Rahat Iqbal, and Hashim Ali, "Central Asia and the Great Power Politics: An Analysis of China's National Interest in the Region and U.S. Approach to China," *The Chinese Historical Review* 30, no. 2 (July 3, 2023): 228–40, https://doi.org/10.1080/1547402X.2023.2268883.

[44] Beverley Loke and Ralf Emmers, "U.S.-China Great-Power Politics and Strategic Ambiguities in an Evolving Indo-Pacific Security Architecture," *Asia Policy* 18, no. 4 (October 2023): 52–60, https://doi.org/10.1353/asp.2023.a911618.

[45] Chen et al., "Effects of R&D Intensity on Firm Performance in Taiwan's Semiconductor Industry."

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CONCLUSION

This study concludes that U.S. geopolitical strategies, particularly through the enactment of the CHIPS and Science Act of 2022 and the imposition of export controls targeting China and Taiwan, have profoundly transformed the global semiconductor landscape. These policies have forced Taiwan to recalibrate its industrial and diplomatic orientations, reshaping its role within a volatile network of technological and economic interdependence. As the world's dominant semiconductor producer, Taiwan Semiconductor Manufacturing Company (TSMC) has undertaken adaptive strategies including overseas expansion, intensified cooperation with strategic allies such as Japan and the United States, and substantial investment in next-generation chip fabrication to maintain its leadership. Yet, Taiwan's intermediary position between two competing powers—the United States and China—presents a complex duality: it provides substantial economic leverage while simultaneously exposing the nation to significant vulnerabilities such as political coercion, economic sanctions, and disruptions within the global supply chain. From a sociological legal perspective, these conditions have catalyzed major reforms in Taiwan's domestic regulatory framework, strengthening legal instruments related to industrial security, intellectual property rights, and trade control mechanisms. These adjustments reflect Taiwan's broader attempt to preserve national sovereignty, economic resilience, and strategic autonomy in the face of escalating geopolitical pressures that continue to redefine global technological hierarchies.

From the perspective of Sharia principles, these developments illuminate the ethical and moral imperatives that must underpin modern economic governance and international trade relations. The principles of justice (al-'adl), balance (tawazun), and collective welfare (maslahah musytarakah) provide a moral compass for states and corporations engaged in global technological competition. Economic policies and industrial strategies, when guided by the concept of amanah (trust) and transparency, ensure that innovation serves not only profit-driven goals but also the equitable advancement of human welfare and social stability. Therefore, integrating Sharia-based ethics into the global semiconductor framework could encourage a more just and sustainable model of economic cooperation, mitigating exploitative tendencies and reinforcing shared responsibility among nations. For policymakers and industry leaders, this implies the importance of embedding ethical accountability within industrial policy, strengthening multilateral partnerships, and promoting equitable access to technological progress. By aligning its legal, economic, and strategic frameworks with these universal moral values, Taiwan can not only secure its position as a leading technological hub but also exemplify a model of ethical resilience and principled leadership in the evolving global semiconductor industry.

REFERENCES

Akira, Yamaguchi. "The Impact of News Shock of the Openings or Expansions of Large-Scale Semiconductor Plants on Local Labour Market in Japan." *Japan and the World Economy* 72 (December 2024): 101281. https://doi.org/10.1016/j.japwor.2024.101281.

Bui, Tat-Dat. "Assessing Sustainable Supply Chain Transparency Practices in Taiwan Semiconductor Industry: A Hierarchical Interdependence Approach." *International Journal of Production Economics* 272 (June 2024): 109245. https://doi.org/10.1016/j.ijpe.2024.109245.

Carnabuci, Gianluca, Elisa Operti, and Balбzs Kovбcs. "The Categorical Imperative and Structural Reproduction: Dynamics of Technological Entry in the Semiconductor

Industry." *Organization Science* 26, no. 6 (December 2015): 1734–51. https://doi.org/10.1287/orsc.2015.1011.

Chen, Tingchien, and Daniel Schiller. "The Role of Labour Market Intermediaries for Migrant Workers in Global Production Networks: The Example of Filipino Migrant Workers in the Taiwanese Semiconductor Industry." *Global Networks* 25, no. 1 (January 2, 2025). https://doi.org/10.1111/glob.12499.

Chen, Tsung-chun, Dong-Qiang Guo, Hsiao-Min Chen, and Tzu-ti Wei. "Effects of R&D Intensity on Firm Performance in Taiwan's Semiconductor Industry." *Economic Research-Ekonomska Istraživanja* 32, no. 1 (January 1, 2019): 2377–92. https://doi.org/10.1080/1331677X.2019.1642776.

Chien, Chen-Fu, Yun-Siang Lin, and Sheng-Kai Lin. "Deep Reinforcement Learning for Selecting Demand Forecast Models to Empower Industry 3.5 and an Empirical Study for a Semiconductor Component Distributor." *International Journal of Production Research* 58, no. 9 (May 2, 2020): 2784–2804. https://doi.org/10.1080/00207543.2020.1733125.

Chung, Park, and So Young Sohn. "Early Detection of Valuable Patents Using a Deep Learning Model: Case of Semiconductor Industry." *Technological Forecasting and Social Change* 158 (September 2020): 120146. https://doi.org/10.1016/j.techfore.2020.120146.

Clark, Richard, Sarah Kreps, and Adi Rao. "The Political Economy of Reshoring: Evidence from the Semiconductor Industry." Edited by Poowin Bunyavejchewin. *PLOS ONE* 20, no. 2 (February 14, 2025): e0316473. https://doi.org/10.1371/journal.pone.0316473.

Danilin, I., and Y. Selyanin. "Race for Nanometers: American Policy Toward Taiwan and Republic of Korea." *World Economy and International Relations* 67, no. 11 (2023): 80–88. https://doi.org/10.20542/0131-2227-2023-67-11-80-88.

Danilin, Ivan V. "The U.S.-China Technological War." *Russia in Global Affairs* 19, no. 4 (2021). https://doi.org/10.31278/1810-6374-2021-19-4-78-96.

Elia, Gianluca, Antonio Messeni Petruzzelli, and Andrea Urbinati. "Implementing Open Innovation through Virtual Brand Communities: A Case Study Analysis in the Semiconductor Industry." *Technological Forecasting and Social Change* 155 (June 2020): 119994. https://doi.org/10.1016/j.techfore.2020.119994.

Faccin, Kadнgia, Alsones Balestrin, Bibiana Volkmer Martins, and Claudia Cristina Bitencourt. "Knowledge-Based Dynamic Capabilities: A Joint R&D Project in the French Semiconductor Industry." *Journal of Knowledge Management* 23, no. 3 (April 8, 2019): 439–65. https://doi.org/10.1108/JKM-04-2018-0233.

Frieske, Benjamin, and Sylvia Stieler. "The 'Semiconductor Crisis' as a Result of the COVID-19 Pandemic and Impacts on the Automotive Industry and Its Supply Chains." *World Electric Vehicle Journal* 13, no. 10 (October 16, 2022): 189. https://doi.org/10.3390/wevj13100189.

Homberg, Michael. "Mensch / Mikrochip." *Vierteljahrshefte Fьr Zeitgeschichte* 66, no. 2 (April 1, 2018): 267–93. https://doi.org/10.1515/vfzg-2018-0014.

Hsu, Liang-Ching, Ching-Yi Huang, Yen-Hsun Chuang, Ho-Wen Chen, Ya-Ting Chan, Heng Yi Teah, Tsan-Yao Chen, Chiung-Fen Chang, Yu-Ting Liu, and Yu-Min Tzou. "Accumulation of Heavy Metals and Trace Elements in Fluvial Sediments Received Effluents from Traditional and Semiconductor Industries." *Scientific Reports* 6, no. 1 (September 29, 2016): 34250. https://doi.org/10.1038/srep34250.

Khakifirooz, Marzieh, Chen Fu Chien, and Ying-Jen Chen. "Bayesian Inference for

Mining Semiconductor Manufacturing Big Data for Yield Enhancement and Smart Production to Empower Industry 4.0." *Applied Soft Computing* 68 (July 2018): 990–99. https://doi.org/10.1016/j.asoc.2017.11.034.

Li, Hongkuan, Haiyan He, Jiefei Shan, and Jingjing Cai. "Innovation Efficiency of Semiconductor Industry in China: A New Framework Based on Generalized Three–Stage DEA Analysis." *Socio-Economic Planning Sciences* 66 (June 2019): 136–48. https://doi.org/10.1016/j.seps.2018.07.007.

Liao, Shu–hsien, Da–chian Hu, Chih–Chiang Chen, and Yu–Lu Lin. "Comparison of Competing Models and Multi–Group Analysis of Organizational Culture, Knowledge Transfer, and Innovation Capability: An Empirical Study of the Taiwan Semiconductor Industry." *Knowledge Management Research & Practice* 13, no. 3 (August 19, 2015): 248–60. https://doi.org/10.1057/kmrp.2013.46.

Liu, Cheyuan, Tao He, Fangzhou Liu, Shutao Liang, and Chunyu Zhang. "Trade Facilitation, Market Size, and Supply Chain Efficiency of Taiwan Semiconductor Companies." Edited by Burak Erkayman. *PLOS ONE* 19, no. 10 (October 16, 2024): e0299322. https://doi.org/10.1371/journal.pone.0299322.

Loke, Beverley, and Ralf Emmers. "U.S.–China Great–Power Politics and Strategic Ambiguities in an Evolving Indo–Pacific Security Architecture." *Asia Policy* 18, no. 4 (October 2023): 52–60. https://doi.org/10.1353/asp.2023.a911618.

Lu, Wen-Min, Irene Wei Kiong Ting, Chien-Heng Chou, and Sheng-Hui Yao. "Assessing Innovation, Sustainability, and Market Performance in Taiwan's Semiconductor Sector: Insights From ESG-Driven Analysis." *Business Strategy and the Environment*, February 11, 2025. https://doi.org/10.1002/bse.4195.

Luo, Ming, Heng–Chao Yan, Bin Hu, Jun–Hong Zhou, and Chee Khiang Pang. "A Data–Driven Two–Stage Maintenance Framework for Degradation Prediction in Semiconductor Manufacturing Industries." *Computers & Industrial Engineering* 85 (July 2015): 414–22. https://doi.org/10.1016/j.cie.2015.04.008.

Monsees, Linda, and Daniel Lambach. "Digital Sovereignty, Geopolitical Imaginaries, and the Reproduction of European Identity." *European Security* 31, no. 3 (July 3, 2022): 377–94. https://doi.org/10.1080/09662839.2022.2101883.

Muhammadi, Rahat Iqbal, and Hashim Ali. "Central Asia and the Great Power Politics: An Analysis of China's National Interest in the Region and U.S. Approach to China." *The Chinese Historical Review* 30, no. 2 (July 3, 2023): 228–40. https://doi.org/10.1080/1547402X.2023.2268883.

Park, Changhyun. "Market Entry Strategies in a High–Tech Successive Generations Market: A Case Study of Three Semiconductor Firms with Different Entry Modes." *Journal of Business & Industrial Marketing* 35, no. 11 (April 1, 2020): 1751–66. https://doi.org/10.1108/JBIM–08–2019–0354.

Park, Changhyun, and Heesang Lee. "Early Stage Value Co–Creation Network – Business Relationships Connecting High–Tech B2B Actors and Resources: Taiwan Semiconductor Business Network Case." *Journal of Business & Industrial Marketing* 33, no. 4 (May 8, 2018): 478–94. https://doi.org/10.1108/JBIM–09–2016–0211.

Peng, Yuxin. "Japan and South Korea's Engagement in the Chinese Market Post–RCEP Implementation: A Case Study of the Semiconductor Industry." *Asia and the Global Economy* 4, no. 2 (July 2024): 100085. https://doi.org/10.1016/j.aglobe.2024.100085.

Pimentel, Andrй de Pieri, Isabela Vianna Pinho, Apoena Mano, and Anna Clara Pereira Soares. "A Escassez Dos Semicondutores e as Transformaзxes Recentes Do Mercado Automotivo." *Tempo Social* 35, no. 1 (April 28, 2023): 109–29.

https://doi.org/10.11606/0103−2070.ts.2023.204348.

Qiu, Wenjie. "Systematic Risk Analysis of Semiconductor Global Market Based on Deep Feature Fusion K−Means Algorithm." Edited by Jun Ye. *Computational Intelligence and Neuroscience* 2022 (September 29, 2022): 1−11. https://doi.org/10.1155/2022/8036956.

Ramani, Vinay, Debabrata Ghosh, and ManMohan S. Sodhi. "Understanding Systemic Disruption from the Covid−19−Induced Semiconductor Shortage for the Auto Industry." *Omega* 113 (December 2022): 102720. https://doi.org/10.1016/j.omega.2022.102720.

Rasiah, Rajah, Rafat Beigpoor Shahrivar, and Xiao−Shan Yap. "Institutional Support, Innovation Capabilities and Exports: Evidence from the Semiconductor Industry in Taiwan." *Technological Forecasting and Social Change* 109 (August 2016): 69−75. https://doi.org/10.1016/j.techfore.2016.05.015.

Shattuck, Thomas J. "Stuck in the Middle: Taiwan's Semiconductor Industry, the U.S.−China Tech Fight, and Cross−Strait Stability." *Orbis* 65, no. 1 (2021): 101−17. https://doi.org/10.1016/j.orbis.2020.11.005.

Sheng, Li. "Cyber−Politics in U.S.−China Relations: Big Tech and the Trade War," 43−70. Springer, 2022. https://doi.org/10.1007/978−981−19−3682−1_2.

Shin, Namchul, Kenneth L. Kraemer, and Jason Dedrick. "R&D and Firm Performance in the Semiconductor Industry." *Industry and Innovation* 24, no. 3 (April 3, 2017): 280−97. https://doi.org/10.1080/13662716.2016.1224708.

Steinmeister, Louis, and Markus Pauly. "Human vs. Machines: Who Wins in Semiconductor Market Forecasting?" *Expert Systems with Applications* 263 (March 2025): 125719. https://doi.org/10.1016/j.eswa.2024.125719.

Stricker, Nicole, Andreas Kuhnle, Roland Sturm, and Simon Friess. "Reinforcement Learning for Adaptive Order Dispatching in the Semiconductor Industry." *CIRP Annals* 67, no. 1 (2018): 511−14. https://doi.org/10.1016/j.cirp.2018.04.041.

Teow, Yeit Haan, Yi Hui Chiah, Kah Chun Ho, and Ebrahim Mahmoudi. "Treatment of Semiconductor−Industry Wastewater with the Application of Ceramic Membrane and Polymeric Membrane." *Journal of Cleaner Production* 337 (February 2022): 130569. https://doi.org/10.1016/j.jclepro.2022.130569.

Villard, Aurйlie, Alan Lelah, and Daniel Brissaud. "Drawing a Chip Environmental Profile: Environmental Indicators for the Semiconductor Industry." *Journal of Cleaner Production* 86 (January 2015): 98−109. https://doi.org/10.1016/j.jclepro.2014.08.061.

Wang, Chun−Chieh, Hui−Yun Sung, Dar−Zen Chen, and Mu−Hsuan Huang. "Strong Ties and Weak Ties of the Knowledge Spillover Network in the Semiconductor Industry." *Technological Forecasting and Social Change* 118 (May 2017): 114−27. https://doi.org/10.1016/j.techfore.2017.02.011.

Wu, Zewen. "Are We in a Bubble? Financial Vulnerabilities in Semiconductor, Web3, and Genetic Engineering Markets." *International Review of Economics & Finance* 90 (January 2024): 32−44. https://doi.org/10.1016/j.iref.2023.11.002.

Yeung, Henry Wai−chung. "Explaining Geographic Shifts of Chip Making toward East Asia and Market Dynamics in Semiconductor Global Production Networks." *Economic Geography* 98, no. 3 (May 27, 2022): 272−98. https://doi.org/10.1080/00130095.2021.2019010.

Yoon, Junghyun. "Supply Chain Security in the Age of Techno−Geopolitics: 'Fab 4' Case in the Semiconductor Industry." *The Korean Journal of International Studies* 21, no.

1 (April 30, 2023): 27–60. https://doi.org/10.14731/kjis.2023.04.21.1.27.