Global Taiwan Institute

Global Taiwan Brief Vol. 10, Issue 5

GTI is pleased to present this special theme issue of the* Global Taiwan Brief, *titled* Young Scholars' Perspectives on Taiwan Issues*. While GTI is proud to publish analysis and insights by recognized scholars and policy-makers, we also wish to provide a venue for the next generation of talented younger writers in the field of Taiwan policy. In this issue, we present analysis on a range of issues—to include defense policy, factors affecting the semiconductor industry, and controversies over national identity—from authors ranging from high school students to young professionals in their mid-20s.

Why Does China Remain So Alluring to Some in Taiwan?

By: 1LT Reed Bauer (US Army)

Reed Bauer (aged 25) is a first lieutenant in the United States Army. He was a Fulbright scholar and masters degree student at National Chengchi University in Taipei, Taiwan, from 2022-2024. He is currently assigned to duty at Fort Moore, Georgia. The views expressed in this essay are those of the author, and do not reflect the official position of the Department of the Army, Department of Defense, the Fulbright Program or the United States Department of State. The author wishes to thank the Foundation of Scholarly Exchange for its academic and financial support.

Taiwan is an island of contradictions. Over the past year, China has conducted multiple military drills around the island of Taiwan, increasing both the frequency and scale to a level not seen in previous years. While the People's Liberation Army (PLA) surrounds the island from the outside, protesters and civil society within Taiwan stand against laws that would strip the president and constitutional court of their powers—laws that are largely seen as favorable to China *(see here and here)*. This might seem like a paradox: why would the legislature pass laws aiding the country that is currently threatening to invade them?

Yet it is these types of contradictions that abound in Taiwanese politics, making understanding the island particularly difficult. The world will continue to have a vested interest in Taiwan for the foreseeable future, yet many misconceptions abound about Taiwan's internal politics and its self-identity. A casual observer might assume that the island has a similar attitude to the United States as Japan or Korea – a largely pro-US stance that has only deepened with the rise of China. However, as shown by this past year's events, many people on Taiwan have deep skepticism of the United States—and are actually more pro-China, and pro-Chinese Communist Party (CCP), than many outsiders are aware. "America Skepticism Theory" (疑美論), the idea that the United States is not a trustworthy partner, is on the rise.

The Global Taiwan Brief is a bi-weekly publication released every other Wednesday and provides insight into the latest news on Taiwan.

Editor-in-Chief
Russell Hsiao
Associate Editor
John Dotson
Staff Editor
Adrienne Wu

To view web sources cited in the published papers (underlined in printed text), visit https://globaltaiwan.org/issues/vol-10-issue-5/.

Global Taiwan Institute
1836 Jefferson Place NW,
Washington DC 20036
contact@globaltaiwan.org

To subscribe, visit
http://globaltaiwan.org/subscribe/.

A recent article in the *Financial Times* argues that TikTok is making Taiwanese youth more pro-China than previous generations. All of these trends point to a longer-term trend that will outlive whichever US president happens to be in the White House. Instead, the cultural, historical and linguistic ties across the strait will always be a lure attempting to reel Taiwan closer to China—a fact that many outside observers often fail to appreciate.

One of the most common heuristic errors in understanding Taiwan is attempting to map ethnic ties over political affiliation. The mainstream narrative is that the supporters of Chiang Kai-Shek (蔣介石) who came to Taiwan in 1949, the *waishengren* (外省人) and their descendants, support the Kuomintang (KMT)—while the remaining *benshengren* (本省人) form the heart of the Democratic Progressive Party (DPP). This may have once been true, but the passing of time and decades of intermarriage have rendered these identities less salient, and most Taiwanese have ancestors who are both *waishengren* and *benshengren*. Even then, these identities don't always map onto political affiliation. For example, when I studied in Taiwan on a Fulbright scholarship, I had one classmate whose grandfather was a soldier in the KMT Army and fled to Taiwan after the Chinese Civil War. Yet his grandfather was brutally murdered by the KMT during the White Terror, forever turning him away from the party and towards the DPP. Similarly, many *benshengren* believe that the DPP struggles to handle bread and butter issues, and instead turn to a KMT they believe governs more efficiently.

However, what should not be overstated is the latent ethnic pull of China. When Xi Jinping talks about the "great rejuvenation of the Chinese race" (中華民族偉大復興), this appeals to not a small number of people living on Taiwan. Many people on Taiwan still identify ethnically as "Chinese" (華人) even if they identify their nationality as Taiwanese (台灣人). This is in addition to a small but influential minority who directly identify themselves as "Chinese" in a nationality sense (中國人). As well, a substantial portion of Taiwanese people—nearly four out of 10—hold an "emotional attachment" to China, even if they don't identify as Chinese. When Xi Jinping talks about the rejuvenation of the "Chinese race," it is targeted at these people.

This emotional attachment manifests itself in a few ways. One example is the traditional religion of Taiwan, which represents another linkage through which China attempts to attract support in Taiwan. Traditional Chinese culture venerates ancestor worship, and it is often through this religious piety that China works to establish ties with Taiwan (never mind that during the Cultural Revolution much of this traditional culture was destroyed in China). Many prominent Taiwanese politicians, such as former President Ma Ying-Jeou (馬英九), go to China osstensibly to partake in these ancestor worship rituals, while also meeting with high level Communist officials. Likewise, the most prominent figure in Taiwan's traditional religion, Mazu (媽祖), is from Fujian province, right across the strait. The PRC uses these religious ties to promote cross strait relations, as well as remind Taiwanese people where their ancestors originate from. [1] Likewise, when Xi Jinping talks about China serving as Taiwan's "ancestral homeland" (祖國), there is implicitly a religious component to this statement that Western observers often miss.

Occasionally, this also manifests itself in discrimination against Taiwan's indigenous people. At one event I attended hosted by the Presbyterian Church (an organization with many indigenous Taiwanese members), group leaders discussed the historical problems that indigenous peoples have faced in Taiwan. One example includes how construction of statues of Koxinga (鄭成功), the first Han conqueror of Taiwan, have often intimidated indigenous communities. Likewise, they discussed the more recent protest movements that resulted in the "rectification of names" (正名) and the reclaiming of places sacred to indigenous peoples. Both of these processes revealed how there are still underlying tensions between indigenous and Han people in Taiwan; these latent tensions remain a source of anxiety for many indigenous leaders that are not present in Han communities. As Taiwan relies heavily on food imports [2], in the event of an invasion or blockade of the island, many indigenous leaders felt that their communities would be targeted by both the People's Liberation Army (PLA) and ethnically Han communities in search of resources.

In addition, the ethnic attitudes of Han Taiwanese can sometimes result in discrimination and prejudice against foreigners. As a master's student taking graduate classes in Chinese, I was often the only non-Taiwanese person in the room, allowing me exposure to opinions that other foreigners might not hear. My university, National Chengchi University (國立政治大學), has provided the intellectual foundations for many of Taiwan's future diplomats and government officials, such as Taipei Mayor Chiang Wan-an (蔣萬安) and President of the Legislative Yuan Han Kuo-yu (韓國瑜). Historically, it has also served as the intellectual base for the KMT, with many professors serving as advisors to the party. This experience gave me the opportunity to hear professors discuss their opinions of foreigners in a more candid way. In one class, I had a professor state that one Chinese-American scholar's research was inaccurate because "their Western taste was too strong (西方味道太重)," and would make statements about how all Americans were "ignorant" (無知) about China and Taiwan studies. As I sat there, I couldn't help but think that this was the intellectual basis for which much of Taiwan's future leaders would view the United States.

There is also a strong emotional component to the 1979 "betrayal" of America cutting ties with the Republic of China, especially among the older generation. As Taiwan is a graying society, this generation will continue to remain relevant in the short to medium term. In conversations I had with a retired admiral in the Republic of China Navy, he

mentioned with vivid detail how his ships were denied port of entry around the world after 1979. With a rawness to his voice, he spoke to me as if it had happened yesterday, and by the end of his story he was choking up. Yet he also spoke of a hope that in the future there could be greater connection between our two societies.

This points to another key idea about Taiwanese political attitudes—the false impression that Taiwanese people are largely unfazed by China's military pressure. This is true to an extent, but ignores the under-the-surface unease that many Taiwanese people hold. While at first glance, it might seem like everything in Taiwan is normal—people go to work, pick their kids up from school, and continue their lives normally—there is a deep undercurrent of anxiety that permeates society. While in Taiwan, I attended a Taiwanese church; nearly every week prayers for "peace across the Taiwan Strait" were brought up. Likewise, young people feel that the long-term future of Taiwan is unstable, both for economic and geopolitical reasons. One of my professors urged any young person who could do so to try and find employment overseas.

Yet many of these anxieties do not manifest themselves into concrete action. In May 2024, when the PLA suddenly commenced large scale military drills, I quickly turned on TVBS, one of Taiwan's most prominent news stations, to see reporting on the event. But instead of seeing coverage of the PLA's largest military exercises around Taiwan in the 21st century, they were reporting on a foreign Youtuber who had come to Taiwan, and there was no coverage of the exercises. Taiwan's open media environment and proximity to China leave it vulnerable to PRC media interference, and many Taiwanese media companies do business in China, incentivizing them to downplay negative coverage of the PRC.

After developing long-term relationships with many Taiwanese people, I would often ask my classmates and community members what they would do should an invasion occur. What surprised me the most from their responses was not that it was usually some variation of "flee," but instead the vagueness of their plans (To where? With what? How?). It was apparent that most people have not thought seriously about the problem. Likewise, the government has seemingly abdicated responsibility on civil defense and societal resilience, instead relying on civil society. In my interactions with these organizations, I found them to be highly professional, detailed, and thoroughly prepared. But the issue with this is that these organizations lack legal authority to organize society. Certainly, there are leaders in this field doing excellent work—work focusing on disaster and casualty management, preparing community centers, and raising the consciousness of individuals—but should an invasion occur, they simply are not equipped to help maintain order in Taiwanese society.

Through their hard work and ingenuity, the people of Taiwan have built a wonderful society—a democratic and open society, and one that plays a key role in the global economy. Taiwan was the first society in East Asia to legalize gay marriage, serving as a model of tolerance in the region. Likewise, its democratic society is rated as one of the freest in the region, according to Freedom House. There are many people who are staunchly opposed to unification with China, and will remain so for the foreseeable future. US policymakers must continue to emphasize shared democratic values, and work with the Taiwanese to continue to preserve Taiwan's *de facto* independent status. The society the Taiwanese have built is worth upholding and defending—and I hope that most Taiwanese would agree with me.

The main point: Taiwan's relationship with China will continue to have linguistic, cultural, and historical ties that will continue to appeal to a certain subset of Taiwan's population. These ties will continue to present a challenge to US policymakers as they formulate a Taiwan policy. A broad, pro-American stance is not something that US policymakers should take for granted.

[1] Ku Ming-chun (古明君) , "Accessibility and Friction: The Mobile Politics of Taiwan's Mazu Pilgrimages across the Taiwan Strait" (可及與摩擦 : 台灣媽祖進香團跨海峽進香的移動政治), *Taiwan Society Studies*, No. 45, June 2023, pp. 107-150.

[2] Lin, Oscar. "Taiwan Food Security Situation Overview," United States Department of Agriculture, Foreign Agricultural Service. June 19, 2024.

***

Taiwan Under the US-EU Strategic Realignment: Supply Chain Resilience, Technological Decoupling and Sustainable Futures

By: Yu-Ning Chiu

Yu-Ning Chiu is a policy analyst at the Research Institute for Democracy, Society, and Emerging Technology (DSET), a think tank in Taiwan. Her research interests span economic security studies, foreign policy analysis, hegemonic strategies and power dynamics.

In recent years, supply chain restructuring has accelerated, forcing enterprises to prioritize geopolitical risks over cost considerations. This shift has intensified the trend toward "short-chaining," with businesses moving toward localized or regional production rather than relying on global production networks. Under the influence of regional conflicts and potential risks, globalization has been significantly impacted and continues to intensify amid varying degrees of nationalist sentiment.

While short-chain production can mitigate risks, it faces numerous challenges: increased production costs, regional variations in environmental regulations, and difficulties

meeting large-scale market demands. Taking the semiconductor supply chain as an example, Taiwan's dominance in advanced manufacturing processes (particularly through Taiwan Semiconductor Manufacturing Company [TSMC, 台灣積體電路製造公司]) has created a strategic vulnerability that both the United States and European Union are actively working to address.

This article explores the importance of supply chain restructuring and green transformation for the United States and the European Union, while also examining their future implications for Taiwan. As supply chain restructuring is not solely driven by US-China competitive dynamics, and with the United States and European Union progressively establishing green transformation objectives, balancing supply chain stability while achieving high standards of green transformation presents a seemingly contradictory yet unavoidable future challenge.

Global Supply Chain Current Status Under the US-China Competition

The Global Supply Chain Pressure Index (GSCPI) has shown significant improvement, dropping from peaks above 4.0 in 2022 to 0.13 in September 2024. By January 2025, it had further declined to -0.31, indicating that supply chain pressures were below historical norms, reflecting improved logistics, lower transportation costs, and stabilized manufacturing. Developed by the Federal Reserve Bank of New York, the GSCPI quantifies disruptions in global supply networks, providing policymakers and businesses with a key indicator—where positive values signal strain and negative values suggest easing conditions.

KPMG's Supply Chain Stability Index also reflects reduced operational instability: dropping from 2.34 in January 2023 to 1.12 in December 2023. However, the United States has not yet fully recovered from past disruptions and continues to face ongoing market volatility. Challenges persist, including US port strikes and Red Sea conflicts affecting maritime trade. The closure of cross-border patrols (CBP) between the United States and Mexico and escalating conflicts in the Red Sea region have caused additional supply chain interruptions.

The United States pursues "selective decoupling," as embodied in the "small yard, high fence (小院高牆)" approach, which aims to prevent China from accessing critical technologies like advanced semiconductors and artificial intelligence (AI). This strategy establishes high barriers through export controls, investment reviews, and technological blockades. The approach specifically targets areas closely related to national security and military capabilities, including quantum computing and biotechnology. In the latter half of 2024, the US government reinforced this strategy with additional economic measures. In February 2025, the administration announced a 10 percent tariff increase on Chinese imports, citing national security concerns and the need to curb illicit fentanyl flows. Concurrently, stricter trade regulations have prompted Chinese e-commerce and logistics firms to adapt by leasing warehouses within the US to navigate evolving restrictions and ensure supply chain continuity.

Conversely, China employs "asymmetric decoupling," seeking to reduce dependence on Western countries while increasing those countries' reliance on China, particularly in areas like mature process chips. China achieves this through self-reliance initiatives and market expansion, especially in developing countries. Additionally, China intensifies independent research and development, striving to overcome key technological bottlenecks—such as providing substantial subsidies in mature process chip domains to potentially replace Taiwan's share in the legacy chips market.

Policy Background Differences between the United States and European Union

The United States has a first-mover advantage in supply chain adjustments, while the European Union leads globally in green transformation. Regarding supply chain transparency, the United States is primarily influenced by laws like the *California Transparency in Supply Chains Act* (CTSCA) of 2012, which requires companies to disclose risks of modern slavery and human trafficking in their supply chains.

While many US companies increasingly recognize transparency's importance for brand image, overall transparency improvements still depend on voluntary corporate disclosures. Recent policy initiatives demonstrate divergent approaches to supply chain resilience. For example, the *CHIPS and Science Act* allocates USD $52 billion for semiconductor manufacturing and research, aiming to reduce dependence on Asian chip suppliers.

In environmental regulations, the US federal government has set forth the *Inflation Reduction Act* as the largest US climate initiative, offering USD $369 billion in subsidies to encourage green technology and renewable energy development. These policies focus on strategic industries while maintaining market flexibility. However, regulations remain relatively fragmented, with varying standards across states. While California leads in environmental protection, the lack of nationwide unified standards suggests that US enterprises will face increasing compliance costs in a heterogeneous market.

For the European Union, industrial policy remains relatively new, but the pandemic has prompted development of short-chain strategies. The European Union faces complex trade challenges, including export controls and escalating protectionism, while dealing with critical raw material dependencies and responding to US-China trade friction. The Visegrád Group (comprising the Czech Republic, Hungary, Poland, and Slovakia) exemplifies the coordination challenges with EU objectives.

Unlike the US approach of encouraging voluntary disclosure, the European Union has adopted a more proactive and mandatory policy. A prime example is the *Corporate Sustainability Reporting Directive* (CSRD), formally implemented in 2023. The CSRD mandates that large companies and listed entities provide detailed reports on their ESG governance performance—thereby expanding the scope of non-financial information reporting, increasing reporting detail requirements and comparability, and influencing non-EU companies doing business with European enterprises.

The ESG (Environmental, Social, and Governance) landscape also shows stark contrasts between the US and EU approaches. In the United States, ESG reporting remains largely voluntary, with the Securities and Exchange Commission still developing comprehensive climate disclosure rules. The fragmented approach has led to varying standards across states and industries, creating challenges for companies operating nationwide.

In contrast, the European Union's approach is more comprehensive and mandatory. The European Union's Sustainable Finance Taxonomy further defines what constitutes green investments, providing clear guidelines for financial markets and corporate planning. However, there are doubts about the effectiveness of policies positioning the European Union as a "global standard-bearer." Many people worry that current EU carbon reduction targets (such as reducing emissions by 50-55 percent by 2030) may be insufficient to address climate change challenges. The European Union had even explicitly stated plans to end fossil fuel subsidies by 2025, yet these have not been implemented.

Global Supply Chain Changing Trends

Companies are accelerating digital technology adoption to optimize supply chain management, utilizing big data analytics and Internet of Things (IoT) technologies for real-time monitoring to predict and resolve potential issues. Supply chain digitization can enhance overall transparency; promptly identify high-risk suppliers, components, and products; and effectively prevent potential losses. Companies are also adopting various strategies, including reshoring and "friendshoring" initiatives to more stable environments like India, Southeast Asia, and Mexico.

Leading companies selected by Global Top Supply Chain Enterprises and The World Economic Forum, such as Cisco Systems and Schneider Electric, demonstrate how restructuring and green transformation can be mutually reinforcing. Cisco's circular revenue goal ensures 99.8 percent of materials are recyclable, while Schneider Electric's STRIVE (sustainable, trusted, resilient, intelligent, velocity and efficiency) program strengthens regional influence while promoting sustainability.

For Taiwan, the enlightening implication is that companies and countries are increasingly focusing on controlling not just the physical components but also the intellectual property and research ecosystems that support these technologies. This not only helps countries develop contingency strategies and optimize inventory management, but also to establish alternative solutions—for most enterprises, the benefits far exceed investment costs. Notably, numerous corporate cases have demonstrated that supply chain restructuring and green transformation can be mutually reinforcing rather than conflicting objectives.

Geopolitical risk assessment has become increasingly complex as traditional economic considerations intersect with technological and security concerns. The concept of strategic autonomy has evolved beyond simple supply chain independence to encompass technological sovereignty, particularly in critical areas like artificial intelligence and quantum computing. The development of common standards and protocols for emerging technologies could help reduce friction in supply chain restructuring while ensuring that security objectives are met.

Conclusions

In terms of technological development, the challenge lies in balancing the need for strategic autonomy with the benefits of international collaboration. Both the United States and European Union must balance protectionist pressures with maintaining international trade relationships, particularly as they develop "friendshoring" networks with trusted partners. The shift toward short-chain production is likely to accelerate, but with important nuances. Rather than complete regionalization, we're seeing the development of "trusted networks" of supply chains that span multiple friendly nations.

For example, the Technology Trade and Investment Collaboration (TTIC) between the United States and Taiwan represents a significant evolution in supply chain cooperation. This framework has established new mechanisms for technology sharing and joint development, particularly in emerging fields like artificial intelligence and advanced manufacturing. The initiative specifically addresses supply chain vulnerabilities by creating dedicated working groups focused on supply chain mapping and early warning systems for potential disruptions.

Such a networked approach helps balance the need for resilience with economic efficiency. Taiwan's efforts to secure critical supply chains through international partnerships have taken several forms. With the United States, cooperation has expanded into areas like quantum computing and advanced materials. European partnerships have focused more on sustainable technology and precision manufacturing. These relationships are increasingly formalized through mechanisms like:

- Joint technology development programs
- Shared research facilities
- Standardized certification processes

- Coordinated investment in strategic sectors

The island has leveraged its technological expertise to become a crucial node in trusted supply chain networks, particularly in areas requiring advanced manufacturing capabilities. This approach allows Taiwan to maintain its technological edge while helping allies develop complementary capabilities. Recent developments in international cooperation have created new opportunities for Taiwan to strengthen its position in global supply chains. These include:

- Expanded research collaboration with democratic partners
- Joint development of supply chain security standards
- Coordinated investment in strategic technologies
- Shared approaches to environmental protection in manufacturing

The role of Taiwan in global supply chain resilience extends beyond its manufacturing capabilities to include expertise in supply chain management, quality control, and technology development. As global supply chains continue to evolve, Taiwan's experience in managing complex manufacturing networks while maintaining high quality standards offers valuable lessons for other economies pursuing supply chain resilience.

The main point: US-China competition and US-EU strategic realignment have forced a fundamental shift from cost-efficient global production networks toward "short-chain" regional production systems, while simultaneously creating new imperatives for green transformation. Taiwan, especially through its semiconductor industry, has become a critical focal point in this restructuring. Through analysis of the policy differences between the US and EU approaches to supply chain resilience and environmental regulations, Taiwan is leveraging its technological expertise to position itself within emerging "trusted networks" of supply chains spanning democratic partners. This strategic adaptation exemplifies a broader trend in which countries and companies must balance multiple competing priorities: maintaining technological leadership, ensuring supply chain security, pursuing environmental sustainability, and fostering international collaboration.

***

How Taiwan's Chip Industry Navigates US Industrial Policy and Export Controls

By: Lery Hiciano

Lery Hiciano is a recent graduate from National Chengchi University's International Master's in Asia-Pacific Studies, based out of Taipei, Taiwan.

Introduction

Taiwan's relationship with the United States, and its role in geopolitics more broadly, is inextricable from that of the semiconductor industry—and more specifically, Taiwan Semiconductor Manufacturing Company (TSMC, 台灣積體電路製造股份有限公司). The chip shortage of 2021 put TSMC and chips at the center of debates around supply chains and equipment shortages, and made Taiwan a mainstream headline topic. TSMC, in its singular role at the apex of global semiconductor production, accounts for more than 90 percent of the world's advanced semiconductor manufacturing capacity. In 2022, the Biden Administration continued the Trump Administration's use of export controls, and placed the Foreign Direct Product Rule (FDPR) at center stage of the ongoing US effort to limit China's technological advancement—especially in semiconductor capabilities. Those 2022 rules were expanded in 2023, and have once again received two major updates as Biden's term ended and Trump returned to the presidency.

Despite Taiwan's importance to the semiconductor industry and its geopolitical situation *vis-à-vis* China, Taiwan's role in semiconductor export control efficacy, and what those chips mean for Taiwan, are often overlooked. The multilateral trade agreements that the United States has with Japan and the Netherlands do not include Taiwan. Moreover, China's retaliatory measures in response to export controls usually skip targeting Taiwanese firms. Yet the past, present, and future status of export controls could have major ramifications for Taiwan, US-Taiwan relations, and US geopolitical goals.

What Are Export Controls and What Have Been Their Effects in Taiwan So Far?

Legally, export controls limit Taiwan's economic freedom by giving the United States more leverage over the types of economic activity in which Taiwanese firms can engage. Using FDPR, any finished product that uses a certain amount of US technology is subject to export control jurisdiction, regardless of the place where it was made. An expert once described the situation as US technology "contaminating" whatever it is placed in, giving the United States jurisdiction over huge swaths of international supply chains. [1]

Although TSMC does operate subsidiaries in China, the fabs in China are kept several generations behind TSMC's most advanced designs, and the company has received permission from the United States to continue exports permanently, ensuring that those fabs can continue to operate. In other words, these fabs are not relevant or a threat to the export control regime or the broader geopolitical balance of power. As Taiwan is included within the first tier (inner-group, partner country designation in the United States' latest export control regulations), it is unlikely for these fabs to expand

or receive technological advancements that are substantial enough to impact the broader landscape—now that rules limit the amount of production possible outside of tier one nations, and TSMC's subsidies from the *CHIPS Act* prevent the company from expanding manufacturing in China.

TSMC moved quickly to cut off Huawei and other entities blacklisted by the US government, but given that international demand so far outweighs supply, the company has avoided financial damage from following US demands. Its services are so in demand that it has raised prices and recorded all-time highs in net profit as well as market capitalization.

Beyond TSMC, most Taiwanese semiconductor firms either do not make products that meet export control thresholds, or else they have received permission to continue business as usual— meaning that Taiwanese exports to China have grown in the years following the initial export control restrictions. This may be partly explained by Chinese firms stockpiling technology in case it is one day restricted; but overall, the close alignment between the United States and Taiwan on this issue has not imposed major material financial costs on Taiwanese firms.

What Happened at the End of 2024 and Beginning of 2025 that Will Materially Impact this Dynamic?

Two major pieces of US legislation, one in December 2024 and another in January 2025, will have major ramifications on this industry moving forward. The former is the 2024 expansion of the export control rules—which, like those in 2022 and 2023, makes the "small yard, high fence (小院高牆)" approach first put forward by US National Security Advisor Jake Sullivan larger and taller. Amongst the many changes, the new laws expanded controls to include high-bandwidth memory (HBM) chips (not just processing units), and lowers the *de minimis* thresholds for the FDPR, thereby ensuring that much of the industry remains subject to US jurisdiction. Previously, US restrictions only targeted finished products that met FDPR thresholds (such as NVIDIA's AI accelerators), but these new rules aim to cut Chinese firms off from the intermediary technology that many have stockpiled over the last three years.

The January 2025 rules, known as the "AI Diffusion Rule," were immediately controversial upon announcement—but they have yet to go into effect. NVIDIA called the regulations a "regulatory morass," and accused them of weakening US global competitiveness and its technological advantage. Moor Insights & Strategy Founder, CEO, and Chief Analyst Patrick Moorhead called them "unprecedented."

The new laws categorize every country in the world into three groups, with only the first group—made up of 18 key allies and partners—facing no restrictions on their access to chips. The law seeks to close loopholes, such as Chinese companies' using data centers operated by third party firms outside of China's borders. Interestingly, these laws also apply to the software behind the AI models, known as "weights," which until now have escaped scrutiny. Furthermore, the law allows for countries in the other tiers and firms from those countries to be afforded higher thresholds for imports, exports, and computational power, if those entities obtain "National Verified End User Status." It is a bold attempt by the US government to re-position itself as the leader in the technological sphere of influence—by withholding access to what many consider the next technological breakthrough only for countries that abide by its rules.

The AP has cited government officials to describe the new law as part of efforts to maintain America's "six to 18-month advantage" in the AI space—a far cry from the 4-5 years that many originally envisioned when the Biden Administration first expanded export control laws. While this number is disputed, in August 2024 media outlets speculated that China had closed the gap to just two to three years. The controversy over this became loud enough that Taiwan's National Science and Technology Council (國家科學及技術委員會) Minister Wu Cheng-wen (吳誠文) had to provide an explanation to the Legislative Yuan about it.

US efforts to lessen dependence on Taiwanese semiconductor manufacturing, part of the justification behind legislation such as the *CHIPS and Science Act* and a key talking point regarding US industrial policy, has yet to fully bear fruit. TMSC's new Arizona plant, while successfully onshoring manufacturing that was long-ago lost to Asia, does not fundamentally reorient the semiconductor industry's supply chain or decrease American reliance on Taiwanese expertise. In the same vein as a warning from TSMC's chairman that an invasion would render TSMC not operable due to the facility's connection to the outside world, it is equally difficult to imagine a world in which TSMC's US fabs can operate without inputs from the main facilities in Taiwan.

Taiwan recently lifted restrictions on TSMC's ability to manufacture leading-edge chips outside of Taiwan: no longer requiring that such production stay 1-2 generations behind domestic manufacturing, which also aligns with the American government's goal of onshoring more capacity. However, much of the company's research and development (R&D) and its leadership, will remain in Taiwan, to say nothing of the fact that TSMC remains subject to Taiwanese laws. Furthermore, TSMC being allowed to expand its capacity to meet the needs of US high-technology industries enlarges the moat the company has built for itself, making it even less likely that a US competitor like Intel could ever hope to catch up. Despite the lifting of restrictions—and despite Taiwan's current minister of the economy saying that "times have changed"—TSMC's international investments will remain a political issue on the island moving forward. During the elections at the end of 2022, Kuomintang (KMT, 國民黨) politicians complained about the Democratic Progressive Party (DPP, 民主黨) "gifting" the company to the United States.

Intel, nominally TSMC's competitor, just fired its engineering-focused CEO Pat Gelsinger, who had promised to invest

heavily into R&D and to challenge TSMC by manufacturing chips on behalf of other firms. The board's surprise decision to fire him has led to widespread reports that the price tag on these investments, and the long time-horizon before they bore fruit, were unbearable for investors. Not only that, rumors abound that Intel may spin-off its chipmaking business—perhaps to a consortium including TSMC—who would then be charged with managing their former rival's manufacturing facilities. That alone would have been unthinkable a month ago, let alone two years ago when the *CHIPS Act* was first passed.

Two years ago, Intel was the number one beneficiary of future funding under the *CHIPS Act*, and the poster child for the US foray into industrial policy as practiced in East Asia. Now, the firm seems to be doing an about-face and foregoing the billions in subsidies in return for a higher margin business model—one that, while financially sound, undermines the American government's broader objectives and makes TSMC stand out even more in the sector. While President Trump states that the government's goal is to onshore manufacturing, lessen dependence on outside stakeholders, and reduce trade deficits, Taiwan and TSMC are not mere pawns that will go along with such an exercise blindly.

Looking to US allies outside of Taiwan, in the semiconductor industry there are three that take priority: the Netherlands (home to ASML), Japan (home to several firms that are vital intermediaries in the supply chain), and South Korea (home to Samsung, SK Hynix, and several other key intermediary firms). Industry lobbying in the United States has pointed to Korean firms as a weak link in the semiconductor export control regime, claiming that overly strict export laws would result in Korean companies benefiting from continuing trade with China while American firms lose revenue. Furthermore, HBM chips, vital for AI breakthroughs, are only made in three companies in the world—Samsung, SK Hynix, and US-based Micron—meaning that South Korea is a vital lynchpin for the industry moving forward. Samsung's failures in the increasingly crucial HBM space are widely publicized, and if the firm fails to catch up in this sector, it potentially concentrates another key aspect of the semiconductor supply chain in one source, outside US borders. Despite South Korea's inclusion in the first tier of the "AI Diffusion Rule," future Korean governments may be more amenable to China, and much less willing to go along with US export controls if they result in domestic firms falling behind Chinese competitors.

The lack of domestic alternatives to TSMC and other firms in allied countries means that while export controls do give the United States greater legal leverage over Taiwanese firms, they give those same firms and the Taiwanese government greater access to US technology, raise political support for pro-Taiwan policies in the United States, and ideally prevent Chinese competitors from overtaking them.

What Are the Things to Watch Out for in the Rest of the Year and Beyond?

Given uncertainties around the world, it is difficult to predict the future. For example, as manufacturing and inbound investment shifts away from China to other countries like India, ASEAN, or Mexico, that could lead to trading backlash towards them as well. A country like Vietnam, which has benefited from increased investment as companies move away from China, is now particularly susceptible to US tariff action, for example. Furthermore, given the current rhetoric from the Trump Administration, it would be incorrect to assume that Taiwan's sole value is as the production hub of a valuable trade good. While semiconductors are important, the "silicon shield" is neither why Taiwan remains independent nor why China wishes to invade. It is also incredibly easy to project forward and assume that the current political climate has fixed global alignment in place. It was only a decade ago that Ma Ying-jeou (馬英九) and Xi Jinping (習近平) held their landmark meeting in Singapore as part of a push for Taiwan to more closely integrate with China. A repeat of that episode now seems impossible, but there is no guarantee that the status quo will remain as such in the long-term.

However, there are certain markers of progress or backsliding worth monitoring in the short term to see whether US policies are overly burdensome, and whether Taiwan is "winning" from its closer alignment with the United States. Within the semiconductor industry, Chinese targeting of firms like TSMC, UMC, or others in the sector would be a major indication of a changing dynamic. Furthermore, lower reported revenues, difficulties making further breakthroughs, or drastic drops in Taiwanese firms' market share in China would all suggest that government policies have started to weigh down the sector. Hypothetically, if in the future, TSMC reported less than favorable growth, this would be a cause for concern— and would suggest to TSMC that growing its manufacturing and customer base in the United States at the expense of opportunities outside the US technological sphere no longer makes business sense.

If Chinese companies continue to catch up—or to leapfrog their way to relative competition with the likes of TSMC, NVIDIA, Oracle, Google, or any of the other major western tech firms—it would be difficult to maintain industry or political support for seemingly ineffective policies that cede significant amounts of global influence and market share to unrestricted competitors. The growing importance of firms like TSMC, NVIDIA, ASML, and more is also a weakness. Export controls' ability to meet their goals rests on technological supremacy remaining within the US-led world order, which cannot be guaranteed moving forward.

The DeepSeek episode, which saw NVIDIA lose USD $600 billion in market value in one day, demonstrates that while these firms may be "too big to fail," putting all of the proverbial eggs in one basket can backfire dramatically. Furthermore, Trump's threat of placing tariffs on all Taiwanese

semiconductors indicates that the bipartisan support Taiwan has enjoyed until now may not be a permanent condition.

The importance of Taiwan to the semiconductor industry, and in turn, the importance of the semiconductor industry to US geopolitical goals and technological development, places it at the center of Taiwan-US relations and policy. As such, it is possible to see semiconductor policy on both sides of the Pacific as a proxy for how US-Taiwan relations are developing, and how confident each side is in the other maintaining its commitments. From Taiwan's perspective, the trade-off between US security guarantees versus economic growth from greater integration with China is a major question each presidential administration must grapple with. The regional military balance of power, US arms sales to the island, and increasingly official recognition of Taiwan's sovereignty are all key signals of that balancing act.

The main point: Recent US export controls give the United States increasing leverage over Taiwan's businesses, especially TSMC. Taiwan is ceding limited control of its most prized corporate jewel—betting that it can remain at the front of its field relative to competitors from China, South Korea, or the United States—in the hope that the United States will deepen its commitment to assisting the island in the face of increasing aggression from China. However, given the unpredictability of another Trump term, it is not clear whether that will happen. Moving forward, it will be important to keep an eye on several indicators— technological, political, economic, and security—in order to determine the cost and benefits of US-Taiwan engagement.

[1] Tamada, Dai, and Philippe Achilleas, eds. *Theory and Practice of Export Control: Balancing International Security and International Economic Relations.* Springer Briefs in Economics. Singapore: Springer, 2017, 59. https://doi.org/10.1007/978-981-10-5960-5.

***

The Innovative Strategies for Taiwan's Defense: Learning from the Underdogs

By: Evan Lee and Erin Wong

Evan Lee is a junior at The Lovett School in Atlanta, Georgia, and the co-founder of The ABTaiwan Project, a youth-led initiative dedicated to capturing the essence of Taiwan on a global scale. His research focuses on policy and critical ethnic studies, particularly the normative implications of identity and culture.

Erin Wong is a high school junior in Houston, Texas, with a deep interest in international relations and public policy. He enjoys analyzing global issues, researching policy solutions, and writing for The ABTaiwan Project to bring attention to Taiwan's geopolitical significance.

Amid highly aggressive and provocative military drills by the People's Liberation Army (PLA)—the military arm of the Chinese Communist Party (CCP, 中國共產黨)—Taiwan finds itself in another period of tense calm, awaiting inevitable further aggression by its larger neighbor *(see here and here)*. The People's Republic of China (PRC) has recently escalated its position on "reunification" with Taiwan, including threats to use force if necessary. With no indication of any change in China's position on Taiwan, these escalating developments in Taiwan's security environment highlight the urgency of strengthening its defense posture. However, a comprehensive strategy for Taiwan must take into account its facing a larger and better-equipped adversary, and must draw lessons from recent conflicts where smaller nations have successfully resisted more powerful nations.

The Evolving State of Modern Warfare

The dynamics of warfare between Taiwan and the PRC are fundamentally different from those between great powers. With great powers touting their nuclear arsenals and massive conventional militaries, open warfare between such nations is generally deterred by the concept of mutually assured destruction. However, Taiwan—which does not have any nuclear weapons and has a much smaller conventional military capacity compared to the PRC—must rely upon asymmetric warfare capabilities, defensive alliances, and innovative technology to counter its adversary.

The war in Ukraine serves as a perfect case study in this regard. Ukraine's strategies, which have allowed it to successfully resist the Russian invasion despite being outclassed in manpower and firepower, highlight the need to study asymmetric warfare under a modern context. Furthermore, fundamental aspects of the war in Ukraine also demonstrate the rapidly changing environment of modern war: to include the advent of drones, widespread electronic warfare, and the importance of adaptability.

Drones

Although drones have been around for many years, militaries have typically relied on advanced, high-cost models like the MQ-9 Reaper, which can cost up to USD $56 million each. Use of smaller commercial drones, such as quadcopters, were mainly confined to civilian use. However, as Ukraine faced significant firepower disadvantages, new uses for these small drones were unexpectedly applied, and these commercial drones began to be deployed en masse for strikes. Priced at around USD $1,000 per unit, Ukraine is losing up to 10,000 drones per month—an expense that adds up. Yet, commercial drones are relatively easy to produce and operate; and whether repurposed for surveillance, logistics, or direct strikes, they are quick to replace. This adaptability in sourcing munitions has helped Ukraine hold out in what has increasingly become a war of attrition, and helped to overcome a significant Russian advantage in

resources.

Although the invasion of Ukraine was not a complete surprise due to satellite imagery indicating military buildup, by using any types of munitions available, Ukraine was able to blunt the Russian momentum and buy time to better organize its defense. The initial stages of any invasion, when concerning asymmetric conflict, is extremely important. Blunting the enemy's momentum should be a key goal for Taiwan in terms of calibrating a forceful response.

Drones have several advantages to which Taiwan should be attentive. Most notable is the fact that current air defense systems are extremely susceptible to drones. As Ukraine carries out cross border strikes on Russia with drones, modern air defenses have struggled to counter them. Even the Israel Missile Defense Organization (IMDO), which employs the advanced Iron Dome and other integrated air defense systems, are struggling against drones. One drone, launched by Hezbollah, slipped past Israeli detection and hit the private residence of Prime Minister Netanyahu. This capability, along with the favorable production costs of a drone, makes it particularly appealing to nations that face opponents with robust air defense systems. Applying rudimentary stealth capabilities to counter the early stage of an invasion can be important. By deploying drones *en masse*, striking the enemy in staging areas despite their illusion of a secured airspace can hurt the adversary's morale and blunt his momentum. Taiwan can similarly exploit this characteristic during any amphibious landing by striking landing sites.

Another advantage that drones bring is their suitability to Taiwan's maritime environment. Given that Taiwan is an island, in the event of an invasion, a naval blockade would almost certainly be implemented by the adversary. With China regularly staging drills that simulate a blockade, Taiwan must adopt strategies to respond. However, Taiwan's current stated strategies against such a blockade are to stock up food, and dedicate more farmland for cultivation. Taiwan, however, should adopt a more offensive approach to this question: instead of just coping, Taiwan should aim to break the blockade. Anti-ship drones, especially when launched in swarms, can help with that goal. Tested on the field in Ukraine, anti-ship drones—such as the "Sea Baby" unmanned surface vehicle (USV)—have successfully denied Russia full control of the Black Sea, and have disabled or sunk ships that could have been used as a staging platform for missiles. Effective use of USVs by Taiwan can help keep the island nation's economy functioning with the continuation of imports and exports (albeit at reduced numbers), and create an overall cushion for its economy in the face of a naval blockade.

When not being used for surveillance or to conduct strikes, commercial drones can be used to play an integral part in information warfare. With drone operators in Ukraine capturing brutal and accessible imagery from the front lines, these footages are used as propaganda to disrupt the narrative that the adversary may be pushing. These videos may damage the morale of the other side, but most importantly, these videos can influence public opinion—whether it be by garnering support for one side or to discredit the accomplishments of another side. With this type of footage abounding on platforms such as Telegram, social media amplifies the propaganda effect that these drone footages may create.

Caveats

This edge in drone warfare that Ukraine once had was quickly erased. Russia caught on extremely quickly and is ramping up its own drone production. Russian news agency *TASS* has reported that Russia is aiming to produce up to 32,000 drones per year. China, is no doubt, also observing this war and taking notes. With China learning lessons about asymmetrical warfare from Ukraine, it may be possible that China is more prepared for an invasion of Taiwan than Russia was for Ukraine. However, this doesn't take away from the effectiveness of drones in asymmetrical warfare. If Taiwan has a strong capability when it comes to drones, it may be able to blunt any aggression by China and calibrate a suitable and informed response.

Cyber Warfare

In addition to the use of drones, cyberspace operations represents an increasingly critical and dynamic frontier of modern warfare. Malicious cyber operations are more and more integrated and coordinated with active military movement on the ground.

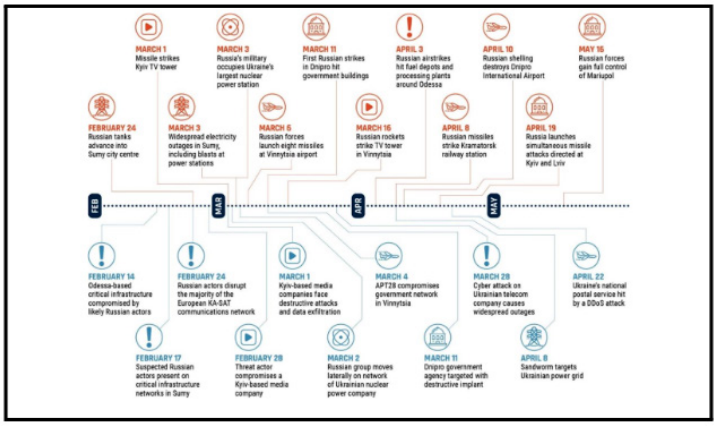

Figure 1: A graphic outlining how Russian cyber operations have coincided with military activities on the ground. (Figure source: Canadian Centre for Cybersecurity.)

Russian cyber operations during the early stages of its invasion of Ukraine were strategically coordinated to disrupt critical infrastructure, as well as to manipulate information. Intended to create confusion, disarray, and vulnerability within Ukraine, cyber operations have proven to be a valuable asset in any early stage of an invasion. These attacks on critical infrastructure can create an atmosphere of insecurity, and undermine the confidence of the population and government in their ability to maintain control and to

respond adequately.

In the context of Taiwan and the PRC, a similar situation is emerging. The PRC, with its advanced cyber capabilities, is increasingly leveraging those capabilities to undermine Taiwan's security. The PRC has already conducted malicious cyber operations targeted at educational, religious, and governmental structures. Furthermore, the PRC has even leveraged its cyber capabilities against other great powers such as the United States, with attempts to compromise US communications. Given the growing sophistication and brazenness of these cyber threats, it is crucial for Taiwan to prioritize resilience against such attacks. Because of the PRC's advanced capabilities, resilience is the best bet to buy time in the face of potential invasion.

Adaptation in the Bureaucracy

Flexibility in state structures is also critical to adapt and respond to any invasion. Ukraine provides another valuable case study in this sense. With the relatively novel appearance of widespread commercial drones on the battlefield, Ukraine, although under heavy Russian pressure, was able to mobilize its industry into producing drones. This was expedited by the creation of a branch of the Ukrainian military dedicated to drone warfare. Flexibility to adapt to and embrace new technologies and tactics on the battlefield as they emerge has proven to be a big factor in the success of Ukraine's ability to head off the brunt of Russia's invasion. Taiwan should recognize the importance of strategically adopting new innovations in warfare with that full endorsement of the state, rather than being overly cautious and risking the loss of critical opportunities.

Furthermore, Ukraine has demonstrated heightened capabilities as a direct result of cooperating with the United States. With the CIA being a major secret partner of Ukraine, battlefield data and logistical support has been critical for Ukraine to pull off offensives and other operations. From this, Taiwan should try to similarly cooperate and partner with US spy agencies to allow for better preparedness and coordination in the face of conflict. Because the United States does not maintain official relations with Taiwan, any of this cooperation must happen cautiously. (Other nations are also actively trying to learn these strategies by sending representatives to glean lessons: North Korea, for example, has directly sent soldiers to participate in the war in Ukraine.) Taiwan should also create some sort of delegation to be integrated into the Ukrainian military. However, because this may invite wrath from Russia and condemnation or provocations from the PRC, any actions like this must be taken cautiously.

Recommendations for Enhancing Taiwan's Readiness for Modern Warfare

There is no doubt that military planners in Taiwan know about the situation they are facing. However, despite a six percent increase in defense spending, conservatism and cultural differences have hindered the effective use of the budget and Taiwan's asymmetric capabilities are being eroded by the PRC's preparations. Therefore, in order to bolster this capability, Taiwan should overhaul the Ministry of National Defense (MND, 國防部) in order to implement strategies that would be more effective in fending off Chinese assaults. Here are some key recommendations:

- Drones: Recently, Taiwan has agreed to a US arms sale of 1,000 drones to bolster its drone capabilities. However, compared with the usage of drones in Ukraine, 1,000 will hardly prepare Taiwan in the face of a full onslaught by the PRC. While Taiwan defense officials and contractors have met with US officials to discuss collaboration in the drone industry, more renewed urgency should be placed on the production base of drone manufacturing. Furthermore, it is important to take into account that the drone industry is dominated by corporations largely under the jurisdiction of the PRC, such as drone manufacturer DJI. As a result, Taiwan should boost its domestic drone production base with the usage of both subsidies for startups and tariffs for foreign civilian drones. In this way, in the event of a blockade or cutoff of foreign drone production, Taiwan would be able to keep producing drones to keep an edge in surveillance and propaganda throughout a conflict.
- Cyber: As Taiwan faces increasingly sophisticated threats from the PRC, its cyber defense capabilities must be significantly enhanced. An essential component of Taiwan's cyber defense should include the establishment of a comprehensive cyber warfare deterrence doctrine. With a definitive doctrine, cyber strategies could be pursued much more effectively. Taiwan should also and bolster cooperation with allies, and foster stronger partnerships with the private sector, to integrate both government and private networks into a resilient, nationwide defense system. This would allow greater civic engagement in defense as well as the potential for unexpected innovation from the private sector that could be more easily integrated into defense. Furthermore, these partnerships should be domestic, as reliance on foreign technology—especially tech associated with the PRC—could be compromised.

Drawing lessons from Ukraine, Taiwan must actively follow and apply new developments from the battlefield in Europe to its own military with increasing urgency. Taiwan must adapt its defense structure to incorporate innovative, resilient, and adaptable strategies capable of withstanding a larger adversary. By fortifying its domestic drone production, enhancing domestic cybersecurity with a clear deterrence doctrine, and establishing robust partnerships with private industry and international allies, Taiwan can build a more secure, responsive defense posture. Preparedness, adaptability, and strategic innovation are Taiwan's best as-

sets to maintain its sovereignty and stability amidst increasing threats.

The main point: Taiwan must urgently adapt its defense strategy to address the growing threat from the PRC by focusing on asymmetric warfare, technological innovation, and institutional flexibility. By learning from Ukraine's resilience against a larger adversary, Taiwan can leverage the cost-effective benefits of drones, protect against the impacts of cyber operations by the PRC, and mobilize the state and all its instruments to bolster the island's defense.

***

Taiwan's Shortage of Chipmakers: A Major Threat to the Industry's Long-term Growth

By: Kevin Zhang

Kevin Zhang is a student at Livingston High School in Livingston, New Jersey.

Taiwan's semiconductor sector has established itself as a leader in technological manufacturing, boasting the world's most advanced fabrication facilities. Over 60 percent of the world's semiconductors, and almost 90 percent of the most sophisticated chips, are manufactured on the small island. This dominance has given Taiwan strategic leverage internationally, especially regarding cross-Strait relations. Geopolitical experts often credit Taiwan's role in the global semiconductor supply chain as a deterrent against military aggression from China—a concept commonly known as the "silicon shield." While Taiwan's semiconductor industry may currently be the most prosperous in the world, its dependency on China as its largest export market—with nearly 60 percent of its chip exports directed to China in 2023—and its reliance on the United States for advanced manufacturing equipment places the small island at the very center between the two industrial giants in the hyper-competitive artificial intelligence (AI) race.

In recent years, US semiconductor export restrictions against China have resulted in notable repercussions for Taiwan's manufacturers. These restrictions have forced leading companies such as Taiwan Semiconductor Manufacturing Company (TSMC, 台灣積體電路製造股份有限公司) to cancel sales to their Chinese clients, leading to a decline in revenue. For instance, TSMC's yearly revenue dropped significantly by 4.17 percent after the Biden Administration announced sweeping limits in late 2022 on the export of advanced chips to China, in order to to curb their development of advanced military systems.

Both Taiwanese and American manufacturers have pursued efforts to diversify production away from the hotbed of the Taiwan Strait, with TSMC investing in new facilities in Japan, the United States, and Germany and the Biden Administration passing the *CHIPS and Science Act* to promote domestic chip production. However, this push for diversification may actually harm Taiwan's political standing. Yes, it does reduce its reliance on the Chinese market, but as production capabilities expand across the world, Taiwan risks losing its semiconductor dominance—and in turn, the geopolitical leverage that comes with it. On the international stage, Taiwan's "silicon shield" may be crumbling. However, there is also a less-documented internal danger that jeopardizes the prosperity of Taiwan's semiconductor production.

Not Enough Talent

For the past three years, the Taiwanese government and its semiconductor industry have struggled to recruit new chipmakers. Just look at the numbers: in 2021, there were a recorded 27,701 unfulfilled engineer positions in the entire industry. This figure increased to 35,167 in the first quarter of 2022, a 40 percent increase from the same period in 2021.

The industry's labor shortage is further exacerbated by a declining pool of young talent caused by Taiwan's education failures and demographic challenges. In September 2021, Liu Yangwei, the chairman of leading Taiwanese electronics manufacturer Hon Hai Technology Group (Foxconn, 鴻海科技集團), emphasized the need for more graduates in semiconductor-related fields. Liu claimed that the biggest challenge in Taiwan's development of third-generation semiconductors is the gap between the supply and demand of talent, citing the industry's 28,000 open positions and the mere 12,000 graduates in related fields that year.

The lack of graduates in semiconductor-related fields reflects a decline in STEM degrees, as seen in Taiwan's younger generations as education officials observe a preference among students for different subjects. In the past two decades, Taiwanese universities have seen a steady decline in the proportion of STEM graduates in both undergraduate and graduate programs. Before 2005, STEM graduates accounted for upwards to 40 percent of all graduates; but by 2020, they accounted for only 32.3 percent.

This decline in young STEM talent can be attributed to multiple factors. One of these is demographics, as Taiwan has the lowest fertility rate worldwide. Coupled with an aging population, universities—and thus the tech industry—will only face increasing difficulty finding new, qualified talent. Second, due to education reforms and new curricula requiring fewer learning hours and less depth in math and science, professors, teachers, and industry professionals have noted students' weaker foundations in math and science, and worry about their inability to keep up with the future demands of the overall tech industry. Third, the semiconductor industry has developed a notorious reputation for unhealthy working conditions full of long hours and intense pressure. Taiwanese students are no longer willing to pursue doctorates in semiconductor-specialized fields when there are more appealing opportunities in other job markets, thereby leading to fewer research analysts furthering semiconductor innovation.

Finally, officials fear the current university entrance exam system is not the most effective in identifying the island's most exceptional math and science students, and many local students search for opportunities to study abroad. According to data from Taiwan's Ministry of Education (MOE, 教育部), the number of senior high school graduates attending further studies abroad increased by more than 20 percent from 2011 to 2017. This trend of increased foreign studies observed in Taiwanese students reflects the surge in global competition for semiconductor talent. The desire for foreign talent has ramped up within the East-Asian region, where the semiconductor value chain is most highly concentrated; however, as other countries around the world also recognize the current and future strategic importance of semiconductors on the international stage, this will only continue to intensify their efforts to advance domestic manufacturing capabilities and attract foreign talent. Out of all the 53,051 Taiwanese students who traveled abroad for work or study in 2022, 20,487 students chose to go to the United States (the most out of any country), with another 7,780 students traveling elsewhere in Asia, mainly Japan.

Taiwan faces a pressing issue: with the current number of workers already insufficient, the small island risks losing even more of its local professionals and young talent.

To make matters even more urgent, with the recent exponential growth in AI research and development (R&D), the demand for advanced, high-computing AI chips—and by extension, the demand for labor—will only continue to soar.

The Taiwan-based manufacturer TSMC provides a prime example. As part of the company's global expansion efforts to both meet the rising demand for chips and hedge geopolitical risk, TSMC committed more than USD $12 billion to the construction and operation of their first semiconductor fabrication facility in Arizona in 2020, with production expected to begin in 2024. However, in July 2023, TSMC delayed the facility's opening until 2025, citing a "shortage of specialist workers" as the root cause. This has forced the manufacturing giant to send some of its experienced Taiwanese technicians to the United States to train prospective workers. Not only are Taiwanese students leaving to study internationally at higher rates, but the labor shortages Taiwanese manufacturers struggle with within their offshore operations are also directing training and talent cultivation away from the small island.

Current Attempts to Address the Issue

Recognizing the economic, political, and cultural importance of the semiconductor industry, the Taiwanese government and chip manufacturers have implemented strategies to help meet the industry's future labor demand. In 2021, the Executive Yuan unveiled a new policy, which differed from previous efforts in that it focused on talent cultivation rather than the industry's innovative capability. The plan imposed "Regulations on Industry-Academic Cooperation and Talent Cultivation and Innovation in National Key Fields"—which worked to foster talents needed by the industry, by increasing industry-university collaboration through the joint establishment of semiconductor R&D institutes. Since its implementation, nine universities have set up semiconductor R&D institutes, and university programs across all of Taiwan have seen a 10 percent increase in undergraduate programs, and a 15 percent increase in graduate programs, in crucial field—such as semiconductors, AI, electronic engineering, and materials engineering. Additionally, the National Science and Technology Council of Taiwan (NSTC, 國家科學及技術委員會) has devoted NTD $35 billion (USD $1.1 billion) to support the establishment of semiconductor talent development programs, which have reportedly produced 848 master's and 241 PhD-level students from 2021 to 2023.

TSMC has also adjusted to the rising labor demand. Initially utilizing a "buddy system" that paired senior engineers with recruits one-on-one, the company has adopted a more efficient training system to meet the growing chip demand amid a labor shortage. In 2021, TSMC established a recruit training center in Taichung, Taiwan, where all new Taiwan-based engineers are required to spend eight weeks learning. This systematic approach allows the company to quickly train new engineers who are ready and qualified to work. Additionally, the company is part of a larger collection of Taiwanese manufacturers who have taken matters into their own hands. After campaigning about the industry's need for more talent and catching the attention of the government, numerous universities formed semiconductor-specific schools—such as the International College of Semiconductor Technology at National Yang Ming Chiao Tung University (NYCU, 國立陽明交通大學). In 2020, TSMC also began a doctorate scholarship that offers NTD $500,000 (roughly USD $15,000) to students annually for up to five years of study. Recipients receive mentorship and internship opportunities, and upon completion of their degree are given the choice to either enter the industry, or remain in academia to teach or conduct research.

How to Proceed in the Future

While these efforts by both the government and enterprises are optimistic, they need to be more expansive to tackle the ongoing labor shortage and the growing demand for talent in the industry. Here are four policy recommendations that the Taiwanese government and semiconductor manufacturers should pursue to address these issues.

First, the government should consider investing further in high-school semiconductor education and awareness. This could range from semiconductor-specific elective courses at vocational schools to extracurricular programs such as university-sponsored semiconductor research, career outlook seminars, and in-person visits to fabrication facilities and research institutes. These activities would foster a greater interest in STEM and allow young high-school students to gauge potential career paths within semiconductor-related fields.

Second, the government, enterprises, and academia should engage in joint efforts to enhance gender diversity across the entire semiconductor industry. Currently, women are

severely underrepresented in both semiconductor education and the workforce. In 2023, women only represented 5.9 percent of TMSC's top management positions and only 34 percent of the company's entire workforce. By curating dedicated scholarships, research programs, and internship opportunities, universities can further encourage women to pursue education in STEM, giving Taiwanese manufacturers a significantly larger talent pool from which to hire.

Third, the government should explore more effective strategies to recruit foreign talent. With the world's lowest birth rate, the small island has already begun to look elsewhere for prospective chipmakers—with, for example, semiconductor colleges recruiting hundreds of students from the Indian Institutes of Technology (IITs). To expand upon these efforts, companies should establish additional semiconductor R&D operations in less-explored areas in Europe and the United States, where they can find and train young talent willing to work in Taiwanese-based operations.

Finally, the industry must undergo a public rebranding. Currently, many promising students are declining to pursue semiconductor education opportunities because of the notorious work-life balance that comes with the industry. If companies really want more local talent at their doorsteps, they must actually attract younger generations, whether through workplace wellness initiatives or less restrictive work arrangements.

The main point: Taiwan's semiconductor industry boasts unparalleled dominance and strategic geopolitical importance; however, the failure to meet the rising demand for labor underscores the dire need for specialized talent. If the industry intends to progress and maintain its semiconductor supremacy in the future, it must adopt new strategies and make talent cultivation an immediate priority.

***