From Taiwan to Malaysia: The Silicon Alley of the East

Building EU Resilience Through Strategic Complementarities

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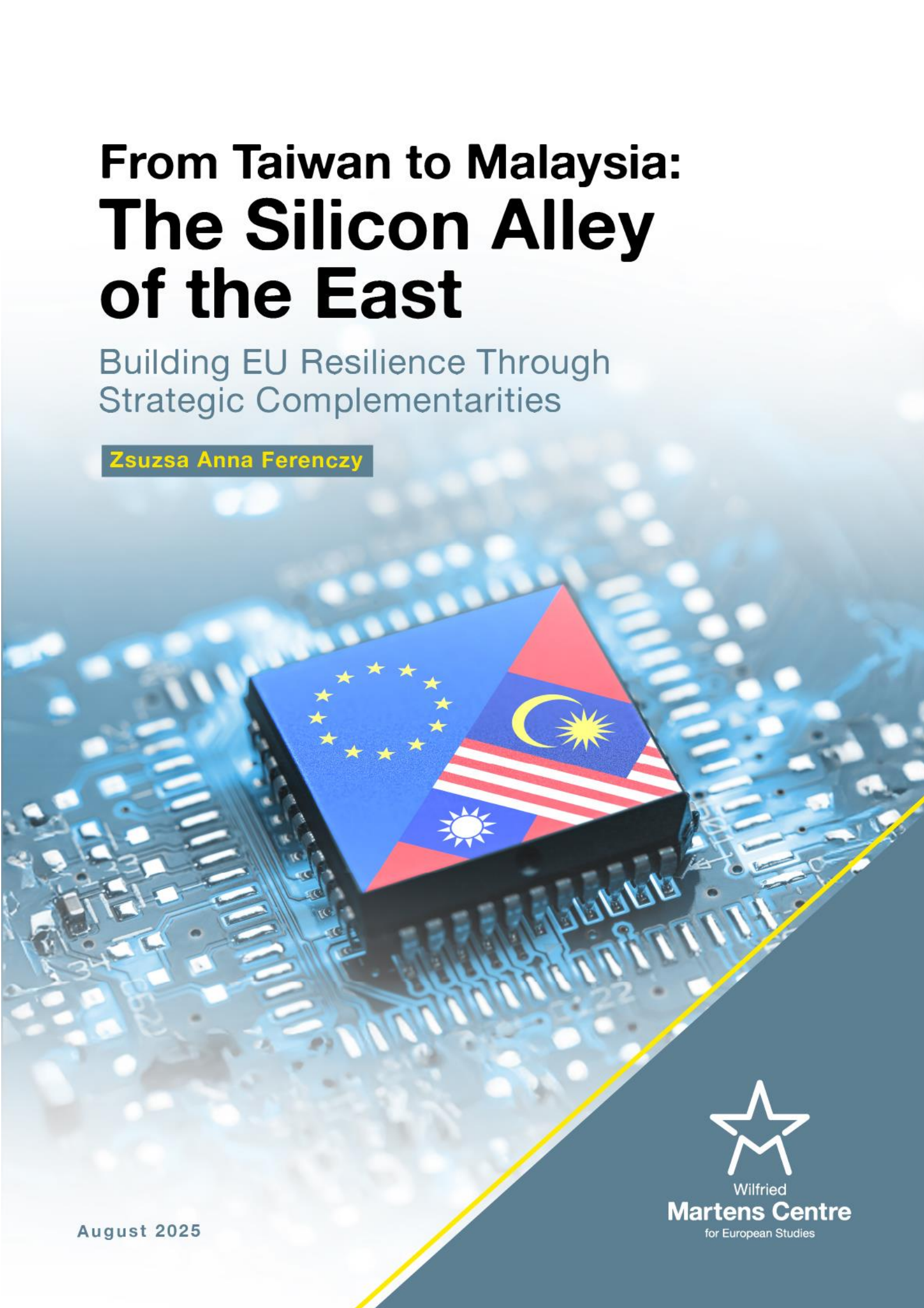

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Abstract

As significant global players in the semiconductor industry, Malaysia and Taiwan are connected by a high degree of economic complementarity. They both rely on a complex supply chain, in which Europe has an important role to play. While still catching up in the chip industry, the EU must project itself as a stable, innovation-driven, and value-aligned semiconductor partner to Malaysia and Taiwan. Driven by a shared interest in boosting resilience, the EU and member states must invest strategically in regional dynamics in ASEAN, capitalise on trends shaping the global semiconductor arena, and understand Taiwan's crucial role in securing resilient supply chains.

Keywords: Resilience; Semiconductors; Malaysia; Taiwan; EU;

Introduction

The Indo-Pacific region is undergoing a significant shift in strategic alignment, shaped by the US-China rivalry, a race for technological supremacy and the integration of technology-enabled grey zone activities into statecraft. Sitting at the heart of the region, **Southeast Asia** is on track to becoming the fourth-largest economy in the world by 2030. Following the shock of the pandemic and growing geostrategic uncertainty, ASEAN has emerged as the key driver of regional growth and a clear winner in the reconfiguration of supply chains. Strategic partners since 2020, **the European Union (EU) and ASEAN** are learning to better position themselves in a new geopolitical reality.

The EU is seeking ways to secure resilient supply chains in close cooperation with reliable partners, while ASEAN countries are interested in upgrading manufacturing to move up the value chain. This offers opportunities for the EU and ASEAN to work closer together, driven by a shared interest to not just prepare for uncertainty, but boost resilience, and thrive despite unpredictability. Yet, with the convergence of two dominant trends, namely the emergence of critical technologies and geopolitical instability, the EU and ASEAN have both struggled to develop strategies that deliver national security, secure economic growth, and ensure innovation and connectivity.

When it comes to critical technologies, there is one element that powers the global economy, namely **semiconductors**. In this field, there is one economy that has been a critical partner to both the EU and ASEAN, and this is Taiwan. Semiconductors – and critical raw materials or CRM – have emerged as the defining terms of this decade. The race for tech or digital sovereignty, and economic security are the central dynamics of our times. In brief, digital sovereignty refers to the ability to have control over one's digital destiny, including the hardware, software and data. Major powers

like China, the US, Japan, and the Republic of Korea are competing for technological supremacy. Some, namely Taiwan and Malaysia, are miles ahead in the race, albeit to different degrees, but connected by a high degree of economic complementarity. Yet others, like the EU, are still catching up.

The 8th largest economy in Asia and the 21st largest globally by purchasing power parity, Taiwan remains a key contributor to global advanced technology supply chains. TSMC, or the Taiwan Semiconductor Manufacturing Company, is a stand-alone economic superpower, with around 55 percent of the global market for contract chip fabrication, producing over 90 percent of the most advanced chips, and doing so with unprecedented accuracy and at unparalleled scale. This has turned TSMC into one of the most valuable companies in the world.

Taiwan's semiconductor industry has thrived thanks to its ecosystem-thinking, policy foresight, and sustained investment in innovation, rather than a heavy reliance on subsidies. Yet, making chips requires complex software, chemicals, ultra-pure silicon and expensive equipment that Taiwan relies on. In fact, Taiwan's domestic semiconductor industry is deeply embedded in a web of globalized supply chains that are fundamental to the global economy, including consumer electronics, cars, military and dual-use applications, including artificial intelligence (AI).

Malaysia and Taiwan, two significant global players in the semiconductor industry, are bound by a high degree of economic complementarity. Taiwanese companies have helped cement the position of Malaysia's Penang state as a powerhouse in the global chips landscape. Cooperation has reinforced the international reputation of both economies. Closely tied to both the US and Chinese markets and therefore exposed to their growing rivalry, Malaysia and Taiwan are examining options to secure resilient supply chains. The EU also finds itself in an uncomfortable position forced to manage its ties with both the US and China.

In fact, the EU, Taiwan and ASEAN countries are all exposed to the US-China competition, which has moved beyond tariffs and involves a battle for technological leadership. The EU has pursued strategic autonomy, which includes reinvigorating economic ties with like-minded partners, including ASEAN. The bloc has its own Chips Act to reduce strategic dependencies in semiconductors, by reinforcing its chip production capabilities, supporting research and development, supply chain security and workforce expansion. Through its Digital Partnerships, the EU is working on strengthening connectivity, with Singapore among its partners. Most recently, in March 2025 several EU member states launched the Semiconductor Coalition, a significant step to boost the bloc's chip ecosystem.

In line with these initiatives, the EU and member states must continue to invest in better understanding the regional dynamics in ASEAN, the trends shaping the global semiconductor arena and Taiwan's crucial role in securing resilient supply chains. The

incentives for Malaysia to hedge against increasing uncertainties are likely to grow, while Taiwan's strategic dilemma will intensify, offering further reasons to amplify complementarity. The EU must strengthen collaboration with both, guided by the common interest in trust-based partnerships for a resilient future. This brief explores the complementarity between Taiwan and Malaysia in the semiconductor industry, and provides policy recommendations to guide the EU's efforts to position itself more strategically in the region.

Penang, the "Silicon Valley of the East"

Malaysia is home to the "Silicon Valley of the East". Penang is a state in the northwest of the country, a regional semiconductor hub with a growing global footprint; it accounts for about 7 percent of global semiconductor sales and 45 percent of Penang's state GDP. With more than five decades of industrial experience, Penang's industrial zone is home to over 4,000 SMEs and 350 multinational companies. In 2023 alone, Penang attracted a record-breaking $12.8 billion in FDI, surpassing the total amount from the previous seven years combined. Investors in the state include big names such as Intel, Micron and Infineon.

Companies from the US, Japan, Taiwan and Germany have helped transform Penang and make it synonymous with manufacturing excellence, leading to several questions: How did Malaysia become such a significant player in the semiconductor industry? How has this boosted Malaysia's regional weight and relevance, particularly amid regional technology decoupling and diversifying trends? What role have international partners played in this process, in particular, companies from Taiwan? And finally, given the imperative to boost its semiconductor industry, how can the EU improve its collaboration with regional partners and tap into ongoing regional cooperation?

Taiwan is a global semiconductor powerhouse, known as "Asia's Silicon Island" in the heart of the Indo-Pacific. It produces over 60 percent of the world's chips and over 90 percent of the most advanced ones. Yet, Taiwan also sits at the centre of economic security considerations, separated from the PRC by the Taiwan Strait, where in 2022 approximately USD2.55 trillion of goods transited. Most importantly, Taiwan stands at the front of the US-China tech rivalry and semiconductor standoff.

Field research conducted in Penang's booming industrial zone in 2025 has helped better appreciate Malaysia's deep-rooted semiconductor ecosystem and the role of Taiwanese companies in the process. Taiwanese companies have helped cement Penang's position as a powerhouse in the global chips landscape. This has contributed to reinforcing the international reputation of both Malaysia and Taiwan, as

leaders in an industry that everyone wants to lead in, but most are still just catching up – including Europe.

Taiwan's tech prowess and Malaysia's comparative advantage in natural resources complement each other. Their bilateral trade is dominated by electrical and electronic products, as well as chemicals and chemical products. In terms of rare earth elements (REE), Malaysia has a strategic edge, home to the world's largest REE processing plant outside China. Its reserves in the states of Terengganu, Kelantan, Pahang, Perak and Kedah, are home to valuable rare earth minerals such as Neodymium (Nd), Dysprosium (Dy), and Praseodymium (Pr), essential for renewable energy technologies and electric vehicles.

The REE supply chain is currently dominated by the PRC, accounting for approximately 85 percent of the global supply. In 2023, Malaysia was the second-largest source of imported ore for China, through both legal and illegal ways, behind Myanmar, according to trade statistics from Beijing. Since December 2023 China has banned the export of REE technology, a move with deep geostrategic implications, likely to impact the extent to which Malaysia can bolster its own technical know-how. Both the US and Europe rely heavily on China for REE, accounting for 70 percent of US REE imports between 2020 and 2023, and 46.3 percent of the total EU imports in 2024 alone. In the same year, Malaysia contributed 19.9 percent of Europe's REE imports.

Taiwan in Malaysia

Taiwanese semiconductor companies have deep roots in Penang, going back decades. They have established facilities and continue to expand their presence alongside European, American, Chinese technology and chipmaker companies, building more resilient global supply chains. At present, Taiwan is Malaysia's 4th largest trading partner, overtaking Japan in 2024, with more than 50 percent of trade in semiconductors. Bilateral cooperation has further expanded since Taiwan launched its New Southbound Policy in 2016.

At the same time, China has been Malaysia's largest trading partner for 16 consecutive years and its primary source of imports. In fact, Malaysia was the first country in ASEAN to establish relations with the PRC in May 1974. Malaysia's strategic value to China was also highlighted by Chinese leader Xi Jinping's recent state visit, just days after US President Trump's sweeping tariffs. China originally faced 145 per cent tariffs, while Malaysia 24 per cent. On his visit, Xi said the two nations would "jointly resist the undercurrents of geopolitical and camp-based confrontation, overcome the counter-currents of unilateralism and protectionism".

Taiwanese presence in Malaysia's semiconductor industry has deep roots. ASE Malaysia in Penang is a subsidiary of Taiwan's ASE Inc, or Advanced Semiconductor Engineering Inc, the world's largest provider of outsourced semiconductor assembly and test services or OSAT. It was in 1991 that ASE picked Malaysia to set up its first factory outside of Taiwan – that was 34 years ago. At present, ASE Malaysia employs over 3,000 people. In February this year, it opened its 5th plant in Penang's Bayan Lepas Free Industrial Zone. The plan is to double the number of its employees once the 4th and 5th plants are fully operational in three to five years. ASE Malaysia's aim is also to introduce cutting-edge technological capabilities to help Malaysia to move up the value chain.

Benefiting from industrial policies dating back to the 1970s, Malaysia is an established player in the semiconductor global value chain, particularly in assembly, testing and packaging or ATP. Malaysia's openness to international partnerships, its successful leveraging of its strategic location, and tradition of supportive industrial policies, are factors that have helped turn Penang into the Silicon Valley of the East. The central government's tax incentives to attract foreign investment, and incentives for reinvestment, relocation and exports, were designed to boost domestic capacity. The government has also sought to leverage existing capacities to position the country as a global innovation leader, and turn it into the region's most advanced chipmaking ecosystem.

Cooperation with Taiwanese companies, such as ASE Malaysia, has to be seen in this context. Through investment and partnerships, Taiwanese tech excellence is now embedded in the local semiconductor industry and ASE Malaysia is determined to double down, with plans to expand in the years to come. ASE Malaysia's continued expansion in Penang demonstrates interest and long-term commitment on both sides, the kind of commitment that is rooted in trust and reliability — currently two of the most challenged values in international trade.

Tapping into regional strengths

Next to Malaysia, Singapore is an integral part of the global semiconductor supply chain. Home to a diverse semiconductor ecosystem with research and development, it accounts for 10 percent of all chips produced worldwide and approximately 20 percent of global semiconductor manufacturing equipment production. Singapore has a highly integrated ecosystem that spans the entire semiconductor value chain, from R&D to manufacturing, assembly, to testing and packaging. In fact, it is the only ASEAN country with a chip factory, and together with Malaysia they are the only two countries with a semiconductor supply chain in ASEAN. Unsurprisingly, Taiwan has played an important role in this regard.

Singapore has emerged as Taiwan's top investment destination among ASEAN countries, with more than two-thirds of Taiwanese investments flowing into the city-state. In 2024, Taiwanese companies' investment reached USD5.81 billion, for the first time investments surpassing those in China since 1991. In April this year, United Microelectronics Corp (UMC), Taiwan's 2nd largest contract chipmaker after TSMC, opened a new semiconductor fab in Singapore, to be injected with up to USD5 billion in the first phase of its expansion. The new fab of UMC Singapore will focus on more advanced chips than its existing fab, extending technology down from 40-nanometer technology to 22-nanometer.

In the past two years alone, Singapore attracted over USD18 billion of R&D and manufacturing investment into its chip ecosystem. In June 2024, German wafer manufacturer Siltronic opened a USD 2.9 billion advanced manufacturing facility in Tampines, its third production plant in the Southeast Asian city-state. Singapore's position as an Asian financial centre has also made it attractive to Taiwanese wealth management players, who consider it reliable and politically stable.

The complementarity in the semiconductor supply chain – between Malaysia's growing ATP cluster and Singapore's increasing share in fabrication – and their geographic advantage to effectively manage supply chains, make the two countries attractive for chip manufacturing companies from across the globe, particularly as the US-China rivalry intensifies. Their proximity has helped combine their distinct strengths and reduce supply chain disruptions. Singapore's stable power grids, advanced water treatment and waste management systems, efficient transportation and logistics infrastructure have enhanced its attractiveness as an FDI destination and semiconductor hub.

Malaysia has consistently done well for the ease of doing business, ranking among the world's top 20. To tap into their assets together, in 2025, Malaysia and Singapore launched the Johor-Singapore Special Economic Zone (JS-SEZ), projected as an opportunity for investors to leverage the complementing strengths of the two neighbours. If done well, this could indeed boost both Malaysia's and Singapore's ability to hedge in times of turbulence.

High Ambitions and Shared Challenges

Taiwan and Malaysia are both vital partners for the US in the semiconductor supply chain. In 2022, Malaysia contributed 23 percent of US chips trade and until 2024, Malaysia was the largest chip supplier for America. Last year, thanks to its manufacturing ability to meet the American economy's growing need in advanced semiconductors, Taiwan overtook Malaysia and is now its number one supplier of

advanced chips. Taiwanese semiconductor companies underpin the growth of the US digital economy, making it inextricably linked to the health of key US industries.

Taiwan and Malaysia are also key partners supporting the EU's digitization. The EU Chips Act, which entered into force on 21 September 2023, was designed to double the EU's global market share in semiconductors from 10 percent to at least 20 percent by 2030. According to the European Commission, the aim is to create a state-of-the-art European chips ecosystem, which would include chip production and research and innovation, and create the conditions for industrial investment in Europe. The Act also focuses on supply chain resilience by strengthening cooperation with those who share the same values and can be trusted, and by developing intelligence to monitor supply chains and setting up alert mechanisms for stakeholders to manage chip shortages.

With the Chips Act, the EU has turned to large-scale subsidies, as did the US with its own CHIPS and Science Act, both seeking to localize semiconductor production. Both consider Taiwan as a like-minded partner of strategic importance. As Taiwan's experience has shown, subsidies are just a part of its success story. Taiwan's investment in its comprehensive semiconductor ecosystem over four decades, strategic foresight that relied on state planning, private sector innovation, as well as talent reintegration are factors that have together led to Taiwan's semiconductor success.

At present, the semiconductor industry is a key pillar of Taiwan's economy. In 2023 alone, the total output value of the industry was USD 139 billion, or 18.4 percent of its GDP. Taiwan's response to the semiconductor shortage caused by the pandemic offers further lessons to Europe. As such, Taiwan focused on attracting and retaining talent. In 2021, the government passed the National Key Fields Industry-University Cooperation and Skilled Personnel Training Act, establishing specialized research colleges through a joint undertaking between public universities and private companies at the forefront of research. These colleges would help industries to cooperate more effectively with academic institutions, and universities can promote innovation and expand recruitment of highly skilled talent.

Malaysia also has high regional ambitions when it comes to its place in ASEAN, just as it continues to hedge amid great power rivalry. Its aspirations go beyond the region, as it seeks to leverage its excellence in the semiconductor industry on the global stage, guided by the New Industrial Master Plan (NIMP) 2030 and the National Semiconductor Strategy. NIMP 2030 identified the potential of REE and aims to tap into these, treating them as a game changer for the country, but only if backed by the private sector, including both foreign and domestic investors. This also underpins the mission of the Malaysian Investment Development Authority in Kuala Lumpur. MIDA is the central government's investment promotion and development agency under the Ministry of Investment, Trade and Industry (MITI) that oversees and drives investments into the manufacturing and services sectors.

The state of Penang has ambitious plans too, which is to move up the value chain by tapping into the front end chip manufacturing supply chain, including wafer fabrications, advanced testing and packaging, and integrated circuit design. The goal is to modernize its OSAT expertise, and grow its chip fabrication capabilities, particularly in power semiconductors, key for technologies like electric vehicles or EVs. This is not going to be easy. Penang – its local government, and domestic and international companies alike – must navigate growing geoeconomic challenges shaped by unpredictable geopolitics.

The Talent Shortage Problem

Addressing the demands of an ever-changing industry, including growing demand for talent, is likely to become an even bigger challenge, as the world continues to face a severe talent shortage. Any expansion plans for chip production, whether in Europe or ASEAN, will depend on securing skilled workforce. In other words, scaling up in the semiconductor industry is not possible without investing strategically in talent, a challenge that Malaysia and Taiwan are both all too familiar with.

According to Taiwan's Ministry of Education, Malaysian students are the third-largest number among its international students. Through partnerships in advanced technological and vocational training and education, Taiwan could support Malaysia in addressing its brain drain and help retain its talent. Effective talent cultivation through brain circulation between the two economies can also help address Taiwan's own brain drain in engineers. Domestically, a reduction in its STEM graduates, low fertility rate and an aging population, externally intensified global competition for talent, have further challenged Taiwan's overall talent pool.

To effectively address the needs on both sides and cultivate talent however, encouraging jointly developed and strategic partnerships is vital. Malaysian and Taiwanese industry-academia collaboration in the field of STEM, supported by government initiatives will be necessary. Both Taiwan and Malaysia need trustworthy and reliable partners in order to stay ahead in the highly competitive semiconductor industry. It is a joint interest to leverage skills, to upskill and reskill existing talent capabilities, focus on talent recruitment and retention, and be bold in talent acquisition and alternative talent pool development across industries.

Still Hedging

Trump's self-professed "liberation day" tariffs have undermined the "China plus one" approach that many Asian manufacturers had embraced under Trump 1.0 in order to

diversify supply chains. In 2019, many tech manufacturers relocated production of goods for export from China to Southeast Asia. In 2025, the locations where factories were built are bracing for shocks by new tariffs. Taiwanese firms manufacturing in Malaysia may not be safe. What is now needed is modularizing regional supply chains and building in greater flexibility in the production network.

Its location, tech expertise, and refraining from choosing sides have made Malaysia attractive to great powers. Its leadership in cutting-edge industries, which took decades and international partnerships to cultivate, has enabled Taiwan to gain international space despite its diplomatic isolation. The domestic semiconductor industries of Taiwan and Malaysia remain key economic assets for US commercial and strategic interests. Their position in the Indo-Pacific, in the proximity of key hubs for electronics manufacturing, will likely secure them leading positions.

The truth is, there is no going around ASEAN – or Taiwan – for any great power that wants to secure a dominant position in the region. This is valid for both China and America. ASEAN is no less important for the EU.

Mindful of these dynamics, Malaysia knows its value and will continue to hedge between China and America, as suggested by its political leadership. No one can dictate Malaysia's stance on China or the US, Prime Minister Anwar Ibrahim said. Along the same lines, Singapore's Prime Minister Lawrence Wong said that ASEAN has the ability to shape its own destiny. He also added that it is not about balancing between two superpowers, but it's about "being consistent and principled in advancing and promoting Singapore's interests".

Hedging lies at the core of ASEAN countries' identity, albeit it is not a posture free of challenges, as other experts have pointed out. Defined as insurance-seeking behaviour under situations of high uncertainty, hedging has allowed Malaysia to avoid taking sides and pursue measures vis-à-vis great powers to have a fallback position. At its core, hedging is a risk mitigation strategy that states adopt to signal ambiguity vis-à-vis external powers and to maximize autonomy in foreign relations.

As the US-China geostrategic rivalry continues to intensify under Trump 2.0, the incentives for Malaysia to hedge against increasing uncertainties will also grow. Beijing's weaponization of its dominance over mining and processing of critical minerals further intensifies trade tensions with the US, leaving others scrambling for fresh supplies. Among the minerals China banned are some that Malaysia is also rich in, namely Dysprosium. In the long-run, Malaysia could offer more secure REE alternatives, which could help to position itself better and use this as leverage to push for tariff cuts, thus strengthening its bargaining position.

At the same time, Malaysia has to consider Washington's demand to lower PRC content in its supply chains, and keep these as "clean" as possible in order to secure

that ties with Washington remain strong. Washington has feared that Malaysia might serve as a backchannel for Chinese firms to access restricted chips. In fact, as reported by the Wall Street Journal in June 2025, claims have emerged that Chinese engineers may have accessed high-end Nvidia chips in Malaysia by renting data centres in order to train their AI models, potentially breaching US export controls. Malaysian trade authorities have launched an investigation.

The growing geostrategic rivalry will also worsen Taiwan's strategic dilemma. Rising threats from China combined with uncertainty from Washington, its primary security provider, will likely force Taiwan to hedge against the risk of being abandoned by America. Taiwan is diversifying its relationships and is already investing in its resilience. President Lai Ching-te's Whole-of-Society Defense Resilience Committee aims to better equip society, the government and the economy to withstand shocks.

Malaysia and Taiwan are examining their options to secure resilient supply chains, as they remain closely tied to both the US and Chinese markets. Seen from this angle, business cooperation in the semiconductor industry between Malaysia and Taiwan will likely involve hedging against global disruptions. This is going to be shaped by how their leaders respond to uncertainty, by what companies consider to be in their best economic interest, and by the extent to which they can keep the PRC out of their supply chains.

Policy Recommendations to Amplify Strategic Complementarities

Against the backdrop of geopolitical risks, business partnerships that are trust-based, mutually beneficial, and sustainable are highly sought after, but hard to come by. Malaysia and Taiwan have benefited from semiconductors cooperation. They both localized knowledge to gain their respective competitive positions, and secured strong clustered domestic sourcing, which has enabled suppliers and manufacturers to operate in close proximity. Malaysia and Taiwan rely on a complex supply chain, in which Europe has an important role to play, namely in the production of specialized chemicals and machine tools. It is in Europe's interest to keep investing strategically in these regional dynamics, and amplify complementarities in order to better position itself.

The EU must project itself as a stable, innovation-driven, and value-aligned semiconductor partner to Malaysia and Taiwan. Initiatives, such as the EU Chips Act, the Digital Partnership with Singapore, and the Semiconductor Coalition are solid tools the EU and member states must use strategically. First, given its high reliance on semiconductor expertise in Taiwan and parts of ASEAN, and their shared affinity in values and interests, the EU must amplify semiconductor complementarities both

bilaterally and region-to-region**.** A thorough understanding of regional dynamics will help identify weak links in the supply chain, and help anticipate and avoid future disruptions.

Second, the EU and member states must stay focused on creating highly integrated local supply chain ecosystems that internally rely on cooperation between governments, industry and research institutions, and externally on like-minded partners. Considering Taiwan's and Malaysia's expertise, the EU and member states should engage in regular targeted exchanges with relevant regional stakeholders with experience in developing ecosystems. Bilateral exchanges with Taiwan and Malaysia should include a dedicated focus in this regard.

Finally, the EU and member states must prioritize talent cultivation, where Taiwan and Malaysia both have valuable experience, but face challenges. The EU and member states should strengthen their focus on industry-academia collaboration and support it with government initiatives. The EU, Malaysia and Taiwan are bound by complementarities. Amplifying these will boost resilience in the EU, ASEAN, and the broader Indo-Pacific, with Taiwan at its core.

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