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Challenges Faced by TSMC and Its Suppliers in Expanding to Europe

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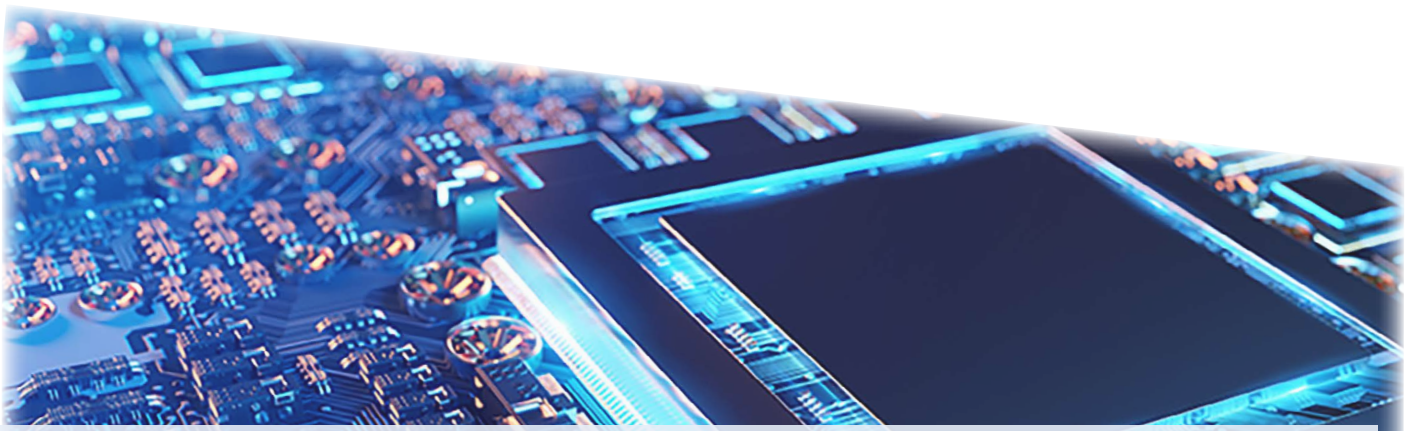

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The semiconductor shortage caused by the COVID-19 pandemic resulted in the European Chips Act (ECA). The ECA was first proposed in February 2022 aiming to double the European Union's (EU) global market share in semiconductor manufacturing to 20 percent by 2030. The ECA opens a door for Taiwanese companies to reposition their geopolitical strategy. In August 2024, the first Taiwan-invested semiconductor fabrication plant (fab) broke ground in Dresden, Germany. It will specialize in producing mature chips for automation and electrification in the automotive and industrial sectors. Taiwan Semiconductor Manufacturing Company (TSMC) and its suppliers' overseas expansion in Germany and its neighboring countries are affected by ECA-mandated subsidies, Taipei's foreign policy and the local business environment. Even though the construction of the fab in Dresden has started, the road is far from smooth. This issue brief examines the hurdles in achieving profitability and sustainability by analyzing the political factors driving Taiwan's semiconductor firms' international expansion, TSMC's struggles to navigate the business environment in Germany, and the hesitation of TSMC's suppliers to expand in the EU. The challenges include high production costs, potential labor conflicts, lack of a local support system, and uncertain future market demand.*

Introduction

Taiwan Semiconductor Manufacturing Company (TSMC) has led the expansion of Taiwan's semiconductor industry into Europe through its investment in Germany. In August 2023, TSMC announced its investment in European Semiconductor Manufacturing Company (ESMC), a joint venture with Robert Bosch GmbH, Infineon Technologies AG, and NXP Semiconductors N.V. In August 2024, the European Commission (EC) approved €5 billion in German state subsidies to support the construction and operation of the €10 billion manufacturing plant in Dresden.[1] Former German Chancellor, Olaf Scholz, and President of the European Commission, Ursula von der

* European Commission, "European Chips Act," https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-chips-act_en (accessed March 19, 2025).

Leyen, attended the groundbreaking ceremony for ESMC's fab.[2] Dresden, the capital of a region known as Silicon Saxony, was chosen for its role as Europe's semiconductor manufacturing hub. The region is home to major semiconductor companies, including Infineon, Bosch, and GlobalFoundries, and comprises a cluster of over 2,500 companies.[3]

The EU views the establishment of a fab in Germany with a potential supply chain connected to neighboring countries like the Czech Republic as a promising project, though concerns remain about its feasibility and long-term impact. This issue brief examines the challenges ESMC faces in achieving profitability and sustainability by analyzing the political factors driving Taiwan's semiconductor firms' international expansion, TSMC's struggles to navigate the business environment in Germany, and the hesitation of TSMC's suppliers to expand in the EU.

Political Factors behind Overseas Expansion of Taiwan's Semiconductor Industry

Political considerations are one of the major reasons that Taiwan's semiconductor firms are expanding business abroad. By extending Taiwan's "silicon shield" abroad, Taipei expects to strengthen its strategic value in the international community. Taipei has proactively encouraged Taiwan's semiconductor firms to set up operation in the U.S., Japan, and the EU. Compared to the U.S. and Japan, the EU has less political leverage over Taiwan even though Taipei is proactively facilitating its collaboration with Prague. The level of political influence is partially reflected in how TSMC and its suppliers proceed with their overseas investment plans.

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TSMC's Dresden project remains relatively small compared to its ventures in the U.S. and Japan, and there is no indication of future expansion plans in the EU. Additionally, despite the EU subsidizing 50 percent of ESMC's construction and operational costs in Dresden, TSMC has shown greater commitment to expanding in Japan and the U.S., where subsidies are comparatively lower. In Japan, Japan Advanced Semiconductor Manufacturing, Inc. (JASM), a TSMC-led joint venture, kicked off mass production in late 2024 and is set to expand with a second fab in Kumamoto Prefecture, scheduled to start operations in late 2027.[4] TSMC's total investment in Japan exceeds $20 billion, with the Japanese government providing $8 billion in subsidies.[5] In the U.S., TSMC Arizona's first fab began mass production of 4-nm process technology in early 2025, with plans to start 2-nm and 3-nm production at a second fab in 2028.[6] Additionally, TSMC Arizona has announced a third fab in Arizona to manufacture 2-nm or even more advanced chips.[7] In March 2025, TSMC further announced a $100 billion investment plan in the U.S. The U.S. government has so far provided $6.6 billion in subsidies,[8] although President Trump is calling for an end to the bipartisan Chips and Science Act approved in 2022.[9]

Building the semiconductor industry in Arizona with limited subsidies, extremely high production costs, labor conflicts, and a lack of skilled workers has been challenging for TSMC. As a result, the commencement of mass production in Arizona's first fab was delayed from late 2024 to early 2025.[10]

Despite the business environment difficulties, TSMC is continuing its efforts in the U.S. due to Washington's strong political influence over Taiwan and Taipei's proactive facilitation of TSMC's expansion. As the leading military equipment supplier, the U.S. could use Taiwan's national security and its support for Taiwan's democracy as leverage to push Taipei into facilitating the export of its advanced semiconductor process technology to the U.S. Moreover, the unpredictability of how the Trump administration proceed with its tariffs on chips is also driving TSMC to expand its business in the U.S.

In terms of Japan, it is a long-time supportive neighbor of Taiwan and a counterweight to China's regional power, offering a more favorable environment with an active semiconductor market, established industry networks, and cultural similarities. Additionally, with strong support from the Japanese government, the construction and operation of the manufacturing plants in Kumamoto Prefecture have proceeded smoothly without any delays.

In comparison, the EU's relatively weak political influence on Taiwan and the lack of local government support reduce the urgency and willingness of Taiwan's semiconductor companies to develop operations in the EU. However, to deepen relations with like-minded partners through exporting its silicon shield, the Taiwanese government continues to support exploring opportunities for expansion in Europe, with a key focus on the Czech Republic. Taipei and Prague's growing relations play an important role in facilitating the expansion of Taiwan's semiconductor firms in the EU.

Diplomatic Push for a Semiconductor Cluster in the Czech Republic

In late 2021, Taiwan's National Development Council led a delegation to Slovakia, Lithuania, and the Czech Republic to explore technological collaboration, including in semiconductors.[11] A few months later, the EU introduced the ECA, welcoming Taiwan as a partner. In response, Taiwan's Ministry of Foreign Affairs expressed its willingness to strengthen trade and investment ties between Taiwan and the EU, indicating that Taipei was keen to leverage the opportunity to deepen its relations with like-minded partners through economic and technological collaboration.[12]

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In December 2024, the Ministry of Economic Affairs (MOEA) announced the opening of the Taiwan Trade and Investment Service Center in the Czech Republic, aiming to facilitate Taiwanese enterprises' expansion within the EU.[13] To further break down the barrier for Taiwanese semiconductor manufacturers and suppliers to establish their businesses in the Czech Republic, Prague entitles Taiwanese to work in the country without a work permit and employment card since March 2025.[14] This signals Prague's eagerness to attract Taiwanese firms. Moreover, the country was selected as a location for overseas manufacturing parks, alongside Japan and the U.S., due to its lower labor costs, proximity to Dresden, and close ties between Taipei

and Prague, highlighted by increasing high-level visits between Czech and Taiwanese officials and semiconductor company representatives.[15]

Despite the Taiwanese government and several companies fostering close relationships and actively negotiating with the current Czech government to further develop a semiconductor cluster, the upcoming parliamentary election in the Czech Republic in October 2025 introduces uncertainty about how the next government may approach Taiwan-related issues.[16] The main opposition party, ANO, has shown little interest in deepening collaboration with Taiwan, focusing more on internal issues within the Czech Republic and the EU. The divergence of opinions within the Czech government was also shown in 2020 when the former Czech President Miloš Zeman criticized the visit of the Senate President Miloš Vystrčil to Taiwan, calling it "a boyish provocation."[17]

The political uncertainty has also been reflected in delays of bilateral initiatives, including the opening of a Taiwan Chip-Based Industrial Innovation Program Office in Prague (CBI-Prague Office). Originally expected to open in September 2024, the office's launch had been postponed to February 2025.[18] Since February 2025, the delays have continued with no further details provided.

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TSMC's Challenges in Navigating Saxony's Business Environment

The success of Taiwan's semiconductor industry in technological advancement, industrial development, and talent cultivation is closely tied to state policies, connections to foreign talents, competitive production costs, and work culture. Germany may struggle to enhance its supply chain security due to its different preconditions, including bureaucratic complexities, high production costs, a lack of a local support system, and the deterioration of German auto industry.

Taiwan began developing its semiconductor industry in the 1970s under an authoritarian regime, which allowed the state to make swift decisions and provide significant resources and support to the industry.[19] Additionally, overseas Taiwanese (Chinese nationals who recognized the Republic of China) served as a bridge to introduce expertise in semiconductor technology to Taiwan.[20] This connection, combined with state-driven policies, significantly accelerated the industry's establishment, enabling a semiconductor industrial cluster to be built within a relatively short period of time.[21]

Unlike Taiwan in the 1970s, where the government could act swiftly, Germany nowadays presents a more complex decision-making environment. TSMC's joint venture in Germany nearly collapsed after the German court had declared the original funding plan unconstitutional.[22] In addition, according to the ifo Institute's research, Germany's "excessive bureaucracy costs Germany up to €146 billion a year in lost economic output."[23] These challenges indicate the German government's

limited capability to support the development of the semiconductor industry, which leads to compromised efficiency and low cost-effectiveness—essential elements for establishing and sustaining the semiconductor industry.

Beyond bureaucratic challenges, production costs in Germany are less competitive compared to neighboring Czech Republic. Kuo Jyh-huei, Taiwan's Minister of Economic Affairs and former Chairman of Topco Scientific Co., Ltd. (TSC, 崇越科技), pointed out that the cost of establishing a semiconductor hub in the Czech Republic could be as low as in Japan, possibly even slightly lower, with costs being 1.5 to 2 times higher than building a fab in Taiwan.[24] In comparison, ESMC's production costs in Germany are expected to be significantly higher, since local energy prices are among the highest in the EU and far exceed those in many Asian countries hosting major semiconductor manufacturers. Concerns exist about the sustainability of high energy-demand industries in Germany if the government cannot offer long-term subsidies.[25] This uncertainty may further destabilize ESMC's production plans and lead to fluctuating future production costs.

Regarding labor costs, like many other well-developed Nordic and Western European countries, Germany offers relatively high wages, long vacations, and more flexible working conditions. In 2023, the average annual full-time adjusted salary per employee in Germany was €50,988, which is significantly higher than in the neighboring Czech Republic, where the average wage was €23,454.[26] Meanwhile, most laborers in European countries, including Germany and the Czech Republic, are entitled to at least 20 days of annual leave, whereas in Taiwan, laborers must remain with the same company for 15 years to receive similar benefits.[27] The extended vacation time inevitably increases labor costs, as additional workers may be required during the peak vacation seasons.

Beyond wages and benefits, work culture differences pose another challenge. Employees in Taiwan's semiconductor industry are known for their flexibility and responsiveness in addressing production issues, often being expected to remain on call or to be able to return to work whenever necessary. In Saxony, Taiwanese employers may find it difficult to continue this work culture since Germany enforces stricter labor rights protection led by its strong workers' unions. Similar labor-related challenges have already emerged in Japan and the U.S. Reports indicate that many Japanese employees at JASM usually do not work overtime, unlike their Taiwanese counterparts.[28] In the U.S., TSMC Arizona faced a lawsuit alleging discriminatory hiring practices favoring East Asian workers, often Taiwanese or Chinese nationals.[29] This indicates that the Taiwanese employers prefer to maintain the original work culture.

> ***"Apart from TSMC's investment plan in Dresden, its suppliers' investment intentions play a crucial factor in forming an ecosystem and cluster for operating the fab in Dresden. Without seamless collaboration with suppliers, TSMC cannot produce chips with high cost-efficiency.***

Given the high energy price, high labor costs, and potential labor conflicts, ESMC may struggle with maintaining cost efficiency. With the EU's subsidies for construction and operation, ESMC may not need to address this challenge immediately. However, if ESMC's future operations continue to depend heavily on financial support from the EU and Germany, its long-term operational sustainability in the absence of subsidies could be

a critical concern.

In addition, the feasibility of developing support systems such as housing, education, and local transportation remains unclear. The Lord Mayor of Dresden stated that to meet the housing need of 10,000 new apartments for incoming workers, Dresden will collaborate with surrounding communities. He also expressed hope that TSMC would build its own staff housing to align with the planned mass production launch in 2027.[30] So far, TSMC has not officially responded to these issues, implying that the challenges might not be resolved soon. In addition, Germany's high construction costs have already slumped the residential construction market in the past few years.[31] The high interest rate and material costs have led to a substantial decline in residential building permits, which fell by 46.9 percent in March 2024 compared to March 2022.[32] Under such critical construction conditions, TSMC might face additional costs while establishing its local infrastructure and risk having to commence operations in 2027 without sufficient support systems for its employees if Germany cannot further provide an effective solution.

Moreover, the falling profits in the German auto industry may make TSMC and its suppliers reconsider their investment plans in the EU since one of ESMC's main products will be automotive chips. Given that electric vehicles (EVs) require at least twice as many chips as internal combustion engine (ICE) vehicles, the growing EV market might increase chip market demand in Germany and the EU.[33] However, to reach that point, German automakers must first overcome the challenges of falling sales performance and high production costs, which are currently weakening the industry. This rocky situation casts a shadow on ESMC's future automotive chips market in Europe as it will likely face fluctuating demand from major European automakers, including VM group (Volkswagen, Porsche, Skoda, Audi, and Seat), Mercedes-Benz, and BMW. At the same time, Stellantis (Fiat, Chrysler, and Peugeot), another major European automaker that potentially could be one of ESMC's future clients, is also exhibiting unstable sales performance.[34]

> ***"It is uncertain whether TSMC and its suppliers will continue with their planned EU expansion. It also remains unclear whether the Taiwanese government can continuously push its semiconductor companies to expand in like-minded countries without sufficient economic returns.***

In sum, inefficient bureaucracy, high energy and labor costs, differences in work culture, a lack of local support systems, and the uncertain prospects of the German auto industry pose barriers to TSMC's expansion in Germany. These challenges may result in construction and operation delays or even temporary halts.

TSMC Suppliers' Hesitation: High Costs and Underdeveloped Semiconductor Ecosystem

Apart from TSMC's investment plan in Dresden, its suppliers' investment intentions play a crucial factor in forming an ecosystem and cluster for operating the fab in Dresden. Without seamless collaboration with suppliers, TSMC cannot produce chips with high cost-efficiency.

TSMC suppliers' reactions to TSMC's expansion in Japan, the U.S., and Germany differ. In the U.S., TSMC has faced difficulties in attracting suppliers due to high costs. For instance, chemical materials

suppliers like Chang Chun Group (CCPG,長春集團) initially planned to set up facilities in the U.S. but later found that transporting materials from Taiwan was more cost-effective. In addition, in November 2024, Gudeng Precision Industrial Co., Ltd. (Gudeng, 家登) decided against constructing a facility in the U.S. due to high production costs.[35] As a result, many suppliers opted to open branch offices to support their core business rather than building full-scale facilities. On the contrary, TSMC's suppliers are willing to expand to Japan. In April 2024, with existing supply chain networks and clients, Gudeng announced plans to build facilities in Japan, set for completion by 2026.[36]

Compared to Taiwanese suppliers' clear investment intentions in the U.S. and Japan, the EU is an uncertain destination. For example, Gudeng has considered expanding to Germany. However, it is unclear whether the company will make a move since the costs are higher and the semiconductor ecosystem and market are relatively underdeveloped there. To mitigate high costs, some suppliers are eyeing the Czech Republic. The material and manufacturing equipment supplier TSC plans to set up an office in Dresden and a warehouse in the Czech Republic, while fab constructor Marketech International Corporation (MIC, 帆宣) is weighing options between Germany and the Czech Republic, with the latter being a more likely choice due to cost concerns.[37]

It is noteworthy that Germany often expresses its determination to build a semiconductor cluster in Saxony, despite Taipei and most Taiwanese suppliers looking at the Czech Republic instead. Although free movement within the EU is easy, Germany would ideally prefer to foster a domestic semiconductor cluster rather than extending it to neighboring countries. However, high production costs in Germany and the strong support from the Taiwanese and the Czech governments have made the Czech Republic a more attractive option for Taiwanese semiconductor suppliers. Meanwhile, Germany has reluctantly promoted TSMC suppliers' expansion into Germany. Instead, it continues to emphasize that the ESMC could create a large job market, which is crucial for German industries and the EU's supply chain resilience. The lack of concrete plans to tackle the abovementioned challenges suggests that Germany has difficulties in solving challenges posed by the ESMC fab project in Dresden and is hesitant to move closer to Taiwan diplomatically. In other words, Germany's passive attitude cannot effectively resolve the hesitation of TMSC's suppliers.

Conclusion and Implications

The expansion of semiconductor companies depends not only on practical factors, such as costs, subsidy policies, and existing markets and networks, but also on political considerations. In comparison to the U.S. and Japan, and the Czech Republic, Germany lacks advantages in both practical and political factors. Therefore, Germany has to subsidize half of the construction and operation costs to attract TSMC to set up operations in Dresden while risking losing ESMC's suppliers to the Czech Republic.

For TSMC, overseas expansion typically aims to lower production costs and maximize profits, making high market demand and abundant subsidies essential. However, high production costs, missing suppliers, potential labor conflicts, lack of local support systems as well as an unstable demand from the German automotive industry leave TSMC with limited room to operate in Germany. Therefore, it is uncertain whether TSMC and its suppliers will continue with their planned EU expansion. It also remains unclear whether the Taiwanese government can continuously push its semiconductor companies to expand in like-minded countries without sufficient economic returns.

Given the abovementioned challenges in the future profitability and sustainability of the semiconductor supply chain in the EU, TSMC has to figure out how to generate sufficient economic returns and

attract its suppliers to follow in its steps under such a critical business environment. If TSMC attempts to address issues by relying on continued subsidies, it could become a financial burden and further exacerbate Germany's economic problems. This is likely to occur despite the German government's decision to amend its constitution to allow for higher debt brake limits, which enables increased infrastructure investment.[38]

In March 2025, EU member-states urged the EC to propose "Chips Act 2.0" to address the difficulties of attracting meaningful investment from advanced chipmakers.[39] It reflects the obstacles and uncertainties TSMC has encountered in Saxony. The EU and Germany must reassess how to balance their ambition to restructure and reinforce the supply chain while maintaining access to affordable semiconductor products. This raises critical questions, including whether Germany can overcome the challenges of cost efficiency to restructure the semiconductor supply chain successfully and whether it is willing to invest more or make sacrifices to achieve the goal.

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