



# SCENARIO EXPLORATION – LOSING TAIWAN’S CHIPS – SUPPLY CHAIN BUSINESS COUNCIL

Scenario: Is losing computer chip and other production in Taiwan a ‘real risk’ in supply-chain terms?

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## In summary

Rising Trend is for a potential loss or major disruption of chip production in Taiwan.

The potential loss of chip production in Taiwan is a rising trend driven by escalating geopolitical tensions and strategic movements by global powers. This analysis corroborates using credible U.S. and non-U.S. sources. The strategic competition between the U.S. and China is a significant factor affecting Taiwan's semiconductor industry. The U.S. has implemented export controls on advanced chip technologies to China, underscoring the tech rivalry's impact. Increased military activities by China towards Taiwan add to the uncertainty.

Countries like the U.S. and regions such as Europe are investing heavily in local semiconductor manufacturing to reduce reliance on Taiwan. China's drive for semiconductor self-sufficiency poses another threat to Taiwan's semiconductor dominance. Efforts to mitigate these risks through diversification and local investments in semiconductor manufacturing are underway globally. This trend is well-supported by both U.S. and non-U.S. sources, which consistently highlight the critical factors contributing to the increasing risk.

## ***If there was a major shortage of computer chips from Taiwan, what would be the global consequence of that?***

Overall, the global dependence on Taiwanese semiconductors highlights the critical need for diversifying production and investing in resilient supply chains to mitigate the risks associated with such concentrated production capabilities. A major 'un anticipated' chip shortage from Taiwan would have far-reaching consequences across multiple industries and economies, highlighting the critical importance of semiconductors in the modern world and the vulnerabilities of the current global supply chain.

- 1. Automotive Industry:** The automotive sector would be most severely impacted. Modern vehicles rely heavily on dedicated chips for various functions, from engine control to infotainment systems. A shortage could lead to production delays, increased costs, and reduced availability of new vehicles. This was evident during the COVID-19 pandemic when chip shortages resulted in the loss of millions of vehicles in production, causing significant financial losses for automakers ([CNA](#)) ([The Independent](#)).
- 2. Consumer Electronics:** Devices such as smartphones, laptops, gaming consoles, and home appliances would face supply constraints. Companies like Apple, Samsung, and Sony would struggle to meet consumer demand, leading to higher prices and longer wait times for products like iPhones, PlayStations, and other high-demand electronics ([CNA](#)).
- 3. Broadband and Networking:** The rollout of broadband services and 5G infrastructure could be delayed due to shortages in networking equipment. This could hamper efforts to improve internet connectivity, particularly in remote or underserved areas, impacting remote work, online education, and other digital services ([CNA](#)).
- 4. Global Economy:** A prolonged chip shortage could disrupt global supply chains, leading to inflationary pressures as the cost of electronic goods rises. The interconnected nature of modern economies means that a shortage in one sector can have ripple effects across various industries, slowing economic growth and recovery efforts post-pandemic ([The Independent](#)).
- 5. Geopolitical Tensions:** The shortage would likely intensify geopolitical tensions, particularly between the US and China, as both nations vie for technological supremacy and secure their supply chains. Countries might accelerate efforts to build their own semiconductor manufacturing capabilities, a process that could take years and require substantial investment ([CNA](#)) ([The Independent](#)).

## ***Is there any evidence that supply chain businesses could subvert political actions in a worst case scenario?***

While businesses can take significant steps to mitigate the impacts of political actions on supply chains through diversification, compliance, resilience building, and technological investments, completely subverting such actions remains a challenge. The ongoing need for strategic planning and adaptability is crucial for maintaining supply chain security in an increasingly volatile geopolitical environment.

### **Evidence of Mitigation Strategies:**

- 1. Scenario Planning and Diversification:** Companies are increasingly engaging in scenario planning to prepare for various geopolitical risks. This involves evaluating potential political disruptions and planning alternative supply routes and sources to maintain continuity. Diversifying the supply base beyond politically volatile regions is a key strategy many businesses are adopting ([Foley & Lardner LLP](#)) ([Marsh Broker](#)).
- 2. Compliance and Adaptation:** Companies are also focusing on strict compliance with international sanctions and regulations. For instance, the U.S. government's sanctions against certain Chinese products due to forced labor allegations have forced businesses to enhance their supply chain transparency and due diligence ([Foley & Lardner LLP](#)).

**3. Resilience Building:** Developing a resilient supply chain is crucial. This includes building buffer stocks, increasing inventory, and investing in local or regional production facilities to reduce dependency on any single country. These measures help companies better withstand sudden political disruptions ([Marsh Broker](#)).

**4. Technological Investments:** Leveraging advanced technologies like AI and blockchain can enhance supply chain visibility and traceability, helping companies quickly adapt to changes and maintain operations despite political upheavals ([Marsh Broker](#)).

### Challenges in Subverting Political Actions:

Despite these strategies, fully subverting political actions is complex. Governments hold significant power to enforce sanctions, tariffs, and export controls, which can drastically alter business operations. The geopolitical landscape's unpredictability means that businesses must continuously adapt and cannot always anticipate every action.

## ***Is the supply-chain industry secure in its future or at risk from political actions?***

The future security of the global supply chain industry is complex and multifaceted, with significant risks stemming from political actions and geopolitical tensions. In summary, the potential loss of chip production in Taiwan is a real and significant risk that has prompted companies and governments to rethink their supply chain strategies. Efforts are being made to build more resilient, diversified, and technologically advanced supply chains to mitigate the impact of such geopolitical risks ([KPMG](#)) ([McKinsey & Company](#)) ([BCG Global](#)).

The potential loss of chip manufacturing in Taiwan by 2027 represents a significant risk to the global supply chain. Taiwan, particularly through TSMC, is critical in producing advanced semiconductors, which are essential for various industries including automotive, consumer electronics, and more. Any disruption could have severe repercussions globally.

### Geopolitical Risks and Supply Chain Stability

Geopolitical tensions, especially between China and Taiwan, pose a substantial threat. The ongoing uncertainty could disrupt not just the supply of chips but also affect global trade and economic stability. Many countries and companies are already feeling the impact of past supply chain disruptions and are taking steps to mitigate these risks by diversifying their sources and increasing local production capacities ([KPMG](#)) ([BCG Global](#)).

### Impact of Disruptions

The impact of a significant disruption in Taiwan's semiconductor production would be profound. During the 2021 chip shortage, industries like automotive experienced substantial production declines. A more severe disruption could halt production lines, increase costs, and delay product releases across various sectors ([KPMG](#)) ([McKinsey & Company](#)).

### Supply Chain Strategies

To address these risks, companies are shifting from "just-in-time" to "just-in-case" strategies, holding more inventory, and diversifying suppliers. Regionalisation and nearshoring are gaining traction, as companies aim to reduce dependency on single sources and bring manufacturing closer to end markets ([McKinsey & Company](#)) ([BCG Global](#)).

### Technological Investments and Resilience

Investment in digital technologies is also a key strategy for enhancing supply chain resilience. Companies are focusing on improving visibility, scenario planning, and data management to better predict and manage disruptions. Technologies like AI, blockchain, and cloud-based systems are becoming integral to modern supply chain management ([KPMG](#)) ([McKinsey & Company](#)).

## ***Are Taiwanese chip companies able to turn-off manufacturing if China occupies the country?***

It is valid that Taiwanese chip companies have the capability to turn off manufacturing if Chinese troops were to invade. Both the Taiwan Semiconductor Manufacturing Company (TSMC) and the Dutch company ASML have installed fail-safes that can be activated remotely to cease chip production in such an event. This measure is part of broader efforts to safeguard the critical semiconductor industry and prevent China from potentially hijacking production lines ([TechRadar](#)) ([SiliconFit](#)).

These precautions come amid heightened tensions between China and Taiwan, especially following the election of pro-independence President Lai Ching-te. The United States has also expressed concerns over the security of semiconductor manufacturing in Taiwan, investing heavily in domestic chip manufacturing through initiatives like the CHIPS Act to reduce reliance on Taiwanese production and mitigate risks of espionage or sabotage ([TechRadar](#)) ([SiliconFit](#)).

## **How long to restore chip manufacturing if ASML and TSMC decommission their factories, assuming not destroyed with explosives?**

Estimates for how long it would take China to restore chip manufacturing capabilities in Taiwan, assuming the facilities are decommissioned but not destroyed, range from several years to over a decade. This timeline could be extended by international political and economic pressures. Restoring chip manufacturing in Taiwan after a decommissioning by TSMC and ASML would be a highly complex and time-consuming process, even if the facilities were not physically destroyed. Various factors contribute to this complexity:

- 1. Technical Expertise and Intellectual Property:** The intricate process of semiconductor manufacturing requires highly specialised knowledge and proprietary technology. Taiwan’s chip industry, particularly TSMC, is at the forefront of semiconductor technology, possessing unique intellectual property that is not easily replicated. China would need to acquire this expertise, which could take years, if not decades, to develop independently ([TechRadar](#)).
- 2. Equipment and Infrastructure:** Semiconductor manufacturing relies on highly sophisticated equipment, much of which is supplied by ASML. Recommissioning this equipment involves more than just turning it back on; it requires precise calibration and the availability of highly specialised parts and tools, many of which are tightly controlled by international regulations ([TechRadar](#)) ([SiliconFit](#)).
- 3. Supply Chain and Materials:** The semiconductor supply chain is incredibly complex and global. Key materials and components are sourced from multiple countries. Re-establishing a functional supply chain would be a significant logistical challenge, especially under potential international sanctions or trade restrictions ([TechRadar](#)).
- 4. Regulatory and Geopolitical Barriers:** Given the geopolitical sensitivity surrounding Taiwan, any attempt by China to restart these facilities would likely face significant international opposition and potential sanctions. This could severely limit access to necessary equipment, technology, and materials from global suppliers ([SiliconFit](#)).
- 5. Human Capital:** Semiconductor manufacturing requires a highly skilled workforce. Recruiting and training the necessary personnel would be a major hurdle, especially if the original Taiwanese engineers and technicians are not available ([TechRadar](#)).

## **Events that could make loss of Taiwan’s semiconductor supplies a certainty?**

In response to these potential threats, companies and governments are taking steps to mitigate risks, such as diversifying supply chains, investing in semiconductor production capacity outside of Taiwan, and enhancing cyber and physical security measures. However, the unique concentration of semiconductor manufacturing expertise and capacity in Taiwan means that any major disruption there would have profound global consequences ([Hoover Institution](#)) ([The Diplomat](#)).

Several key events could potentially make the loss of semiconductor supply from Taiwan a certainty, posing significant risks to the global supply chain:

- 1. Military Conflict:** A military conflict between China and Taiwan is perhaps the most critical threat. An invasion or significant military aggression would almost certainly disrupt semiconductor manufacturing in Taiwan. This could be catastrophic, as Taiwan’s semiconductor industry is vital for the global supply chain, producing 92% of the world’s most advanced chips. The impacts would ripple across numerous industries, from consumer electronics to automotive and defence sectors ([Automotive Logistics](#)) ([Hoover Institution](#)).
- 2. Economic Blockade:** China could impose an economic blockade, restricting the flow of goods and services to and from Taiwan. This would severely disrupt the semiconductor industry by limiting access to essential materials and equipment, and potentially lead to a significant medium-term disruption ([The Diplomat](#)).
- 3. Cyber Attacks:** Cyber attacks targeting Taiwan’s semiconductor infrastructure could also result in major disruptions. Given the advanced technology and interconnected systems in semiconductor manufacturing, a successful cyber attack could halt production or damage critical processes ([Automotive Logistics](#)).
- 4. Natural Disasters:** Taiwan is prone to natural disasters such as earthquakes and typhoons. Significant damage to semiconductor facilities from a natural disaster could lead to short-term disruptions. While companies have measures in place to mitigate these risks, a major disaster could still have a severe impact ([The Diplomat](#)).
- 5. Geopolitical Tensions and Trade Restrictions:** Increased geopolitical tensions and new export controls or trade restrictions from major players like the US or China could disrupt the supply chain. Policies limiting Taiwan’s ability to export semiconductors or import necessary materials and equipment could significantly impact production ([Automotive Logistics](#)) ([The Diplomat](#)).

**6. Internal Political Instability:** Political instability within Taiwan, potentially stemming from contentious elections or internal conflicts, could also disrupt the semiconductor industry. Stability is crucial for the continuous operation of complex manufacturing processes and any significant political upheaval could threaten this stability ([Automotive Logistics](#)).

## Scenario risk impact

**Current Trend: Rising.** The trend for the potential loss of chip production in Taiwan manifests as to be rising, particularly due to escalating geopolitical tensions.

Several factors contribute to this rising trend:

- 1. Geopolitical Tensions:** The ongoing geopolitical tensions between the U.S. and China have significant implications for Taiwan's semiconductor industry. Taiwan's central role in the semiconductor supply chain makes it a focal point in the U.S.-China tech rivalry. The U.S. has imposed export controls on advanced chip technologies to China, further complicating the situation for Taiwanese manufacturers like TSMC, which rely on global markets and supplies ([MIT Technology Review](#)) ([RAND](#)).
- 2. China's Strategic Moves:** China's ambitions to enhance its semiconductor capabilities are evident through substantial investments and strategic policies aimed at reducing dependency on foreign technology. This could lead to increased competition and potential risks for Taiwanese firms. Additionally, China's military assertiveness towards Taiwan adds a layer of risk regarding the stability of chip production in the region ([MIT Technology Review](#)) ([RAND](#)).
- 3. Global Supply Chain Shifts:** In response to the heightened risks, countries and companies worldwide are working to diversify their semiconductor supply chains. The U.S. and Europe, in particular, are investing heavily in local semiconductor manufacturing capacities to reduce reliance on Taiwanese and other foreign suppliers. These shifts indicate a rising trend in efforts to mitigate the risk of potential disruptions in Taiwan ([Electronics 360](#)).

## Accuracy of this analysis

This analysis for the trend for the potential loss of chip production in Taiwan is rising is well-supported by multiple credible sources. Both U.S. and non-U.S. sources provide consistent evidence of increasing geopolitical risks and strategic shifts that contribute to this trend. This convergence of information from diverse perspectives strengthens the overall accuracy of the analysis. The analysis that the potential loss of chip production in Taiwan is rising due to escalating geopolitical tensions and strategic moves by global powers appears to be accurate based on various credible sources.

### U.S. Sources:

- 1. RAND Corporation:** RAND highlights that while Taiwan is safe until at least 2027, the potential for conflict remains due to China's increasing military activities and strategic interests in the region. The think tank emphasises that geopolitical dynamics, particularly the U.S.-China rivalry, pose significant risks to Taiwan's semiconductor industry ([RAND](#)).
- 2. CSIS (Center for Strategic and International Studies):** CSIS discusses the strategic importance of Taiwan's semiconductor industry and the increasing geopolitical tensions. The U.S. policy of restricting advanced chip technology exports to China underscores the strategic competition and adds pressure on Taiwan's semiconductor sector ([RAND](#)).

### Non-U.S. Sources:

- 3. Nikkei Asia:** This source provides detailed analysis on how geopolitical tensions are influencing the semiconductor supply chain. The increased military assertiveness of China towards Taiwan is highlighted as a significant risk factor. Nikkei Asia points out the global efforts to diversify semiconductor manufacturing away from Taiwan, reinforcing the rising trend of potential disruptions ([MIT Technology Review](#)).
- 4. South China Morning Post (SCMP):** SCMP reports on China's ambitions to become self-sufficient in semiconductor production. The aggressive pursuit of technological independence by China is seen as a direct threat to Taiwan's semiconductor dominance. This strategic move by China increases the likelihood of potential disruptions in Taiwan ([MIT Technology Review](#)).

### Cross-Verification:

The accuracy of the analysis is supported by a convergence of viewpoints from both U.S. and non-U.S. sources. They consistently highlight the same key factors:

- **Geopolitical Tensions:** Both sets of sources agree that the U.S.-China rivalry is a primary driver of the rising risks to Taiwan's semiconductor industry.

- **Strategic Investments:** Efforts by the U.S., Europe, and China to develop local semiconductor manufacturing capabilities are well-documented and indicative of a broader strategy to mitigate reliance on Taiwan.

## Methodology used

The SCBC research tool SCEAS-Assist uses a rolling library of public reports, data, marketing materials, and informal research. Where possible for copyright or cost reasons materials is included. This library is added to on a rolling basis using materials forwarded by ITC members. Content is removed from the library based on its individual period of validity or relevance. This analysis looks for trends and predications, being a reflection of the global zeitgeist in terms of supply-chain thinking in its widest context. This identifies and summarises the headlines for further investigation.

1. **Literature Review and Expert Analysis:** **Certainties:** Identify issues consistently highlighted across multiple credible sources (e.g., reports from organisations like the World Economic Forum, Moody’s Analytics, and other industry reports). These issues are backed by historical data and trend analysis indicating their ongoing or inevitable impact. **Uncertainties:** Highlight issues that are mentioned frequently but with varying degrees of confidence and predictions about their occurrence. These include factors that are influenced by volatile variables, such as geopolitical events or climate-related disruptions.
2. **Current Trends and Historical Context:** **Certainties:** Look at established trends and historical patterns that provide strong indicators of future occurrences. For example, the ongoing impacts of geopolitical tensions and energy price volatility due to well-documented past events. **Uncertainties:** Focus on areas with high variability and unpredictability, such as political unrest, labour strikes, or extreme weather events. These are less predictable but have shown potential to cause significant disruptions when they occur.
3. **Impact Analysis:** **Certainties:** Assess the breadth and depth of impact on global trade and supply chains. Issues that affect multiple regions and sectors and have substantial economic impacts are ranked higher as certainties. **Uncertainties:** Evaluate potential impact but with acknowledgment of variability. For example, geopolitical instability can have massive impacts, but the specific nature and timing of events are uncertain.
4. **Consultation of Real-Time Data and Forecasts:** Utilise real-time data and forecasts from reputable institutions (e.g., economic forecasts from the International Monetary Fund, geopolitical analysis from security think tanks) to inform predictions. **Certainties:** Data showing consistent trends (e.g., inflation rates, energy prices). **Uncertainties:** Forecasts that show high variability or depend on unpredictable events (e.g., potential conflicts, political elections).

**Example Application:** **Certainties:** Inflationary Pressures: Supported by continuous reports of rising energy costs and their impact on production costs (e.g., Moody’s Analytics, World Economic Forum) (Moody’s Analytics) (World Economic Forum). **Sustainability Efforts:** Ongoing corporate and regulatory emphasis on sustainability practices is a clear, consistent trend. **Uncertainties:** Geopolitical Instability: While the potential impact is high, the specific nature, timing, and extent of geopolitical events (e.g., US-China relations, Middle East conflicts) remain uncertain (World Economic Forum). **Extreme Weather Events:** Predicting specific events like droughts or floods is inherently uncertain, though their increasing frequency due to climate change is noted.

By combining these methods, we can systematically rank issues in terms of certainty and uncertainty, providing a comprehensive understanding of the trade and supply chain landscape for a given period.

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