Chips, Power, and Uncertainty: Taiwan's Semiconductor Industry and the Reshaping of Global Production

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Abstract

This article examines why Taiwan's semiconductor industry matters so much to the global economy and why that matters more now than it used to. A single company, TSMC, manufactures roughly 90 percent of the world's most advanced logic chips (Boston Consulting Group & Semiconductor Industry Association [BCG & SIA], 2021). That level of concentration would be notable in any industry; in one so embedded in defense, computing, and consumer electronics, it is a structural risk. China's persistent claim over Taiwan, combined with an increasingly assertive foreign policy, has forced governments and firms to take that risk seriously. Drawing on comparative advantage, global value chains, strategic trade theory, and supply shock analysis, this article explains how Taiwan built its dominance, what is at stake if that supply is disrupted, and how the United States, through the CHIPS Act and sweeping export controls, is trying to reduce dependence on a single geographic point of failure. The liberal trade model, which assumed production locates wherever it is most efficient, is under real strain. Semiconductors are no longer ordinary traded goods.

1. Introduction

Semiconductors are in everything. They run phones, cars, hospital imaging machines, and the guidance systems in military hardware. Yet almost all of the world's most advanced chips come from one company, in one place. Taiwan Semiconductor Manufacturing Company (TSMC) makes roughly 90 percent of leading-edge logic chips (BCG & SIA, 2021). That is not a quirk; it is one of the more consequential concentration risks in the modern economy.

This would not matter quite so much if Taiwan were politically unremarkable. It is not. China claims the island as its own territory and has never ruled out taking it by force. As that pressure has grown, so has a fairly obvious question: what happens to the global electronics economy if something goes wrong in the Taiwan Strait?

2. How Taiwan Got Here

Taiwan's dominance in chip manufacturing was not accidental. It was built deliberately over decades through state investment, technical education, and a particular industrial model that turned out to be extremely hard to copy.

TSMC was founded in 1987 with Taiwanese government backing and technology licensed from Philips. Its founder, Morris Chang, pioneered the pure-play foundry model, manufacturing chips designed by other companies rather than developing products of its own (Miller, 2022). That sounds like a narrow niche, but it was transformative. It allowed firms like Qualcomm, Nvidia, and AMD to exist as design-only companies without building fabrication plants, which cost tens of billions of dollars. TSMC handled the manufacturing; everyone else handled the ideas.

Over time, TSMC did not just stay competitive; it pulled away. Every generation of chip production accumulated process knowledge that made the next generation easier to execute. Competitors could not simply replicate this by spending money. The knowledge was embedded in the organization. This is what economists mean by learning-by-doing: capability compounds, and at some point, the gap becomes structural rather than temporary.

The result is a global value chain where the most technically demanding step, physically fabricating chips at nanometer scales, happens almost exclusively in Taiwan. The rest of the chain is distributed. Chip design happens in California and the UK. Packaging and testing happen in Malaysia and South Korea. Final assembly happens in China and Vietnam. Each stage was optimized for efficiency. Under normal conditions, it works well. Under stress, the single point of failure is glaring.

3. What Concentration Actually Means

The COVID-19 pandemic provided a preview. Demand shifts and logistics disruptions caused a moderate chip shortage that cost the global automotive industry billions of dollars in lost production; cars were sitting on lots waiting for inexpensive microcontrollers (Semiconductor Industry Association [SIA], 2021). That disruption stemmed from forecasting errors and shipping delays, not from any direct threat to Taiwan's manufacturing capacity.

A geopolitical crisis involving Taiwan would be a different problem entirely, not a shortage that can eventually be resolved through improved logistics, but the potential elimination of the world's most advanced chip production for an unknown period. Every sector dependent on leading-edge semiconductors, consumer electronics, cloud computing, telecommunications, and defense systems, would face a supply shock with no short-term substitute available.

This is what economists call trade dependence: welfare depends on a trading relationship that is not under direct control. Virtually every advanced economy is in this position with Taiwan. Taiwan, in turn, depends heavily on semiconductor exports. The relationship is mutually beneficial yet deeply asymmetric: if production stops, Taiwan loses export revenue, but the global economy loses something it cannot quickly replace.

4. China's Position, and the Limits of Interdependence

The standard argument for why economic interdependence prevents conflict is that countries with deeply linked economies incur high costs in the event of war. China's own technology sector has historically depended on TSMC for advanced chips, giving Beijing some stake in maintaining the status quo. However, this argument has limits.

U.S. export controls have already cut Chinese firms such as Huawei off from TSMC's advanced manufacturing services. Once Beijing cannot access Taiwanese chips due to Washington’s restrictions, the deterrent effect of economic interdependence weakens considerably. China's response has been to invest heavily in domestic chip production under its *Made in China 2025* strategy and successor programs, signalling that the stabilizing effect of interdependence depends on both sides perceiving the arrangement as broadly equitable (Miller, 2022; SIA, 2023). That perception is eroding.

5. The U.S. Response: Export Controls and Industrial Policy

The October 2022 U.S. Department of Commerce export controls went further than many expected, restricting the sale of advanced semiconductors and chip manufacturing equipment to China and targeting capabilities relevant to artificial intelligence, high-performance computing, and defense applications (Bureau of Industry and Security, 2022).

The economic effects run in both directions: U.S. firms lost access to a major market, while China gained a stronger incentive to develop domestic production rather than rely on suppliers subject to American policy decisions.

The CHIPS and Science Act of 2022 allocated roughly $52.7 billion to rebuild semiconductor manufacturing on American soil. It represents the most significant industrial policy intervention by the U.S. government in decades and marks a clear departure from the free-trade orthodoxy that dominated American economic thinking since the 1990s. The economic justification lies in strategic trade theory, the idea that in industries with high barriers to entry, significant economies of scale, and national security implications, government support may be necessary where the private sector alone would not suffice. Semiconductor fabrication meets all three criteria.

Whether this intervention will succeed remains uncertain; TSMC's Arizona projects have already encountered delays. However, the logic underlying the policy is coherent.

The European Union has followed a similar path, passing its own Chips Act with the stated goal of doubling Europe's share of global semiconductor production to 20 percent by 2030 (European Commission, 2023). Japan has also attracted TSMC investment in Kumamoto. The broader trend is clear: governments across the developed world are prioritizing supply chain resilience over pure efficiency.

6. The Cost of Diversification

Relocating semiconductor production away from Taiwan toward the United States, Europe, and Japan enhances supply chain resilience but also increases costs.

Advanced chip manufacturing is extraordinarily capital-intensive. TSMC's cost advantages are not merely geographic; they reflect decades of accumulated scale and organizational knowledge. Distributing production across multiple jurisdictions requires duplicating investments, operating facilities below optimal scale, and dispersing accumulated expertise. As a result, unit costs rise and technological progress may slow.

There is also a distributional dimension affecting developing economies. Countries in Southeast Asia, namely, Malaysia, Vietnam, and the Philippines, host significant portions of the semiconductor supply chain, particularly in packaging, testing, and assembly. Some may

benefit as firms seek alternative production locations. Others may find themselves excluded from reconfigured production networks that previously supported industrial growth. The outcomes remain uncertain.

7. Conclusion

Taiwan's semiconductor industry is often framed as either a technological or geopolitical issue. It is both, but it also serves as a stress test for prevailing theories of trade and production.

Classical trade theory assumes that production locates where it is most efficient and that such arrangements remain stable. The Taiwan case challenges this assumption. Efficiency and security are now in tension. The most efficient configuration of global chip production is also, given current geopolitical realities, one of the riskiest. Governments are increasingly making explicit trade-offs between these priorities, accepting higher costs in exchange for reduced vulnerability.

Whether this shift is justified depends on how one evaluates the probability and consequences of disruption. If a crisis involving Taiwan remains unlikely, the costs of diversification are real and the benefits speculative. If the risk materializes, the consequences of inaction could be catastrophic.

What is already evident is that the liberal trade model, the idea that market efficiency alone should determine production location, irrespective of political context, is under considerable strain. Semiconductors are no longer traded like ordinary goods; they occupy a central position in industrial policy, national security, and great power competition. Understanding this shift, and its implications for trade patterns, investment flows, and economic development, is one of the key analytical challenges of the present moment.

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