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US Semiconductor Chip Manufacturing Reshoring: Regulatory, Economic, and Structural Challenges

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Abstract

Since the 2008 global financial crisis, successive U.S. administrations have prioritized semiconductor chip manufacturing reshoring as a core component of safeguarding global leadership, with policies such as the One Big Beautiful Bill Act (2025) and the CHIPS and Science Act driving this effort. While partial results have been achieved—including 244,000 new high-tech/manufacturing jobs announced in 2024 and semiconductor projects accounting for two-thirds of early 2025 Foreign Direct Investment (FDI)—the initiative faces three core dilemmas: regulatory ambiguities, economic constraints, and structural bottlenecks. This study analyzes the motivations (addressing manufacturing hollowing-out, maintaining economic/technological power, safeguarding national security, boosting blue-collar employment), pathways (policy incentives like tax breaks/subsidies, tariff policies, legislative intervention), and outcomes of U.S. semiconductor reshoring. It draws on data from authoritative sources (e.g., Semiconductor Industry Association [SIA], OECD, Reshoring Initiative) and case studies (Intel's Ohio fab delays, TSMC's Arizona project setbacks) to identify key challenges: frequent policy adjustments undermining investment confidence, higher U.S. manufacturing costs (30-50% above Asian countries) due to energy/labor/raw material expenses, and structural gaps in the semiconductor value chain (reliance on Asian upstream materials, domestic high-skilled labor shortages). The study further explores the global impacts of reshoring, including the restructuring of the global semiconductor supply chain and intensified U.S.-China competition—with China's semiconductor industry (e.g., SMIC) evolving from import dependence to independent R&D, though still lagging in advanced processes. It concludes that the U.S. must reassess its technology blockade policies, balance national security with global technological cooperation, and promote supply chain stability to ensure long-term prosperity in its semiconductor sector.

Keywords: U.S. semiconductor chip manufacturing reshoring, policy incentives, tariffs, legislative acts, regulatory dilemmas, economic constraints, cost barriers, structural challenges, labor shortages, value chain complexity, U.S.-China semiconductor competition, global semiconductor supply chain, technological sovereignty

1. Introduction

1.1 Research Background

Since the 2008 global financial crisis, successive U.S. administrations have implemented a series of strategic policies to advance manufacturing reshoring, aiming to safeguard the country's global leadership. The U.S. has long been a leader in the semiconductor industry, and semiconductor chip manufacturing—aligned with Moore's Law—stands as the most critical component of its manufacturing reshoring efforts. Notably, since the Trump administration, the reshoring of semiconductor chip manufacturing has represented a pivotal shift in U.S. economic and national security policy.

In 2017, the Trump administration proposed the "Manufacturing Reshoring Strategy," and in 2025, the *One Big Beautiful Bill Act* (Public Law No. 119-21) emerged as a key legislative instrument to accelerate semiconductor reshoring. This policy trajectory builds on prior initiatives: the Obama administration's "reindustrialization," the first Trump administration's "Bringing Manufacturing Back to America," the Biden administration's "Manufacturing Revitalization Policy," and the current second Trump administration's "Bring Back American Jobs." These efforts have yielded partial results: according to the Reshoring Initiative's 2024 Annual Report, U.S. manufacturing reshoring and Foreign Direct Investment (FDI) collectively announced 244,000 new jobs in 2024, continuing to drive the reconstruction of domestic production capacity. Among these, 88% of new positions belong to high-tech or medium-high-tech manufacturing (Reshoring Initiative, 2024). Within the high-tech sector, the semiconductor industry is one of the primary drivers of reshoring and FDI; early 2025 data shows that semiconductor projects account for two-thirds of FDI, underscoring the industry's central role in the reshoring trend (Tranmer, A., & Roberts, D., 2025).

Nevertheless, the new Trump administration faces deeper challenges following the issuance of reshoring orders. Regulatory ambiguities, economic constraints, and structural bottlenecks have collectively hindered the reshoring of U.S. semiconductor chip manufacturing, preventing it from meeting initial expectations.

1.2 Research Objectives and Significance

This paper analyzes the motivations, pathways, and outcomes of U.S. semiconductor chip manufacturing reshoring initiatives, while identifying three core dilemmas under current reshoring policies: regulatory predicaments, economic constraints, and structural challenges. It focuses on how key policies—such as tariffs, legislative acts, and executive orders—have influenced semiconductor reshoring. The findings reveal the complex dynamics between U.S. manufacturing competitiveness, national security concerns, and the impact on global supply chains amid U.S.-China competition.

Further, this paper explores how reshoring is reshaping the global industry landscape and the evolving role of major players like China in the semiconductor value chain. A core conclusion emphasizes that amid shifts in the global semiconductor industry chain and intensifying U.S.-China competition, the U.S. should reassess its technology blockade and reshoring policies to safeguard its interests in the semiconductor chip sector.

2. Definition and Concept of Semiconductor Chip Manufacturing Reshoring

2.1 Concept of Manufacturing Reshoring

"Reshoring" refers to the process of relocating production activities previously outsourced overseas back to the domestic market. With the deepening of globalization and production outsourcing, manufacturers in many countries—particularly developed nations—gradually shifted their production bases to regions with lower labor costs. However, as production chains grew more complex, global supply chain uncertainties mounted, and national security considerations intensified, manufacturing reshoring has become a key strategic goal for many countries.

Reshoring is not merely an adjustment to corporate production models; it also involves reforms across multiple dimensions, including government policy promotion, tax incentives, technology investment, and workforce training. Through this process, countries can restore or enhance domestic manufacturing capabilities, reduce reliance on external supply chains, and thereby strengthen their competitiveness and security in the global market.

2.2 Specificity of Semiconductor Industry Reshoring

For the U.S., semiconductor chip manufacturing reshoring carries unique significance and complexity. Semiconductors drive progress in communications, healthcare, military systems, transportation, clean energy, computing, and countless other applications. They underpin cutting-edge technologies critical to future societal development, such as neuromorphic computing, virtual reality, the Internet of Things (IoT), high-efficiency sensing, automation, robotics, and artificial intelligence (AI). As a core technology supporting modern information technology, communications, AI, and military defense, the semiconductor industry impacts not only national economic vitality but also global technological competition and national security.

Unlike traditional manufacturing reshoring, semiconductor reshoring entails more than restoring production capacity—it encompasses technological R&D, innovation capabilities, material supply, and talent cultivation. First, the high complexity of semiconductor manufacturing technology requires addressing technical bottlenecks during reshoring. The U.S. must not only relocate production lines domestically but also invest heavily in state-of-the-art production equipment and process technologies. Second, semiconductor reshoring involves controlling critical raw materials and supply chains. Semiconductor production relies on specialized chemicals, equipment, and materials, often supplied by vendors across different countries. To ensure reshoring success, the U.S. must not only build more domestic fabrication facilities (fabs) but also strengthen control over global semiconductor supply chains to mitigate external risks.

Thus, semiconductor reshoring is not merely a strategy for U.S. economic revival but also a critical measure to safeguard national security and enhance technological sovereignty.

Figure 1. Annual R&D Expenditures by Company Headquarters Location (2007-2023)

Source: OECD.

3. Motivations for U.S. Semiconductor Chip Manufacturing Reshoring

3.1 U.S. Manufacturing Hollowing-Out and Declining Relative Competitiveness

In the 1960s, the U.S. was the global hub of semiconductor manufacturing, with companies like Intel and Texas Instruments dominating the global market. However, from the 1980s to the 1990s, driven by globalization, many U.S. semiconductor firms relocated their production bases to Asian regions with lower labor costs, including China, Taiwan (China), and South Korea. This globalized manufacturing model promoted the international division of labor in the semiconductor industry chain, enabling the rise of companies such as Taiwan Semiconductor Manufacturing Company (TSMC) (Taiwan, China) and Samsung (South Korea) as major global semiconductor manufacturers.

By the early 2000s, Asian countries had not only caught up to the U.S. in semiconductor production capacity but also made significant strides in technological R&D and innovation. This trend led to a gradual decline in the U.S. share of the global semiconductor manufacturing market, exacerbating issues of manufacturing hollowing-out and weakened relative competitiveness.

3.2 Maintaining Economic Share: Enhancing Technological Power

A primary motivation for U.S. semiconductor reshoring is to maintain its economic share in the global semiconductor leadership. According to the Semiconductor Industry Association (SIA), the U.S. semiconductor industry led the global market in 2023 with $264 billion in sales, accounting for 50% of global revenue (Semiconductor Industry Association, 2025). If the U.S. semiconductor industry maintains its strong 8% annual growth rate, global semiconductor sales are on track to potentially reach $1 trillion by 2030 (Semiconductor Industry Association, 2025).

As a cornerstone of global technological competition, the semiconductor industry is central to U.S. concerns about "technological power"—defined as a state's ability to leverage its technological strength to compel other actors to act against their initial preferences (Zhang, Q., 2022). In an era where cutting-edge digital information technology drives productivity growth, the transformative power of technological power has become a core focus of great-power competition, with international power struggles increasingly centered on the contest for digital technological dominance (Qi, K., 2023). Thus, semiconductor reshoring is not merely about restoring production capacity but also about enhancing technological power to secure U.S. leadership in the global semiconductor value chain.

3.3 National Security: Safeguarding Supply Chains and High-Tech Advantages

National security is another core driver of U.S. semiconductor reshoring. As the foundation of modern military technology, communication systems, and cybersecurity, semiconductors hold immense strategic value. The U.S. government recognizes that reliance on semiconductor supply chains controlled by competitors—particularly China—exposes it to geopolitical vulnerabilities and threatens its technological and military advantages.

An August 2022 report by the U.S. think tank Center for Strategic and International Studies (CSIS) revealed that massive weapons shipments to the Ukraine-Russia conflict frontline had depleted U.S. domestic weapons stockpiles to the minimum level required for readiness and training (Shivakumar, S., & Wessner, C., 2022). Yet, U.S. domestic defense manufacturers could not operate at full capacity due to shortages of semiconductors from East Asia. The U.S. Department of Defense has long maintained an unusually high dependence on the East Asian commercial semiconductor industry—even the semiconductor components for the most advanced active F-35 fighter jets are manufactured by TSMC and United Microelectronics Corporation (UMC) (Shivakumar, S., & Wessner, C., 2022).

To address this vulnerability, the U.S. is promoting semiconductor reshoring to rebuild domestic manufacturing capacity and reduce external reliance. This is particularly critical for high-end chips and military-related chips, where technological autonomy is essential to mitigating external risks and preserving U.S. global strategic competitiveness.

3.4 Boosting Blue-Collar Employment and Wage Levels

Beyond enhancing economic competitiveness and national security, semiconductor reshoring aims to improve blue-collar employment and wage levels. A March 2025 White House article, *President Trump is Putting American Workers First — And Bringing Back American Manufacturing*, and the *One Big Beautiful Bill Act* both emphasize "bringing jobs back to the U.S."—a core priority for successive U.S. administrations (White House, 2025a).

Over the past decades, the expansion of manufacturing outsourcing has deprived many U.S. blue-collar workers of stable employment, particularly in high-tech manufacturing. Semiconductor reshoring is creating a large number of manufacturing jobs, especially for workers with operational skills in semiconductor production. Through policy incentives such as tax breaks and corporate subsidies, the U.S. government is encouraging semiconductor firms to build new domestic manufacturing facilities—generating direct jobs and stimulating employment growth across related industries.

According to SIA data, semiconductor reshoring is expected to create over 500,000 U.S. jobs, including a large number of blue-collar positions (Semiconductor Industry Association, 2025). In sectors like semiconductor manufacturing, equipment production, and construction, reshoring will also drive up wage levels for blue-collar workers. This model of job creation through reshoring helps alleviate U.S. economic inequality and provides higher-quality employment opportunities, fostering domestic economic revival and social stability.

4. Reshoring Pathways: Policy Incentives and Legislative Intervention

4.1 Policy Incentives: Taxation, Subsidies, and Investment

A key pathway for U.S. semiconductor reshoring is policy incentives, particularly tax breaks, subsidies, and investment support. These measures provide economic incentives for semiconductor firms to establish domestic manufacturing facilities.

Tax incentives are critical to reshoring: by reducing corporate tax burdens, the government encourages semiconductor firms to relocate production to the U.S. and invest domestically. These policies also prioritize equipment procurement and technological R&D, ensuring maximum financial support for domestic investments. The Trump administration's 2017 tax reform—which lowered the corporate income tax rate and reduced taxes on production activities—directly accelerated semiconductor reshoring.

Direct subsidies further complement these efforts: the government provides financial support to firms building semiconductor fabs in the U.S. The passage of the *CHIPS and Science Act* and the *Infrastructure Investment and Jobs Act* has allocated additional funds to manufacturing infrastructure, ensuring the smooth operation of semiconductor producers. This combination of policies and funding not only advances semiconductor reshoring but also lays the groundwork for long-term U.S. technological innovation and industrial competitiveness.

4.2 Tariff Policies and External Pressure

Tariff policies are another critical tool for promoting semiconductor reshoring. The U.S. government—especially the Trump administration—has imposed high tariffs on semiconductor products from China and other countries as part of its trade policy. These tariffs directly increase the cost of imported semiconductors, making domestic U.S. production more attractive, while indirectly encouraging firms to relocate production bases to the U.S. to avoid tariff-related costs.

Tariffs also signal U.S. strategic resolve to control the semiconductor sector. The Trump administration has explicitly framed the semiconductor industry as critical to national security, justifying tariff barriers and protective measures to support domestic manufacturing capacity (Amrith Ramkumar, 2025). External pressure stems from the geographic concentration of global semiconductor production—particularly China's rise in the global semiconductor market. Through high tariffs, the U.S. aims to reduce reliance on China and other countries while strengthening the advantages of domestic manufacturing.

4.3 Evolution of Reshoring Executive Orders and Legislation

The late 20th to early 21st century marked a period of U.S. manufacturing "hollowing-out" and the evolution of semiconductor reshoring policies. During this time, the U.S. government gradually recognized the semiconductor industry's importance to national security and technological competitiveness. Early policies focused on tax incentives and R&D funding to encourage corporate innovation. However, as global competition intensified—particularly from China—the U.S. government began intervening in the economy through non-market means, seeking to reshape international industrial layout via fiscal policies, tax breaks, and legislation to revitalize U.S. manufacturing.

This "state capitalism" model is particularly evident in semiconductor reshoring: the government guides resource allocation to coordinate economic activities and ensure key industries maintain global dominance (Alami, I., Dixon, A. D., & Mawdsley, E., 2021). The Obama administration adhered to traditional establishment views, avoiding excessive political intervention in the economy, while the Trump administration launched comprehensive intervention in manufacturing (Huang, Z., 2023). During its first term, the Trump administration repeatedly rejected routine mergers or acquisitions involving U.S. semiconductor firms, citing vague "national security" concerns (Lian, Z., et al., 2019). In 2018, it imposed high tariffs on Chinese semiconductor products to protect domestic high-end semiconductor production.

The Biden administration continued this tough stance on foreign semiconductors, introducing the *CHIPS and Science Act*—which provides $52.7 billion in funding for semiconductor fab construction and R&D (Zimmerman, A., 2022)—and the *Infrastructure Investment and Jobs Act*, which supports semiconductor reshoring through investments in power supply, raw material access, and workforce training.

In its second term, the Trump administration has further advanced semiconductor reshoring through legislation like the *One Big Beautiful Bill Act* and administrative measures. For example, it announced a roughly 100% tariff on semiconductors imported into the U.S., while exempting tech firms that invest in U.S. manufacturing (Amrith Ramkumar, 2025). These policies formalize semiconductor reshoring as a national strategy, aiming to secure long-term U.S. competitiveness in the global semiconductor industry.

5. Regulatory Dilemmas: Conflicts Between Administrative Policies and Reshoring Implementation

5.1 Policy Volatility and Investment Uncertainty

The rise of state capitalism—characterized by the state's dominant role in capital accumulation amid complex national security, technological innovation, and global competition—can lead to market distortions, inefficient resource allocation, and reduced innovation incentives (Alami, I., Dixon, A. D., & Mawdsley, E., 2021). In semiconductor reshoring, the U.S. government's focus on semiconductor technology's role in national security (e.g., military, communications, cybersecurity) has led to interventions such as guiding capital toward semiconductor fab construction, designing policies to encourage domestic technological innovation, and providing funding via acts like the *CHIPS and Science Act*.

However, frequent policy adjustments and uncertainties have eroded corporate trust in these policies, preventing firms from making effective long-term strategic adjustments and resulting in underwhelming reshoring outcomes. This reflects a key shortcoming of state capitalism: inconsistencies and opacity in policy implementation.

The Trump administration's reshoring policies—including tax incentives, subsidies, and tariffs—have been marked by frequent changes, leading to fluctuations in corporate investment decisions and undermining reshoring effectiveness. For example, the Trump administration announced a 100% tariff on imported chips to force foreign firms to relocate production to the U.S., but policy uncertainty made it difficult for firms to commit to long-term investments (Amrith Ramkumar, 2025). Despite Apple's pledge to invest $600 billion in the U.S., its core production remains overseas—highlighting the limitations of policy implementation (Financial Times, 2024).

Using a Difference-in-Differences (DiD) framework, research shows that while short-term tax incentives and funding support exist, policy volatility has prevented firms from forming stable expectations, limiting investment and production scale expansion in the U.S. semiconductor sector (Borusyak, K., Jaravel, X., & Spiess, J., 2021). This underscores the critical role of policy consistency and clarity in successful manufacturing reshoring.

5.2 Policy Conflicts and Goal Contradictions: The Interplay Between Tariffs and Incentives

A key regulatory dilemma is the conflict between the Trump administration's tariff policies and reshoring incentives like the *CHIPS and Science Act*. The *CHIPS and Science Act* provides over $50 billion in funding to encourage firms to build semiconductor fabs in the U.S. (Congressional Research Service, 2022), while tariff policies impose additional taxes on imported semiconductors and key components. This creates a contradiction: while tariffs aim to promote domestic production, they also increase production costs, reducing the attractiveness of reshoring.

The SIA notes that tariffs may place unfair competitive pressure on mature-node chip manufacturers, dampening their willingness to invest in the U.S. (Economic Liberties, 2024). While tariffs have prompted some semiconductor manufacturers to consider relocating to the U.S., high tariffs have also raised production costs, undermining reshoring's appeal (Conerly, B., 2023). Despite the *CHIPS and Science Act*'s generous financial incentives, many firms remain hesitant to build large-scale U.S. facilities due to cost-benefit tradeoffs driven by tariffs.

The core regulatory challenge for the Trump administration is that uncoordinated policy tools can offset each other's effectiveness, preventing manufacturing reshoring goals from being achieved.

6. Economic Constraints: Challenges and Limitations

6.1 Cost Challenges in Semiconductor Production

The U.S. semiconductor manufacturing industry faces significant cost barriers. Despite $52 billion in funding from the *CHIPS and Science Act*, U.S. manufacturing costs remain higher than in Asian countries (Steptoe, 2024). The SIA estimates that the U.S. plans to invest approximately $650 billion over the next decade in semiconductor fab construction—yet these facilities cost 30% to 50% more to build than in Taiwan (China), South Korea, and China (The Future of Commerce, 2025). For example, a single semiconductor fab costs roughly $10 billion to build and requires a three-year construction cycle (Forvis Mazars, 2023).

Energy costs further exacerbate this challenge: U.S. electricity prices are 30% to 40% higher than in Asian countries, creating a significant barrier for energy-intensive semiconductor manufacturing (Forvis Mazars, 2023). Additionally, specialized raw materials for semiconductors—such as high-purity silicon and chemical reagents—often rely on overseas imports, increasing production costs. These factors make it difficult for U.S.-based firms to compete with Asian rivals on cost, even with reshoring policy support.

The Trump administration's broad tariffs on products from China, Southeast Asia, and Europe have further raised costs for firms purchasing intermediate goods like steel and aluminum. Research on the 2018 tariffs shows that U.S. domestic manufacturers suffered significant losses due to rising raw material prices (ThinkBRG, 2023).

Labor costs represent another major constraint. Building a single fab requires approximately 6,000 construction workers and a three-year timeline (Asa Fitch & Dan Gallagher, 2025). While the U.S. boasts high labor productivity and advanced technology, manufacturing wages are far higher than in China, India, and Southeast Asia. The shortage of high-skilled blue-collar workers has also increased skills training costs for the semiconductor industry, further elevating U.S. labor costs (Asa Fitch & Dan Gallagher, 2025). This challenge is particularly evident in TSMC and Samsung's U.S. investments: delays in factory construction due to a lack of skilled workers and effective training systems have increased overall costs (Conerly, B., 2023). The U.S. semiconductor sector's reliance on high-skilled labor—coupled with high costs and shortages—undermines the economic viability of reshoring.

6.2 Global Competition Intensifies U.S. Semiconductor Cost Imbalances

The global semiconductor market is highly competitive, especially in AI and high-performance computing (HPC) (U.S. Department of Commerce, 2021). While the U.S. maintains technological advantages in these areas, it lags behind Asian competitors in manufacturing capacity and cost control (RBC Wealth Management, 2023). China's semiconductor industry is growing rapidly, and with substantial state subsidies and policy support, it is narrowing the gap in production capacity with global leaders. In low-end chips and consumer electronics, Chinese and other Asian semiconductor producers are capturing an increasing share of the global market, shrinking the U.S. market share (Carnegie Endowment for International Peace, 2022).

Global market demand volatility further complicates U.S. semiconductor reshoring. While the U.S. leads in semiconductor design and innovation, it faces significant gaps in production technology and manufacturing capacity—particularly in advanced processes. For example, Intel lags behind TSMC and Samsung in 5nm and more advanced process production (Asa Fitch & Dan Gallagher, 2025). TSMC has built extensive advanced semiconductor production lines in Taiwan (China) and dominates global 7nm and 5nm process manufacturing, while major U.S. firms remain in the catch-up phase (Asa Fitch & Dan Gallagher, 2025).

Even with government funding, U.S. production facilities face bottlenecks in technology transition and equipment upgrades. For instance, while TSMC and Samsung have invested in advanced manufacturing equipment in the U.S., existing U.S. facilities lack the capability to smoothly transition from 7nm to 3nm or 2nm processes (Conerly, B., 2023). This requires massive capital investment, as well as solutions to process complexity and equipment supply challenges.

Domestic U.S. demand also fails to fully support reshoring investments. While demand for HPC and AI chips is strong, it is concentrated in a few sectors, with weaker demand in other segments like consumer electronics—creating market gaps for U.S. semiconductor reshoring (Carnegie Endowment for International Peace, 2022).

7. Structural Challenges: Outcomes and Dilemmas of U.S. Semiconductor Reshoring

7.1 Expectations for U.S. Semiconductor Chip Manufacturing Reshoring

A key goal of U.S. semiconductor reshoring is to drive economic growth and create jobs. As of July 2025, supported by tax incentives, funding subsidies, and legislative backing, companies in the semiconductor ecosystem have announced over $500 billion in private-sector investments. This is expected to triple U.S. chip manufacturing capacity by 2032 and create or sustain over 500,000 U.S. jobs—including 68,000 facility jobs, 122,000 construction jobs, and over 320,000 additional jobs across the U.S. economy (White House, 2025c).

This has significant implications for blue-collar workers: reshoring has generated jobs in semiconductor-related equipment installation, construction, and maintenance—mostly technical and process-oriented roles requiring specialized skills.

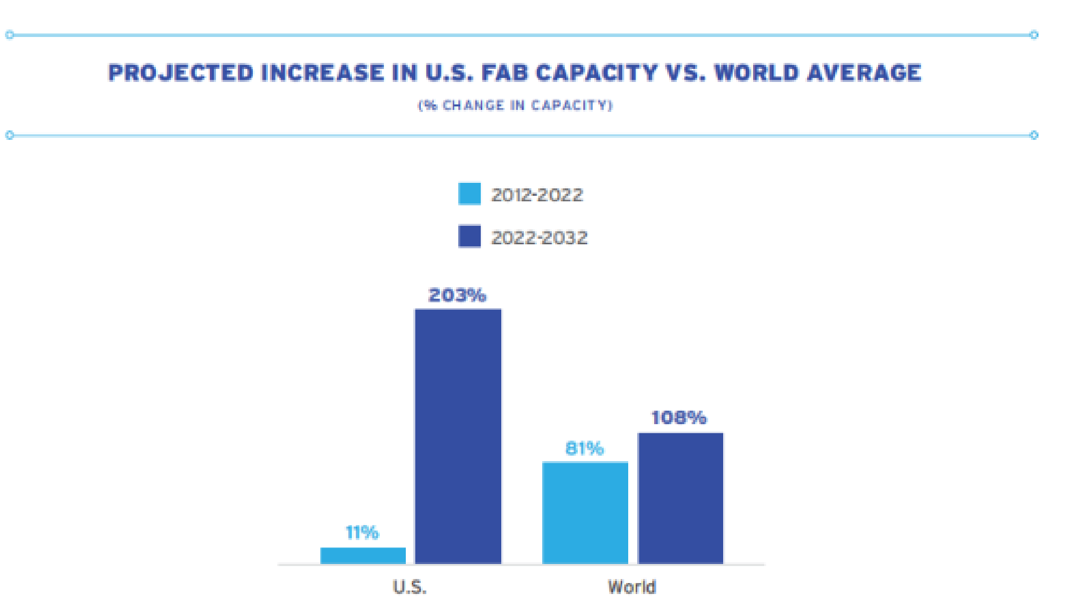

Figure 2. Projected Increase in U.S. Fab Capacity vs. World Average (% Change in Capacity) (2012-2022, 2022-2032)

Source: SIA/BCG.

7.2 Outcomes and Challenges of Semiconductor Reshoring Under the Trump Administration

The core of the Trump administration's economic strategy is reshaping the U.S. manufacturing base—with a focus on semiconductors. Through "America First" policies, the administration has sought to stimulate domestic manufacturing reshoring via protectionist measures, reduce external reliance, and strengthen U.S. industrial competitiveness. It views semiconductor technology as foundational to national security and economic competitiveness, leading to policies like high tariffs on imported semiconductors and funding support to restore domestic production (White House, 2025a).

The White House has announced that since President Trump's return to office, his "America First" economic policies have driven trillions of dollars in new investments in U.S. manufacturing, technology, and infrastructure (White House, 2025b). Despite the administration's emphasis on "Trump Effect"-driven investment success, the ultimate measure of semiconductor reshoring effectiveness lies in whether production capacity meets expectations—and progress on fab construction has been disappointing.

Intel's plan to invest $28 billion in two Ohio fabs has faced repeated delays due to weak market demand, delayed funding disbursements, and labor shortages. According to Reuters, the first fab—originally scheduled to start operations in 2025—will now likely open in 2030 or 2031, with the second fab delayed until 2031 or 2032 (Reuters, 2025a). Additionally, Intel's new CEO, Lip-Bu Tan, has adjusted the company's strategy to slow Ohio fab construction and suspend new fab plans in Poland and Germany (Reuters, 2025b). He emphasized a shift to a "demand-driven" manufacturing strategy, moving away from the traditional "build-it-and-demand-will-come" approach (Reuters, 2025c).

TSMC's $165 billion plan to build multiple semiconductor facilities in Arizona has also progressed slowly due to labor shortages, cultural differences, and infrastructure issues. The company further faces policy pressure from the Trump administration: President Trump has stated that TSMC's U.S. production capacity is insufficient to meet domestic demand and has threatened to impose high tariffs on Taiwan-manufactured chips (Tom's Hardware, 2025).

Micron Technology's announcement of a $200 billion U.S. semiconductor investment—heralded as a positive response to the Trump administration's reshoring policy (White House, 2025c)—lacks specific construction timelines or progress updates, reducing external confidence in the project's advancement.

7.3 Structural Challenges in the U.S. Value Chain

7.3.1 The Global Value Chain of the Semiconductor Industry

The semiconductor value chain comprises five key links, each concentrated in specific regions:

- **Raw Material Procurement**: Semiconductor production requires materials like high-purity silicon and specialty gases.
- **Design**: U.S. firms (e.g., Intel, AMD, NVIDIA) dominate the global high-end semiconductor design market.
- **Manufacturing**: A capital- and technology-intensive link, primarily concentrated in Asia (e.g., TSMC, Samsung).
- **Packaging and Testing**: Mostly located in China, Taiwan (China), and South Korea.
- **Distribution and Sales**: Global networks, ranging from direct supply to large corporations to distributor-mediated channels.

A 2024 SIA-Boston Consulting Group (BCG) report highlights the specialization of the global semiconductor supply chain: U.S. semiconductor manufacturers rely heavily on suppliers from Taiwan (China), Japan, South Korea, and China for key materials—such as bare wafers, epi wafers, photoresist chemicals, photomasks, gases, wet chemicals, substrates, and lead frames—accounting for a large share of fab construction costs (Semiconductor Industry Association, 2025).

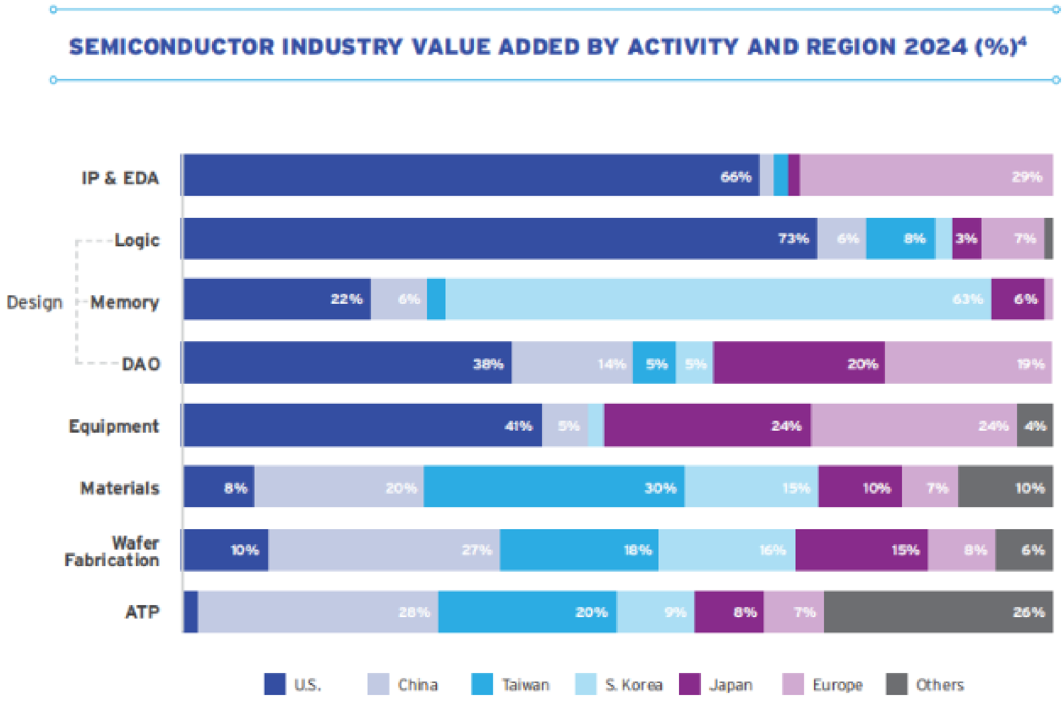

Figure 3. Semiconductor Industry Value Added by Activity and Region (2024)

Source: IPnest; Wolfe Research; Gartner; SEMI; BCG analysis.

U.S. semiconductor reshoring policies aim to reshape this global value chain—particularly by bringing manufacturing back domestically. However, the U.S. has few domestic suppliers of core upstream semiconductor products (e.g., high-purity elements, chemicals, specialty gases) and lacks dominant firms in key downstream assembly, testing, and packaging sectors. Similarly, the semiconductor industry relies on critical minerals that are under-mined in the U.S., further constraining domestic supply chains.

7.3.2 Complexity of Global Supply Chains

The complexity of global supply chains presents another major challenge to U.S. semiconductor reshoring. In the global value chain, high reliance on international cooperation across production equipment, raw materials, technology transfer, and cross-border investment determines a country's ability to dominate the semiconductor industry. While the Trump administration has used tariffs, subsidies, and legislation to promote reshoring, these policies lack coordination and transparency with global supply chains (BBC, 2024a).

The administration's attempts to restrict imports and boost domestic production conflict with global economic integration: the U.S. semiconductor industry cannot fully decouple from global supply chains, meaning unilateral domestic reshoring policies are vulnerable to market uncertainties and external economic shifts. The disconnect between government policies and market demand further exacerbates reshoring dilemmas.

From a value chain perspective, U.S. semiconductor reshoring faces multi-dimensional challenges—including costs, technology, labor, market demand, and global supply chains. Despite policy interventions, structural issues like high production costs, technical bottlenecks, labor shortages, and global competition continue to hinder semiconductor chip manufacturing reshoring.

7.4 Structural Challenges of Labor Shortages

Structural issues and skill gaps in the U.S. labor market are severely limiting semiconductor reshoring goals. While the U.S. leads globally in semiconductor design and innovation, semiconductor manufacturing—especially advanced process production—requires a large number of skilled technical workers. According to an SIA-Oxford Economics study, the U.S. will face a shortage of 67,000 technicians, computer scientists, and engineers in the semiconductor industry by 2030, with a broader shortage of 1.4 million such workers across the U.S. economy (Semiconductor Industry Association, 2025).

U.S. semiconductor reshoring thus faces multiple human resource challenges: labor shortages, skill mismatches, and limitations in education and training systems.

7.4.1 Shortage of High-Skilled Blue-Collar Workers

Semiconductor manufacturing is a highly technology-intensive industry, requiring large numbers of high-skilled blue-collar workers (e.g., equipment operators, process engineers, testing technicians). A key challenge for the U.S. semiconductor industry is the shortage of technical workers proficient in operating manufacturing equipment and mastering complex production processes. Reuters reports that reshored semiconductor facilities continue to face severe shortages of skilled workers, with slow construction progress directly attributed to insufficient trained personnel (Reuters, 2025d).

7.4.2 Limitations of Labor Training Systems

The U.S. labor training system for semiconductor manufacturing also has significant limitations. While the U.S. boasts world-leading higher education and research institutions, investment in technical worker training—particularly for manufacturing blue-collar skills—is insufficient to meet semiconductor industry needs (BBC, 2024b). Compared to Asian countries, the U.S. vocational education system prioritizes academic education and management training over production-related vocational education and skills training. This gap prevents the labor market from quickly supplying sufficient technical workers for new semiconductor fabs.

For example, TSMC and Samsung's Asian facilities leverage robust worker training systems to rapidly develop large teams of semiconductor manufacturing workers, while U.S. education and training systems have failed to align with production demands (Tech in Asia, 2025). This structural education gap creates major obstacles to attracting and developing semiconductor technical workers in the U.S.

7.4.3 Redistribution of the Global Labor Market

The global semiconductor labor market has undergone significant changes over the past decades: manufacturing centers have shifted from the U.S. to Asia, with Taiwan (China) and South Korea emerging as core global semiconductor manufacturing hubs by offering efficient production environments, low labor costs, and strong technical worker training systems (Tom's Hardware, 2025). U.S. semiconductor reshoring policies have failed to address the redistribution of the global labor market, further complicating reshoring efforts.

8. Global Impacts: Industrial Chain Restructuring and U.S.-China Competition

8.1 Uncertainty and Restructuring of Global Industrial Chains

The global semiconductor industry chain has undergone significant transformations in recent years—exacerbated by U.S.-China trade tensions and the COVID-19 pandemic. For decades, East Asia (particularly Taiwan (China) and South Korea) served as the global production and supply hub, while the U.S. dominated high-end semiconductor design and innovation. However, shifting geopolitical and economic conditions—especially intensifying U.S.-China technological competition—are reshaping the global semiconductor chain.

According to SIA analysis, global semiconductor production is gradually diversifying across regions, with firms building facilities in Southeast Asia, India, and the U.S. This shift from over-reliance on Asian manufacturing centers to more regionalized distribution aims to mitigate trade tensions and supply chain risks (Carnegie Endowment for International Peace, 2022).

SEMI's latest quarterly *World Fab Forecast* report projects 18 new fab construction projects globally in 2025, including 3 200mm and 15 300mm facilities—most scheduled to start operations between 2026 and 2027 (SEMI, 2025). The Americas and Japan will lead with 4 projects each, followed by China, Europe, and the Middle East (3 projects each), Taiwan (China) (2 projects), and South Korea and Southeast Asia (1 project each) (SEMI, 2025).

However, industrial chain restructuring is not straightforward. Despite U.S. semiconductor reshoring policies, the redistribution of global chains faces constraints in technology, market demand, and production capacity. Global supply chain uncertainty has pushed countries to balance supply chain autonomy with strategic security, driving demand for production chain diversification—but implementation remains challenging (Reuters, 2025d).

8.2 Intensified U.S.-China Competition and Technology Blockades

U.S.-China competition in semiconductor technology has become a focal point of the global technology industry. During the Trump administration, both sides have engaged in fierce competition via tariffs, technology blockades, and export controls. U.S. technology blockades—particularly targeting Chinese firms like Huawei—have restricted access to advanced semiconductor technologies, significantly impacting China's semiconductor industry development (BBC, 2024c).

By integrating semiconductor producers like TSMC and Samsung into its domestic chain, the U.S. has partially restored its semiconductor dominance. However, U.S. technology blockades have also accelerated China's independent semiconductor R&D. The Chinese government has increased support for domestic semiconductor firms, boosted R&D investment, and implemented an "industrial autonomy" strategy to reduce reliance on external technologies—driving rapid growth in China's domestic semiconductor sector (Asa Fitch & Dan

Gallagher, 2025).

U.S.-China semiconductor competition now extends beyond market share to core areas like technical standards, patents, and production processes. The interplay between U.S. technology blockades and China's "self-reliance" policies has heightened global semiconductor market uncertainty, prompting countries worldwide to pursue independent supply chains to ensure technological and production security.

Research shows that while U.S. reshoring policies have delivered partial results (e.g., job growth, improved supply chain resilience), U.S. high-tech manufacturing competitiveness has not improved significantly (Li, X., Jiang, X., & Yang, C., 2025). In contrast, China's manufacturing competitiveness—especially in medium-high-tech sectors—continues to strengthen, with accelerated industrial transformation and upgrading. The short-term impact of U.S. manufacturing reshoring on low-tech and some medium-high-tech sectors has not been sustained; instead, it has intensified U.S.-China competition in high-tech fields (Li, X., Jiang, X., & Yang, C., 2025).

8.3 Evolving Role of China in the Global Semiconductor Industry Chain

As U.S.-China technological competition intensifies, China's role in the global semiconductor chain is undergoing a profound transformation: from import dependence to independent R&D, and from the edge of the chain to its core. Historically, the global semiconductor chain was concentrated in the U.S., Taiwan (China), and South Korea, with China relying heavily on imports for semiconductor technology. However, China's manufacturing competitiveness has grown rapidly in recent years—particularly in semiconductor manufacturing—with increased R&D investment, optimized chain collaboration, and improved domestic technical capabilities gradually reducing reliance on external technologies and equipment.

China's semiconductor industry growth is strongly supported by government policies: policy incentives and funding for domestic firms have accelerated progress in key areas like semiconductor production, design, and equipment manufacturing (Li, J., & Whalley, J., 2021). For example, China's *Made in China 2025* plan aims to achieve semiconductor self-production and technological breakthroughs.

According to global semiconductor industry reports, China's investment in semiconductor design and manufacturing continues to rise—particularly in wafer manufacturing and packaging testing, where it has developed significant technical capabilities (Li, J., & Whalley, J., 2021). Semiconductor Manufacturing International Corporation (SMIC) is gradually challenging TSMC and Samsung's market share, with its global manufacturing market share rising to the top tier after TSMC (Li, J., & Whalley, J., 2021). Additionally, through mergers, acquisitions, and partnerships, China is strengthening its technological influence in the global semiconductor market—exemplified by the rise of design firms like HiSilicon (Huawei)—signaling its growing importance in the semiconductor chain (Li, J., & Whalley, J., 2021).

Nevertheless, despite significant progress in R&D and market expansion, China's semiconductor industry faces challenges like technology blockades and production capacity constraints. In advanced processes (e.g., 7nm and below) and high-end chip design, China still lags behind global leaders (Li, J., & Whalley, J., 2021). Thus, while China's role in the global semiconductor chain is evolving, further time and technical accumulation are needed to consolidate its competitive position.

9. Conclusion

This paper systematically analyzes the motivations, pathways, outcomes, and core challenges—regulatory dilemmas, economic constraints, and structural bottlenecks—of U.S. semiconductor chip manufacturing reshoring. Against the backdrop of global semiconductor chain restructuring, U.S. government policies and funding support have promoted semiconductor reshoring, but outcomes have fallen short of expectations due to three key constraints:

1) **Regulatory Dilemmas**: Frequent policy adjustments and uncertainties have complicated reshoring efforts. Conflicts between tariffs and subsidy policies have increased corporate cost pressures, undermining long-term investment decisions.
2) **Economic Constraints**: High production costs—including for high-skilled labor, energy, and imported raw materials—have put U.S. semiconductor production at a global competitive disadvantage.
3) **Structural Challenges**: The complexity of the global semiconductor value chain, coupled with U.S. gaps in technological R&D, production processes, and high-skilled labor, has hindered reshoring progress.

Amid intensifying global competition, the growing competitiveness of China and other Asian countries in semiconductors has further complicated U.S. reshoring efforts. China has made significant strides in semiconductor manufacturing and technological autonomy, moving from the edge to the core of the global chain—a trend that is irreversible.

Sino-US semiconductor competition not only impacts the economic competitiveness of both countries but also will shape the global technological competition landscape. The U.S. should reassess its technology blockade policies to balance national security with global technological cooperation. Only through collective efforts to promote global semiconductor supply chain stability and technological innovation can the U.S. ensure the long-term prosperity and growth of its semiconductor chip industry.

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