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Securing Semiconductor Supply Chains in the Indo-Pacific Economic Framework for Prosperity

Squaring the Circle on Deeper Cooperation

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This report is part of a collaborative project between CSIS's Asia Program, Wadhwani Center for AI and Advanced Technologies, and Scholl Chair in International Business. This is one of two reports in a series that maps semiconductor supply chains and opportunities for cooperation in the Indo-Pacific region. The accompanying report, "Mapping Semiconductor Supply Chains in the Indo-Pacific," can be found ***here****.*

Introduction

A seismic shift in trade, economic, and technology competition policy is underway, particularly in the United States. Matters traditionally relegated to the national security realm increasingly bleed over into economic policy. Parallel to this shift is a U.S. movement away from traditional free trade agreements (FTAs) centered on market access and tariff liberalization in favor of arrangements focused on sustainability and worker-centric goals, without offering additional market access. These two moves have become part of a new industrial policy that aims to strengthen U.S. high-tech competitiveness while preventing foreign adversaries from acquiring advanced technologies.

Under the Biden administration, the shift toward a more expansive definition of national security in trade policy is evident in the October 7 Bureau of Industry and Security (BIS) **export controls** on advanced semiconductor chips and the tools used to manufacture them. These controls include extraterritorial application of U.S. law on foreign supply chains and businesses that will significantly affect foreign firms. An emerging deal among the United States, the Netherlands, and Japan to support the October 7 controls makes clear the United States is pursuing policies that restrain Chinese technological advancements while building more secure supply chains among U.S. allies.

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In August 2022 Congress passed the historic **CHIPS and Science Act**, which provided, among other funding, $52 billion for the semiconductor industry. Onlookers have described this as a renewal of industrial policy in the United States. Coinciding with this new approach to techno-industrialism is the pursuit of new economic arrangements for advanced technologies such as semiconductors, as evidenced in the **Chip 4 alliance**, the U.S.-Japan-India-Australia **Quadrilateral Security Dialogue** (the Quad), and the **U.S-EU Trade and Technology Council** (TTC). A fundamental question that arises from the confluence of these policies is whether they add up to a greater whole that constitutes a substantially new approach to trade. Another key question is how the simultaneous pursuit of new restrictions on high-tech exports as well as historic levels of domestic support for advanced industries affect close allies of the United States.

The Biden administration is complementing renewed domestic industrial policy initiatives with new multilateral economic arrangements, such as the **Indo-Pacific Economic Framework for Prosperity** (IPEF). IPEF, which has 14 members, including the United States, is an expansive four-pillar arrangement that covers trade, supply chains, decarbonization and infrastructure, and fair economy issues such as anti-corruption and transparency. The **supply chains pillar** includes specific modules to identify critical sectors and goods, increase resiliency and investment in those critical sectors, enhance relevant information sharing and transparency, improve supply chain logistics, and protect the role of workers.

This paper is one of two. It evaluates the intersection of the U.S. high-tech industrial strategy and its emergent trade strategy, focusing on **IPEF**. The second paper provides a deeper dive into the semiconductor ecosystem in Japan, China, South Korea, Taiwan, and the United States. This paper assesses the evolution of the CHIPS and Science Act and how it interacts—to the extent it does at all—with ongoing negotiations within the supply chain pillar of IPEF. It concludes that the administration has not thus far succeeded in building consistency between IPEF and the deployment of CHIPS funding, but squaring the circle on chips fund deployments and the administration's IPEF strategy, while easier said than done, offers long-term strategic benefits. In other words, having adopted an aggressive approach to reshoring via industrial policy, the administration should now put more weight on supporting friend-shoring.

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U.S. Industrial Policy and Semiconductors

CHIPS AND SCIENCE ACT

On August 9, 2022, President Biden signed the **CHIPS and Science Act** into law. The $278.2 billion act incentivizes domestic production of semiconductors with the goal of reshoring supply chains. The legislation is intended to achieve four primary goals: (1) establish a U.S. presence in leading-edge semiconductors, which the United States does not currently manufacture domestically; (2) fortify the

supply of mature node chips; (3) spur research and development (R&D) in the semiconductor sector; and (4) create thousands of domestic jobs.

The centerpiece of the act, the **CHIPS for America Fund**, includes $52.7 billion to build, expand, or modernize domestic facilities and equipment for semiconductor fabrication, assembly, testing, advanced packaging, or R&D. In addition, the act includes the **CHIPS for America Defense Fund**, which allocates $2 billion total ($400 million annually through fiscal year 2026) for the Department of Defense to implement the Microelectronics Commons, a national network for onshore university-based prototyping, "lab-to-fab" transition of semiconductor technologies, and semiconductor workforce training.

Another **$11 billion** is allocated for several Department of Commerce R&D programs, including the National Semiconductor Technology Center (NSTC), the National Advanced Packaging Manufacturing Program, the Manufacturing USA Semiconductor Institute, and Microelectronics Metrology Research and Development. Additionally, the act includes an investment of approximately **$174 billion** in spending over the next five years, most of which will target R&D. The act allocates approximately $77 billion to the development of domestic technology hubs, funded by the U.S. Department of Commerce, the National Science Foundation, and the U.S. Department of Energy. The goal of these programs is to incentivize semiconductor manufacturers and related firms to invest in production capacity in the United States.

Guardrails

Since the intent of the CHIPS and Science Act is to incentivize domestic funding to support U.S. semiconductor manufacturing capability, government funding is contingent on several factors. These **guardrails** act as outbound investment restrictions to prevent public funds from supporting high-tech investments in China. First, the act **mandates** that any company that receives funds must agree to withhold for 10 years "any significant transaction, as defined in the agreement, involving the material expansion of semiconductor manufacturing capacity in the People's Republic of China or any other foreign country of concern." In addition, the act **bars** funding recipients from using funds in other countries. CHIPS incentive recipients are also limited from pursuing joint research or technology licensing efforts with foreign entities that raise national security concerns. The act is broadly aimed at China, though it also includes North Korea, Russia, Iran, and other countries the U.S. Department of State deems "entit[ies] of concern."

On March 21, 2023, the Department of Commerce provided **additional guidance** on chips funding guardrails. The rule establishes restriction standards for advanced facility expansion, prohibiting significant transactions involving material expansion. The text defines significant transactions as $100,000 or above and material expansion as an increase of facility production capacity by 5 percent. These guidelines aim to catch even small transactions made to expand manufacturing capacity.

The March 21 guidance also limits legacy facility expansion in foreign countries of concern and officially classifies semiconductors as critical to national security. The rule limits existing legacy facilities from adding new production lines or expanding production capacity beyond 10 percent. The guidance also reinforces BIS's October 7 export controls by aligning **prohibited technology thresholds** for memory chips, defined as NAND flash memory chips with 128 layers or more or dynamic random-access memory (DRAM) with a technology node of sub-18 nanometers. The rule

also offers details on joint technology and research licensing efforts with foreign entities of concern, defining joint research efforts as R&D involving two or more persons. It also defines technology licensing as an agreement to make patents, trade secrets, or know-how available to another party.

Recipients **must inform** the Department of Commerce of any public fund allocation that could violate the guardrails. If the department finds that funds have been misallocated, it has the **authority to repeal** the full amount of funding allocated to the recipient. However, the agency's claw-back authority does not apply to "existing facilities and equipment of a covered entity for manufacturing legacy semiconductors" or "significant transactions involving the material expansion of semiconductor manufacturing capacity that produces legacy semiconductors and predominately serves the market of a foreign country of concern."

Implementation

On February 23, 2023, Secretary of Commerce Gina M. Raimondo announced the launch of the first applications for CHIPS funding for commercial manufacturing facilities. Awards will be granted on a rolling basis. The Department of Commerce has outlined a strategy for oversight and administration of the implementation of the CHIPS and Science Act and has stated there will be "rigorous review of proposals" to ensure funded projects support the overall goal of the legislation. Two new offices established at the National Institute of Standards and Technology (NIST) will oversee and implement the CHIPS program: the CHIPS Program Office (CPO) and the CHIPS R&D office. The CPO provides policy and stakeholder support through the implementation process and administers the financial incentive structures. The CHIPS R&D Office will oversee the NSTC and manage the Industrial Advisory Committee, Advanced Packaging, Manufacturing USA, and other R&D projects.

The **application process** "will verify the technical and financial merit of the project, rationale for public funding, and organizational structure and operational capabilities of the applicant." The **strategy document** notes the CPO will "strictly monitor the use of funds to ensure recipients are delivering on their commitments."

According to recent announcements by Secretary Raimondo and the Department of Commerce, companies must meet several implementation provisions if they wish to receive federal funds. Companies receiving funding will be **required** to give a share of unexpected profits to the federal government and to provide childcare for employees. Additionally, while Congress wrote the law to prevent companies from using grant money for stock buybacks or to pay dividends, the Department of Commerce has stated it will **give preference** to companies that promise to withhold from stock buybacks.

Awards will consist of direct funding, federal loans, and/or federal guarantees of third-party loans. Secretary Raimondo also stated that projects with additional funding sources, such as private capital, will **receive preference** for government grants. Additionally, applicants must secure incentives from state or local governments to become eligible for federal funding. The Department of Commerce will **require** projects to be linked to **state and local incentive programs**, including state-level tax grants, tax credits, exemptions, and abatements, to generate "spillover benefits" for local communities, including work force investments, infrastructure investments, and education benefits, as opposed to direct tax abatements that benefit only one company.

Unlocking Private Capital

Companies have begun launching new initiatives in the United States, even before the formal CHIPS implementation process. In October 2022, IBM announced it would invest $20 billion in New York's Hudson Valley over the next 10 years. Taiwan Semiconductor Manufacturing Company (TSMC), which began construction on a **chip plant in Arizona** last year, recently tripled its planned investment to **$40 billion**. This factory, expected to be completed in 2026, will produce advanced three-nanometer semiconductors. Intel, meanwhile, has begun construction on a **$20 billion mega-site** in Ohio, and Samsung has announced plans to build **a $17 billion plant** in Texas.

U.S. High-Tech Alliances

As the United States accelerates spending on its domestic high-tech sector, trade policy has emerged as a central tenet of this new technology strategy. This is largely a result of the complex and globalized nature of semiconductor value chains paired with the need to ensure that advanced technology is not exported to foreign adversaries. Coordinating supply chain resiliency and export controls has thus been a major element of the U.S. semiconductor strategy. Outside of IPEF, the United States has pursued advanced technology agreements through a host of bilateral and plurilateral arrangements. These include the Chip 4 alliance, the Quad, and bilateral arrangements, but all are at a nascent stage of development.

The **Chip 4 alliance** is an aspirational technology partnership between the United States, South Korea, Japan, and Taiwan focused on diversifying semiconductor supply chains to minimize China's regional influence over an industry critical to national security. The **goals** of the Chip 4 alliance include geographically diversifying supply chains away from China, protecting the intellectual property (IP) of member nations, coordinating consistent export controls, and implementing fair supply chain distribution among member nations. The four countries in the Chip 4 alliance account for **82 percent** of global semiconductor industrial output. However, the Chip 4 alliance is nascent, and senior officials met for the first time in February 2023.

The Quad is an international informal arrangement between the United States, Australia, India, and Japan. The four countries share a common interest in restraining China's regional influence and have formed **working groups** on a variety of issues, including technological innovation and supply chain resilience. Although the Quad has not produced concrete outcomes, it represents another initiative to forge deeper economic and security ties among partners in the Indo-Pacific.

IPEF and Semiconductors

In building more secure semiconductor supply chains within IPEF, the United States has a diverse set of partners with which to deepen economic integration. These regional partners vary significantly in terms of semiconductor production capacity. Long-standing semiconductor partners such as Japan and South Korea possess advanced semiconductor manufacturing capabilities, accompanied with institutional systems that make it easy to do business in-country. Other partners, such as Thailand and India, are keen to accelerate their domestic semiconductor industries. Still others, such as Australia, New Zealand, and the Philippines, have little semiconductor capacity and in some cases are reluctant to pursue the investments needed to indigenize a competitive high-tech microelectronics industry.

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Japan

Japan is a leader in machine tools, materials, and chips and is one of the closest U.S. allies. In the 1980s, it accounted for **50 percent** of the global production for semiconductors. Today Japan accounts for **6 percent** of global logic, micro, memory, and analog chips, due in part to **U.S. trade policy toward Japan** as well as the country's failure to switch from traditional vertical integration to a horizontal division of labor. Nevertheless, Japan remains one of the world's semiconductor leaders through its international competitiveness in memory products, particularly NAND, sensors such as complementary metal-oxide semiconductor (CMOS) image sensors, advanced immersion lithography, and power semiconductors. Japan's key advantage in the industry is its outsize influence over semiconductor manufacturing equipment and materials, accounting for **35 percent** of semiconductor manufacturing equipment and roughly half of the global semiconductor materials supply.

Japan has been a key ally of the United States at the nexus of trade and national security. The Japanese government in May 2022 passed **legislation** to promote "economic security," which included a package of initiatives to protect supply chains of critical goods, including semiconductors; protect basic infrastructure; support innovation and technology development through R&D; and create a classified patent system. In July 2022 the United States and Japan **formed a high-level dialogue** focused on semiconductor cooperation to counter China's growing economic influence, establishing a new joint research center focused on next-generation semiconductors.

Japan recently launched a bilateral public-private partnership on semiconductors. The **Rapidus project** facilitates the release of several **IBM** patents to the Japanese firm with the goal of helping Rapidus achieve two-nanometer chip production at scale. Rapidus is largely regarded as the hallmark success story of U.S.-led international collaborative efforts on building secure semiconductor supply chains. When the project was launched, Japan's METI provided an investment of roughly **$550 million**, which the private sector has since augmented for a total of $2.4 billion. However, these projects will require substantially more funding over time, without which they are unlikely to succeed in shifting global supply chains. Rapidus demonstrates that these cooperative agreements can succeed, but initiating a longer-term supply chain shift will require the United States to commit to significantly higher spending, and that spending will need to be iterative and consistent.

Another sign of joint U.S.-Japan cooperation on high-tech sectors is that **Japan, along with the Netherlands**, has joined the U.S. October 7 controls applying restrictions on advanced machine tooling and artificial intelligence (AI) chips to China.

South Korea

South Korea is a global memory chips leader and a plurilateral participant eager to expand in the U.S. market. South Korea's global semiconductor market share was **18.4 percent** as of 2020, six years after

it became the **second-largest semiconductor producer** globally. As of 2020, South Korea accounted for **56.9 percent** of the global memory semiconductor market. Korean exports of semiconductors in 2020 totaled **$99.2 billion**, of which memory semiconductors accounted for **$63.9 billion**, or 64.4 percent. Semiconductors are South Korea's principal export, accounting for **19.3 percent** of total exports as of 2020.

South Korea **envisions** a strong semiconductor industry as the chief pillar on which to secure not only the nation's relevance on the global electronics stage but also its military interests. The **Special Act to Protect and Foster National High-Tech Strategic Industry**, a response to Covid-19 pandemic-related shortages, designates that "national high-tech items," including semiconductors, receive tax benefits, regulatory benefits, and other preferential treatment to spur R&D and to increase production output. The South Korean National Assembly also passed the **National Advanced Strategic Industry Act** during the administration under President Moon Jae-in, empowering the Minister of Trade, Industry, and Energy to **regulate the export** of advanced semiconductors to foreign companies. Current president Yoon Suk Yeol also declared his intentions to make South Korea a **"semiconductor superpower"** and **vowed** to train more semiconductor specialists by **expanding** the quota for engineering students at universities.

Together with the United States, Japan, and Taiwan, South Korea is a member of the **Chip 4 alliance**. Competition concerns between rival Taiwanese, South Korean, Japanese, and U.S. companies, however, threaten to restrain cross-market coordination. Due to the strength of South Korea's semiconductor production industry, and because China is its largest semiconductor chip trading partner, it is **unclear** if South Korea will fully endorse U.S. export controls on China. The one-year exemption of South Korean semiconductor producers from the October 7 export controls gives it time to consider its options, though the uncertainty brought on by the export controls has created a suboptimal environment for South Korean companies to operate in China.

When asked about what will happen after the one-year exemption, BIS under secretary Alan Estevez **said** there "will likely be a cap on the levels that [South Korean semiconductors] can grow to in China." It is unclear through what mechanisms BIS could limit South Korean semiconductor manufacturing in China, though the most likely would be encouraging South Korea to join the recent U.S.-Japan-Netherlands trilateral arrangement. It also remains unclear to what degree South Korea would be enthusiastic about joining the trilateral arrangement and entertaining additional controls more generally. As of May 2023, it appears that Korean firms are poised to receive an extension on the **one-year waiver**, providing additional leeway to maintain operations in China.

In April 2023, President Biden **hosted** President Yoon for a formal state visit in Washington D.C., where the two leaders reiterated the importance of deepening U.S.-South Korea political, economic, and security ties, particularly on nuclear security matters. This demonstrates the growing bilateral closeness of the two countries. Despite the historic nature of the visit, the Yoon-Biden meeting did not produce concrete details about semiconductor cooperation and sectoral export controls.

In addition to controls, the United States is providing incentives to entice additional South Korean investment in the United States, and the strategy appears to be succeeding. Samsung, a key player in the South Korean semiconductor industry, is considering the construction of **11 additional U.S. semiconductor plants** in the next 20 years.

Malaysia

Semiconductors are a growing sector of the Malaysian economy, particularly in advanced packaging. Malaysia's legal framework fosters strong IP protection and offers an enticing environment for multinational corporations to operate in the country. It has served as a manufacturing center for electronics companies since the 1970s due to its relatively cheaper labor force and local talent pool. The **Malaysian semiconductor industry** consists largely of advanced technology packaging (ATP) and outsourced semiconductor assembly and testing (OSAT). Malaysia accounts for roughly 4 percent of global ATP market share.

With a **high concentration** of facilities established by foreign investors through OSAT, Malaysia possesses the expertise, equipment, and infrastructure necessary for additional ATP capacity. Its close bilateral trade relationship with China, however, raises questions about long-term IP protections and the outflow of potentially sensitive chips for military end use in China.

The United States and Malaysia upgraded their bilateral relationship to a comprehensive partnership in April 2014. Malaysia is the United States' 17th-largest trading partner, and as of 2020, U.S. direct investment in the country was $13.5 billion. In May 2022 Malaysia and the United States **signed** the Memorandum of Cooperation (MOC) on Semiconductor Supply Chain Resilience. The MOC was signed to emphasize the importance of U.S.-Malaysia cooperation in "creating resilient, secure, and sustainable semiconductor supply chains," building trust, increasing transparency, and promoting semiconductor supply chain investment between the two countries.

Singapore

Singapore is a small country with a powerful semiconductor industry looking to bolster its status as a tech and innovation hub. **Semiconductor manufacturing** accounts for more than 80 percent of electronics manufacturing output and 7 percent of gross domestic product (GDP). Singapore accounts for **11 percent** of the global semiconductor market, and **20 percent** of global semiconductor equipment is manufactured in Singapore. In December 2020 the Singaporean government announced a **$25 billion** R&D budget for the next five years, representing a 30 percent increase over the previous five-year budget.

Singapore's political stability attracts corporations **seeking to diversify** manufacturing bases and supply chains. With its **favorable** tax and regulatory environment and pool of competent, high-skilled workers, Singapore is an attractive destination for investment in high-value-added manufacturing. It also boasts one of the world's strongest **IP protection regimes**.

The United States and Singapore maintain robust trade ties, as demonstrated by the U.S.-Singapore Free Trade Agreement, which the parties signed in 2004. In August 2021 the United States and Singapore **finalized** several agreements expanding cybersecurity cooperation, as well as a partnership aimed at enhancing growth and innovation and building resilient supply chains.

Vietnam

Vietnam is an ascendant tech powerhouse and viable "friend-shoring" alternative for U.S.-China derisking in the high-tech sector. Since the early 2000s, Vietnam has increasingly been seen as an alternative for companies relocating from China, and its industry has been **boosted** by significant investments from

large multinational companies. The Vietnamese government offers incentives for high-tech projects, including reductions in corporate taxes. As tech firms exited China in 2020, the Vietnamese government formed a working group to **attract tech investments** through customized incentive offers to foreign investors. Vietnam hosts a strong pool of engineers at a lower cost than its neighbors.

Samsung Electronics is the country's largest foreign direct investor. In 2013 the company invested **$1.3 billion** in Vietnamese main board and electronic component manufacturing. As of 2021, Samsung's investments reached **$18 billion**. Samsung has six plants in the country and is building a new **R&D center in Hanoi**.

Vietnam and the United States are **"trusted partners"** in a relationship that has become "increasingly cooperative and comprehensive." Since the United States and Vietnam concluded a bilateral trade agreement in 2001, the United States has become Vietnam's top export market and its second-largest trading partner. The U.S. government's Workforce for an Innovation and Start-up Ecosystem (WISE) will provide up to $2 million to **support** the Vietnamese transition from a low-skill industry-based economy to a "workforce better equipped to participate in the global digital economy." In addition, through the U.S. Agency for International Development (USAID) **Partnership for Higher Education Reform**, the U.S. government will provide up to $14.2 million to "**strengthen** teaching, research, innovation, and governance within the three largest national universities in Vietnam."

India

India is an eager participant in the global semiconductor ecosystem and a key member of the IPEF supply chains pillar, though U.S.-India strategic alignment remains elusive. India's **semiconductor demand** is valued at around $24 billion and is expected to reach $100 billion by 2025. The country currently meets its semiconductor demand entirely through imports. In December 2020, India's government issued an **expression of interest** for establishing and expanding existing semiconductor wafer/device fabrication facilities in the country or otherwise acquiring semiconductor facilities outside of India.

In 2013, IBM and STMicroelectronics worked with the Indian government on an investment of $7.91 billion to set up **India's first chip-making facility**. To accelerate the foundation of India's semiconductor and electronics industry, the Indian government **proposed** $1.58 billion for an **Electronics Development Fund** to promote electronics hardware manufacturing in the country.

India's commerce and industry minister Piyush Goyal is confident that the U.S.-India economic relationship will continue to deepen. Minister Goyal **noted** in November 2022 that "India and the US relations are continuously improving and strengthening" and that bilateral trade would grow to $500–$600 billion by 2030. However, India's lack of willingness to entertain serious concessions has stymied progress within the bilateral relationship. India and the United States also maintain partnerships throughout the high-tech ecosystem. India, a Quad member, launched the **Initiative on Critical and Emerging Technology** with the United States in May 2022, which focuses on issues ranging from innovation ecosystems to advanced defense industrial cooperation and building resilient semiconductor supply chains.

Persistent disagreements over trade policy, however, have hampered further supply chain integration with India, preventing the parties from concluding a formal bilateral FTA. The United States determined

that India **no longer met** Generalized System of Preferences (GSP) criteria, which allow specific products to enter the United States duty-free. The United States **revoked** India's GSP status in 2019, ending special duty treatment for $5.6 billion worth of Indian exports to the United States. Although India has somewhat softened its rhetoric on the war in Ukraine, the country's complex military procurement and energy relationship with Russia impedes deeper cooperation with the United States.

Thailand

In Thailand, political uncertainty and relatively high labor costs restrain deeper Thai economic integration with IPEF partners. It is the **thirteenth-largest exporter** of electronic products, producing a variety of electronic products from semiconductors to memory devices. Thailand's top export category is electronic components and equipment, which reached **$42 billion** in 2021. The Thai government has increased efforts to educate the workforce to bolster electronics manufacturing, and it incentivizes foreign investors through competitive tax incentives. In 2021 Thailand **unveiled** an initiative to attract semiconductor, packaging, and digital industries to enter the country. The Thai government's foreign investment regulatory framework **encourages** companies to enter the market through tax and nontax incentives.

Nevertheless, Thailand lags in attracting additional foreign high-tech investments, particularly compared with neighbors such as Vietnam and Malaysia, primarily due to relatively higher labor costs. Political uncertainty in Thailand, which experienced a **coup** in 2014, has left investors wary. Thai opposition parties saw strong **outcomes** in the May 2023 general election. As of the writing of this paper, it remains unclear to what degree Thailand's opposition party will be able to form a government and whether potential disruptions are likely. Election outcomes may create further **disruptions** that harm the country's standing with investors. While IPEF provides Thailand with an opportunity to deepen its involvement in semiconductor supply chains, it risks being overtaken by partner countries with more advanced markets.

Indonesia

Indonesia is a growing geopolitical influence with a sizable labor force but an uncertain geopolitical agenda. It possesses many critical resources that could accelerate its growth as a semiconductor-producing country. **Silica**, for instance, is abundant in Java, Sumatra, and Kalimantan. Indonesia holds the **world's largest nickel reserves** and has even gone so far as to propose the creation of an **"OPEC-like group"** focused on governing the export of nickel. These nickel deposits have since **fueled** Indonesia's interest in establishing itself as a key player in the electric vehicle industry. President Joko Widodo has also **touted** Indonesia's construction of new chip design facilities and a new polysilicon factory in Central Java. Under the Ministry of Industry's "**Indonesia 4.0**" initiative, electronics manufacturing is one of five key priorities for development by the Indonesian government.

The government's prioritization of the semiconductor industry is backed by **heavy tax incentives**. Nineteen special economic zones throughout the country provide additional tax, customs, and excise exemptions and immigration flexibility. However, **researchers have found** the lack of domestic brand firms or a robust domestic supplier base, coupled with lack of a skilled workforce, is a key barrier to the development of native semiconductor production capacity. In addition, Indonesia's liberal application of local content requirements pose **stark barriers** for potential investors.

The United States and Indonesia **cooperate** across multiple economic frameworks, such as the Association of Southeast Asian Nations (ASEAN) Regional Forum, East Asia Summit, Asia-Pacific Economic Cooperation (APEC) forum, and the G20. However, the country remained on the **U.S. Priority Watch List** in 2021. **Corruption** presents another key obstacle to semiconductor companies that want to establish a presence in the country. While Indonesia's participation in IPEF could further bolster its economic and trade relationship with the United States, Indonesia benefits from hedging its bets between the two countries.

Philippines

The Philippine market is ripe for opportunity. However, it is constrained by ongoing rule of law and corruption issues. It **accounts** for 2.8 percent of world integrated circuit (IC) exports, ranking among the top 10 exporters of the last decade, and it performs well in the assembly and testing stage. As of 2022, semiconductors and electronics trade in the Philippines accounted for **$19 billion**, or 59.6 percent of total merchandise exports. Exports are **driven** by automobile electronics, consumer electronics, and electronic data processing, which grew significantly in 2022. In the **2023–28 development plan** released by the National Economic and Development Authority in January 2023, the government prioritizes implementation of "priority global value chains (GVC)–oriented industry clusters," seeing the greatest opportunity for growth in industry, manufacturing, and transport.

Businesses grapple with **corruption** and weak rule of law, hampering Philippine economic growth. However, the country has recently emerged from decades of protectionist policy. The 1987 constitution mandated that Philippine businesses be split between Filipinos and foreign investors 60-40. In 2022 the amendment of the **Foreign Investments Act** and the passage of the **Public Service Act** removed this restriction in the business and public services sectors.

The United States ranks among the Philippines' **top three trade partners**. In 2022 the United States announced funding for the development of nickel and cobalt processing facilities in the Philippines under the auspices of USAID. The agency will also support the **Advanced Manufacturing Workforce Development Alliance** in the Philippines, which aims to leverage $5.3 million in private sector contributions to bolster advanced manufacturing. Under President Marcos, the Philippines has recently **expanded** its defense cooperation with the United States, providing the United States with access to four additional military bases in February 2023 and supplementing the **original five sites** under the Enhanced Defense Cooperation Agreement. As this security relationship continues to deepen, the United States has an opportunity to build stronger economic ties into its regional security agenda.

Australia

Australia is a close defense and strategic ally with outsize influence in plurilateral arrangements. It has not historically been a key player in the semiconductor industry. Instead, it has positioned itself as an adopter of platforms that incorporate semiconductors. The country therefore relies on imported semiconductors, with 87 percent coming from China. As a result, the Australian academic community and policymakers have **called for investment** in the domestic semiconductor industry.

The New South Wales government **conducted a sectoral study** that found Australia already possesses semiconductor design capabilities in radio frequency, millimeter wave, photonics, and radar. It also boasts known deposits and reserves of several key semiconductor manufacturing materials such as

silica and **cobalt**, as well as the research talent and equipment to design high-end chips. The report concluded that with some time and a significant amount of money (an early estimate called for an initial $1.5 billion package in investment and incentives), Australia could reshore parts of its semiconductor design and manufacturing process. Australia continues to be chief among the United States' close allies and a leader in IPEF and the Quad, maintaining a privileged defense status with the United States.

New Zealand

New Zealand is an advanced economy with a relatively small semiconductor sector but significant willingness to engage in plurilateral and multilateral trade discussions. It produces only around **0.2 percent** of global semiconductor output. Over the past decade, the New Zealand semiconductor sector has shown that, while currently modest, it has the potential to gain in regional importance. In the fiscal year ending September 2022, New Zealand exported **$42.9 million** of machines for manufacturing semiconductors and imported $1.6 million, a significant increase from just seven years prior, when New Zealand exported $5.41 million of machines for semiconductor manufacturing and imported $1.93 million. In 2022 the top five import origins for semiconductors were China ($26.51 million), Japan ($9.76 million), Malaysia ($4.62 million), the United States ($3.25 million), and Australia ($3.17 million), showing how, much like Australia, New Zealand relies heavily on China for its computer chips supply chain.

Policy Recommendations

The simultaneous pursuit of industrial policy, more expansive export controls, and a nontraditional approach to trade signals a profound shift in the U.S. approach to international trade policy. This shift is particularly evident in both the domestic pursuit of an industrial policy focused on semiconductors and international work on supply chain cooperation. The United States has succeeded in launching a historic 14-member coalition through IPEF, which can increase the supply chain resiliency of semiconductors while also making those supply chains more secure. However, additional policy changes can enhance work already underway in the framework, to give more meaning and substance to a "friend-shoring" agenda that complements the reshoring efforts advanced by the CHIPS and Science Act—and effort that will be essential to the long-term success of U.S. strategy. Specifically, the United States should do the following:

1. **Establish trusted trading partner standards for future cooperation.** Previous CSIS reports have **detailed** how to build a trusted trade partner model, which focuses on promoting stronger economic diplomatic engagement, committing to enhanced information exchanges, and leveraging best practices for international trade. The diversity of IPEF's membership makes developing trusted partner models for semiconductor cooperation more difficult, but laying the foundation for greater coordination on export controls is a key step for deeper cooperation on semiconductor supply chains.

2. **Accept that trusted partnership relationships are reciprocal.** Developing secure, resilient supply chains in the semiconductor sector is not simply a matter of reshoring. Partnerships rely on all the parties to support and reinforce mutually agreed-upon outcomes. The United States must regard potential IPEF partners not just as sources of critical minerals and components but as partners in the production process.

3. **Leverage IPEF's diverse member base to expand information sharing.** Given the diversity of economies participating in IPEF, the United States should use the framework as a vehicle for sharing information and establishing early warning alerts for semiconductor supply chains. Over time, increasing the availability and transparency of data will have a trade-liberalizing effect.

4. **Advance trade facilitation efforts.** Regional governments continue to express their desire to participate more fully in semiconductor global value chains. IPEF provides the United States with an opportunity to help participating partners identify what economic role they can play and how best to pursue policy changes that make trade and investment more attractive and viable.

5. **Leverage the complementary features of industrial policy and trade tools to increase efficiencies and reduce costs.** The United States cannot rely solely on domestic production for its high-tech sector, meaning trade tools, including tariff concessions, can play an important role in driving efficiencies and deepening partnerships with allies. These trade measures would also satisfy the demands of U.S. partners, who, while intrigued by U.S. industrial policy and IPEF, still seek concrete trade liberalization.

6. **Reform immigration rules to attract foreign talent.** IPEF can serve as a vehicle for participant nations to bolster their innovation landscape by opening immigration rules to attract talent. The ability to bring in and retain high-skilled employees is crucial to developing a resilient semiconductor supply chain, given the need for well-trained specialists in multiple domains.

7. **Collaborate on attracting foreign investors during supply chain reshuffles.** One of the findings of prior reports on the trusted partner model was that nations failed to take advantage of recent seismic changes in supply chains by making their economies more attractive for foreign investors. To that end, a valuable lesson from Vietnam's technology sector growth was the formation of a working group to attract investments through customized incentive offers to foreign firms that exited China in 2020. IPEF could provide partners with the right consultation space to make economies more attractive to foreign investors as they divest from economies of concern.

8. **Ensure transparency in policymaking and implementation.** Several IPEF partner governments interviewed for this paper expressed dissatisfaction with the level of transparency available during the Department of Commerce's deployment of chips funding. Some governments regard the process as a black box and indicated that a less opaque system would better enable them to identify opportunities for new trade and investment initiatives. Furthermore, countries and private entities have expressed confusion over the failure to provide sufficient information in the wake of the October 7 export controls, which have created additional uncertainty throughout the sector.

Conclusion

Against the backdrop of increased tensions with China, the United States is reinvigorating industrial policy through the CHIPS and Science Act and building a new regional trade architecture with partner countries through IPEF. With this two-part solution, the United States is working to strengthen its semiconductor supply chains at home and abroad through collaboration with partner countries. Commensurate with the pursuit of industrial policy is the increased infusion of national security into the economic and trade policy realm. One part of this securitization of trade policy relates primarily

to inbound goods that constitute critical parts of supply chains, ranging from medical devices to downstream consumer goods such as smartphones. The other major security concern relates to outbound items, particularly exports of dual-use goods with both military and civilian uses. The IPEF supply chains pillar offers an opportunity to mitigate both types of risk.

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The first type of risk is embodied in the growing awareness that relying on a single source for inputs is riskier than in the past. Supply chain disruptions during the outset of the Covid-19 pandemic underscore this problem. When China shut down, the effects of production and port shutdowns reverberated throughout the global economy. Thus emerged the recognition that building resiliency into supply chains—avoiding putting all eggs in one basket—is of paramount importance for the U.S. economy. These trade security concerns relate overwhelmingly to the inflow of goods and services and thus focus on ways to leverage alternative suppliers of critical goods. As CSIS has noted in previous reports, however, it is difficult for the U.S. government to identify which countries offer viable alternatives as supply chains reshuffle. IPEF thus presents an opportunity for partner countries to more clearly convey the role their countries and private sectors can play in building more resilient supply chains.

On the other side of trade and security, there is growing recognition that the United States and its techno-democratic allies should move in unison to control exports of sensitive technology to countries and entities of concern. In other words, this second nexus of security and trade is predicated on the idea that the destination of exports matters. In building semiconductor supply chains into its IPEF strategy, the United States thus has an opportunity to begin laying the foundations for future cooperation on regional high-tech trade. That means, however, understanding that just as partners should work together to deny advanced technology to adversaries, they should also share technology with each other to better develop resilient supply chains.

This growing fusion of security and trade policy has led the United States to pursue an industrial strategy that serves two purposes: building additional resiliency into supply chains by encouraging onshoring and friend-shoring and minimizing geopolitical risks that result from relying on foreign producers. Both forms of security are inherently focused on risk reduction but through different means. Given that autarky in the semiconductor sector is impossible, IPEF can serve as a vehicle for establishing frameworks about imports, exports, and the overall resiliency and security of supply chains. ■

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