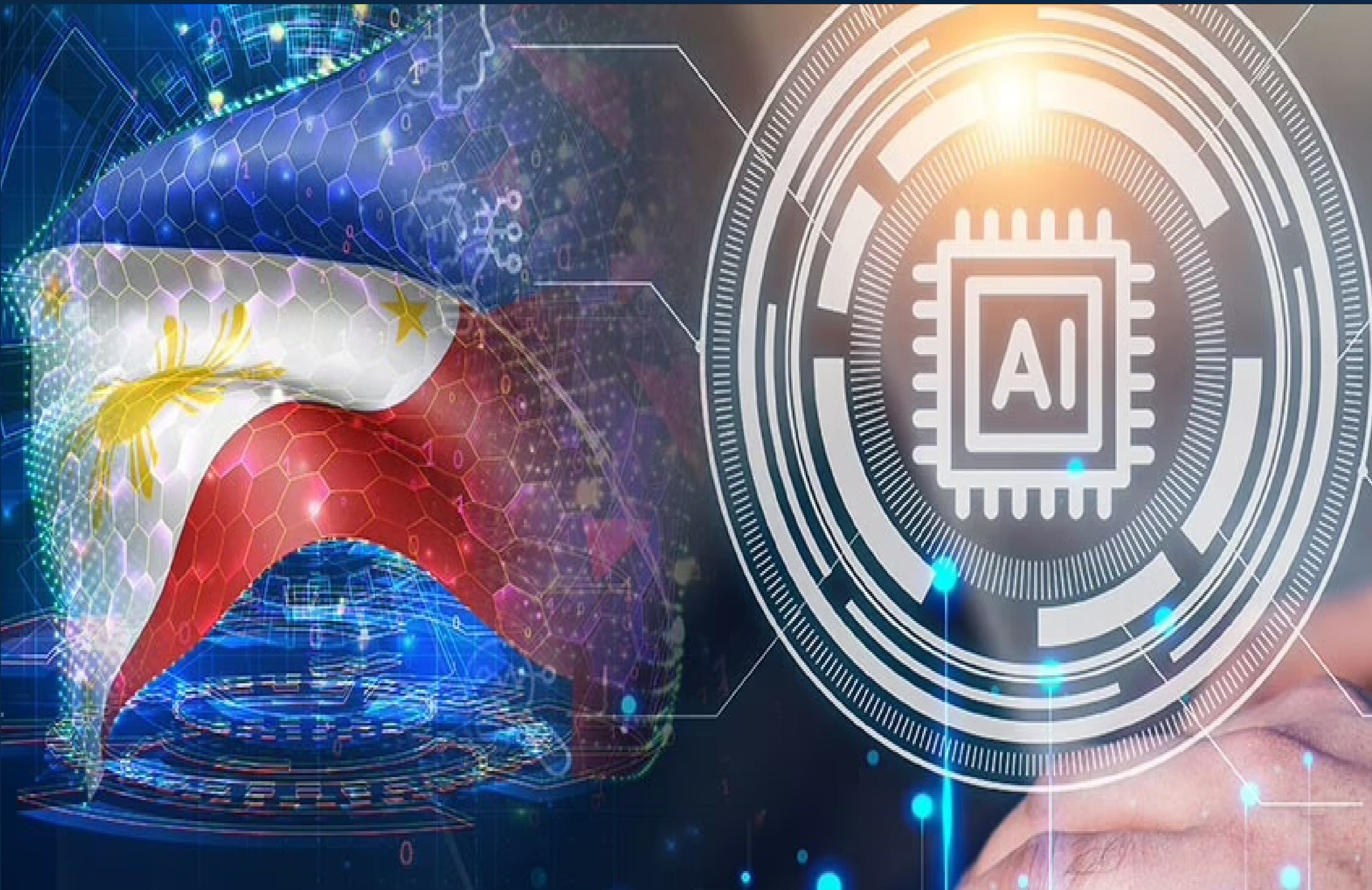
ISSUES & INSIGHTS 26.13 SEPTEMBER 2026

PACIFIC FORUM INTERNATIONAL

Enhancing Technology Protections in the Philippines

EDITED BY
AKHIL RAMESH AND ROB YORK



PACIFIC FORUM INTERNATIONAL

Founded in 1975, the Pacific Forum is an independent, nonpartisan, and non-profit foreign policy research institute based in Honolulu, in the US state of Hawaii. The Forum's focus areas encompass current and emerging political, security, economic, and business issues and work to help stimulate cooperative policies in the Indo-Pacific through research, analyses, and dialogues undertaken with the region's leaders in academia, public policy, military, and industry. The Forum collaborates with a network of more than 30 research institutes around the Pacific Rim, drawing on Asian perspectives and disseminating project findings and recommendations to opinion leaders, governments, and various publics throughout the region. We regularly cosponsor conferences with institutes throughout Asia to facilitate nongovernmental institution building as well as to foster cross-fertilization of ideas.

A Board of Directors guides the Pacific Forum's work. The Forum is funded by grants from foundations, corporations, individuals, and governments. The Forum's studies do not engage in classified or proprietary work.

Support Pacific Forum

Pacific Forum is a private, independent, nonpartisan, and non-profit, 501(c)(3) organization. Make a tax-deductible charitable contribution at www.pacforum.org/support-us

To support a specific program, please contact our Director of Development at: brooke@pacforum.org

Media: Fintech News Philippines

TABLE OF CONTENTS

Introduction

Over the course of 9 months, eight Philippines Technology Policy fellows engaged in substantive research on policies related to Philippine's semiconductor manufacturing ecosystem and strengthening U.S.-Philippines cooperation in the semiconductor sector.

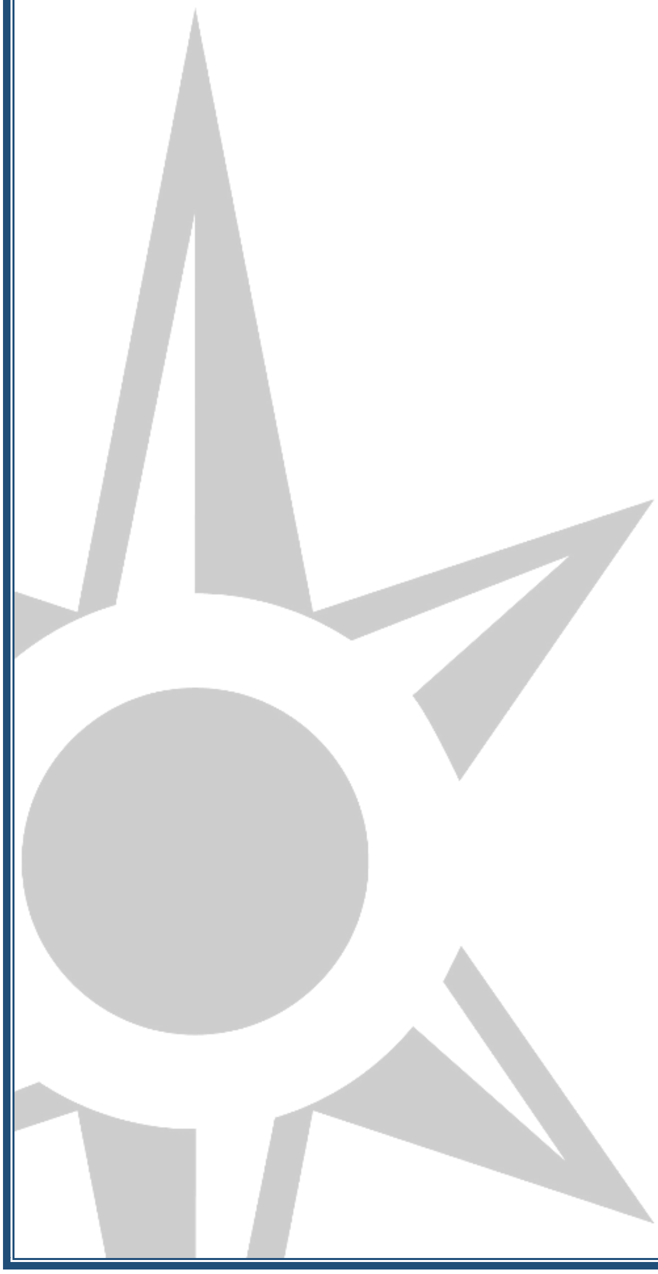
The eight fellows engaged in independent primary and secondary research alongside virtual meetings with industry experts and other guest speakers. In spring 2026, toward the end of their fellowship—sponsored by the Export Control and Related Border Security (EXBS) Program at the US Department of State— Pacific Forum organized a study tour to Washington D.C., San Jose, California, and Phoenix, Arizona, providing the fellows an opportunity to interact and learn from industry, government and academia, informing their research and analysis. Their fellowship concluded with policy papers offering actionable policy recommendations to enhance semiconductor technology protections and cooperation with the U.S. Find here, their eight policy papers covering various areas of US-Philippines semiconductor cooperation.

Akhil Ramesh
Chief Research and Development Officer
Pacific Forum

PACIFIC FORUM INTERNATIONAL

A Framework for Upgrading and Supply Chain Security

By
Rafaelita Mercado Aldaba



Executive Summary

Rafaelita Mercado Aldaba

Export controls are increasingly shaping semiconductor supply chains and influencing where firms locate investment, technology, and higher-value capabilities. This paper examines their implications for the Philippine semiconductor industry, particularly for global value chain positioning, technology transfer, capability development, and industrial upgrading. The analysis shows that the Philippines has a substantial semiconductor base, but the **central challenge is to move beyond existing strengths in assembly, testing and packaging toward higher-value and more technology-intensive activities.** A **progressive upgrading strategy**, particularly through **advanced packaging, process and product engineering, verification,** and selected **IC design** activities, offers the **most realistic path forward**.

The analysis further finds that US export controls constrain particular technological frontiers rather than Philippine semiconductor upgrading as a whole. Their direct impact on existing production appears limited, but they become increasingly important where activities involve strategically sensitive manufacturing equipment, design software, process know-how, advanced computing, and other controlled technologies. The Philippines' **trusted partner positioning** and relatively favorable regulatory status create opportunities, but these are **not sufficient** on their own. Attracting higher-value activities will also require stronger domestic competitiveness, including reliable and competitively priced infrastructure, streamlined regulation, deeper supplier and research capabilities, a more specialized workforce, and credible governance of strategic trade, intellectual property, and cybersecurity.

The paper therefore proposes a capability-based industrial policy and US-Philippines cooperation framework that uses the Philippines' trusted partner position as a platform for semiconductor upgrading and supply chain security. Domestic policy should build the infrastructure, skills, supplier, research, and governance capabilities needed to attract and absorb higher-value investment while bilateral cooperation can accelerate access to technology, specialized knowledge, research networks, finance, and trusted supply chains. **Priority actions** include establishing a **joint upgrading work program** and scorecard; developing **semiconductor-ready infrastructure in the Luzon Economic Corridor**; launching a **workforce and talent compact**; building **advanced packaging and shared IC design capabilities**; strengthening **domestic suppliers, R&D, and commercialization**; and improving **trusted technology governance**. US financing and technology partnerships can help anchor these higher-value investments. Together, these measures can **advance Philippine industrial upgrading while contributing to more secure, diversified, and resilient semiconductor supply chains.**

I. Background and Rationale

Export controls have become an increasingly important feature of the global semiconductor industry. Traditionally designed to prevent the transfer of sensitive military and dual-use technologies, export controls have evolved into broader instruments of technological and economic statecraft[1]. In an era characterized by intensifying geopolitical competition, particularly between the United States and China, export controls are increasingly being used not only to protect national security but also to preserve technological leadership, strengthen economic resilience, secure critical supply chains, and maintain strategic advantages in emerging technologies such as semiconductors, AI, quantum computing, advanced manufacturing, and advanced communications[2]. Consequently, export controls have moved from the periphery of trade policy to the center of contemporary technology and industrial strategy[3].

Trusted partner status and governance alignment have become increasingly important factors in determining the location of advanced semiconductor activities, sensitive technologies, and strategic investments, alongside more traditional determinants such as industrial and technological capabilities, human capital, and a competitive operating environment. Against this evolving global backdrop, the Philippines is emerging as a strategically positioned trusted partner because of its decades-long experience in semiconductor assembly, testing, and packaging (ATP), its pool of technical talent, and its deep integration into global semiconductor and electronics production networks. The US is a major destination for Philippine electronics exports, particularly semiconductors, which account for nearly half of the country's merchandise exports and thereby underscore the depth of the bilateral economic relationship. The Philippines also remains embedded in complex East Asian supply chains that include China and other major semiconductor economies.

The recently announced Pax Silica initiative of the US seeks to strengthen trusted ecosystems across critical minerals, semiconductors, advanced manufacturing, and AI-related infrastructure. Leveraging its significant copper and nickel resource base, established ATP capabilities, and the planned development of a 4,000-acre AI-native industrial hub within the Luzon Economic Corridor, the Philippines is well positioned to expand its role within these emerging trusted technology ecosystems.

In this context, deepening US–Philippines semiconductor cooperation is critical to the country's industrial upgrading. Moving beyond a predominantly production-based role toward a broader trusted partner model requires a coherent regulatory and industrial policy framework that enables technology access while complying with export control requirements. Understanding how export control regimes influence technology transfer and the position of the Philippines in the semiconductor value chain is therefore essential to designing policies that strengthens supply chain security while supporting industrial development and long-term competitiveness.

This paper has two objectives. First, it assesses the economic implications of US export controls for the Philippine semiconductor industry, including their effects on global value chain (GVC) positioning, technology transfer, and capability development. Second, it develops a capability-based industrial policy framework for US–Philippines semiconductor cooperation that supports upgrading under a sustained export control environment.

The remainder of the paper is organized as follows. Part II explains the structure of the semiconductor GVC and how export controls increasingly shape opportunities for technological and industrial upgrading. Part III reviews government policies affecting the growth and development of the industry, together with its performance and evolving position in GVCs. Part IV assesses the implications of export controls for Philippine semiconductor upgrading and ecosystem development and presents a framework for industrial policy and US–Philippines cooperation. Part V synthesizes the key findings and sets out policy recommendations and

[1] S. Koren, et al, "Reigning in the Export Control Arms Race", https://www.csis.org/analysis/reining-export-control-arms-race.

[2] McKinsey, "Restricted: How Export Controls Are Reshaping Markets", https://www.mckinsey.com/capabilities/geopolitics/our-insights/restricted-how-export-controls-are-reshaping-markets#/; Barczentewicz, "US Export Controls on AI and Semiconductors: Two Divergent Visions", 2025.

[3] C.P. Bown and D. Wang, "Semiconductors and Modern Industrial Policy", 2024; Branstetter, "Export Controls and US-China Technology", 2024.

priority actions to strengthen semiconductor capabilities, support industrial upgrading, and enhance supply chain security.

II. The Semiconductor GVC: Structure, Upgrading, and Export Controls

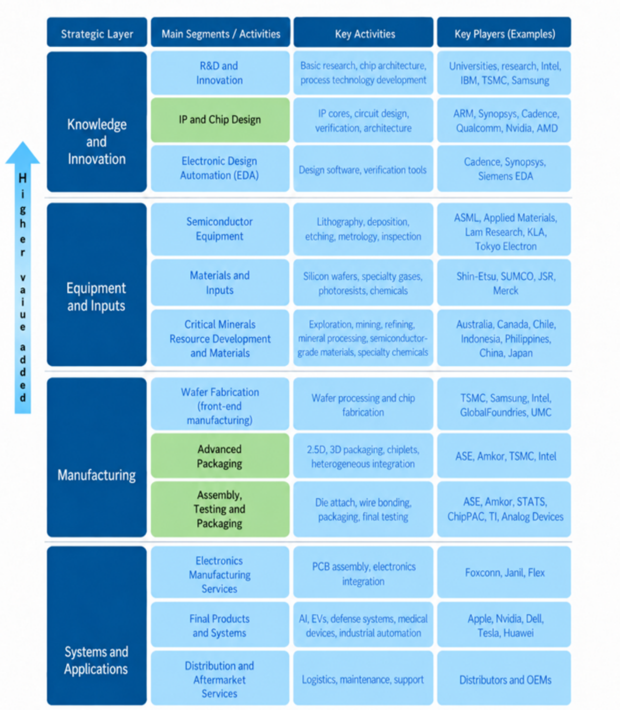
A. Semiconductor GVC Structure

The semiconductor industry is organized around one of the world's most complex and globally fragmented value chains, with different stages of production distributed across many countries[4]. Technological capabilities, cost structure, infrastructure, talent base, supplier ecosystems, and strategic relationships have played important roles in determining how countries participate in and position themselves within this global production system. The semiconductor value chain can be organized into four broad layers: knowledge and innovation, equipment and inputs, manufacturing, and systems and applications.

Figure 1 summarizes the principal activities and major players within each layer. Understanding these layers is crucial to assessing the Philippines' current position and identifying opportunities for technological and industrial upgrading.

The **knowledge and innovation layer** provides the intellectual foundation of the industry, encompassing R&D, semiconductor architecture and IC design, intellectual property development, and electronic design automation (EDA). These activities are highly knowledge-intensive and generally capture high levels of value added. Because advanced semiconductor know-how, design software, and AI-related technologies are increasingly regarded as strategic assets, this layer is also among the most exposed to export controls.

Figure 1: The Semiconductor Global Value Chain



Source: Adapted from OECD (2025) and Frederick & Gereffi (2016).
Note: The green boxes indicate priority stages in the proposed Philippine upgrading pathway. ATP as the existing industrial base, advanced packaging as the most direct upgrading opportunity, and IC design as a key higher value capability.

The **equipment and inputs layer** supplies the specialized machinery, materials, chemicals, and other production inputs required for semiconductor manufacturing. These include lithography, deposition, etching and inspection equipment, as well as silicon wafers, specialty gases, photoresists, advanced materials, and semiconductor relevant critical minerals such as gallium, germanium, indium, tantalum, tungsten, and selected rare earth elements.

The segment is highly concentrated and characterized by substantial technological barriers to entry. Dependence on geographically concentrated mineral and material supply chains adds further geopolitical and supply security risks. This concentration is particularly important because several critical semiconductor inputs are sourced from only a few countries. For example, China accounts for 98 percent of the world's refined gallium and 68 percent of the world's germanium production[5]. Such concentration can make access to

[4] G. Gereffi, J. Humphrey, and T. Sturgeon, "The Governance of GVCs", 2005.

[5] G. Baskaran and M. Schwartz, "From Mine to Microchip", 2024.

key materials vulnerable to trade restrictions and geopolitical disruptions. The segment is also highly exposed to export controls, as restrictions on advanced equipment, selected materials, software, and associated production technology can directly constrain a country's ability to establish or upgrade advanced semiconductor manufacturing capabilities.

The **manufacturing layer** transforms semiconductor designs into physical devices. It includes **wafer fabrication, advanced packaging, and assembly, testing and packaging (ATP)**. Wafer fabrication is the most capital- and technology-intensive stage of manufacturing and is concentrated among a relatively small number of firms and economies. Advanced packaging has become increasingly important as chip performance depends more on chiplets, heterogeneous integration, high-bandwidth memory, and 2.5D/3D architectures. It therefore provides an increasingly important pathway for value creation and technological upgrading without requiring the enormous capital investments associated with leading-edge fabrication. ATP, meanwhile, remains a critical and strategically important part of the semiconductor value chain and a major foundation of the Philippine semiconductor industry. It requires substantial capabilities in process engineering, automation, quality assurance, and production management, and provides an important platform for progression into more advanced packaging and engineering activities. While ATP typically generates lower value added and faces fewer export control constraints than more technology-intensive manufacturing activities, this does not diminish its importance to semiconductor production, supply chain resilience, and Philippine industrial upgrading. As highlighted in green in Figure 1, ATP, advanced packaging, and IC design are activities that are particularly important to the Philippines' semiconductor upgrading pathway. Regulatory exposure tends to increase as activities involve more strategically sensitive technologies, including certain advanced packaging, advanced node fabrication, AI and high-performance computing technologies.

Finally, the **systems and applications layer** integrates semiconductors into products and technologies such as AI, cloud computing and data centers, automotive electronics and electric vehicles, telecommunications, industrial automation, healthcare, and defense and aerospace systems. Demand and technological developments in these downstream industries increasingly shape the types of chips, manufacturing processes, and packaging technologies required throughout the semiconductor value chain.

B. Export Controls and Technological Upgrading Along the Semiconductor GVC

Export controls are regulatory measures used by the US to restrict or condition access to sensitive and dual-use goods, software, technologies and technical knowledge that may have both civilian and military applications. Under the Export Administration Regulations (EAR), commodities, software, and technologies identified on the Commerce Control List (CCL) are assigned Export Control Classification Numbers (ECCNs). Each ECCN specifies applicable reasons for control, such as **National Security (NS), Regional Stability (RS), and Anti-Terrorism (AT)**, and the corresponding licensing requirements. The number of reasons for control does not itself indicate the restrictiveness of a control. What matters is the scope of the restriction, the destination, end user and end use, the applicable licensing and review policy, and whether license exceptions are available.

Table 1: Illustrative US Export Controls and Licensing Exposure Across the Semiconductor GVC

GVC segment	Product or technology	ECCN	Reason(s) for control	Indicative treatment for Philippines
Conventional ATP / Testing	Specified assembly and inspection/testing equipment	3B991 / 3B992	AT	Generally No License Required (NLR)
Advanced packaging	Specified TSV-related advanced etch equipment	3B001.c.3/c.4	NS, RS, AT	Generally NLR
Advanced fabrication	Selected advanced etch, deposition, lithography and related equipment	3B001	NS, RS, AT	Varies by subparagraph; license required for specified equipment

Advanced node fabrication	Specified advanced semiconductor manufacturing equipment	3B993 / 3B994	RS, AT	Generally NLR for ordinary Philippine recipients
IC design	Specified GAAFET-related ECAD software	3D006	NS, AT	License required
Advanced design	EUV computational lithography software	3D003	NS, AT	License required
Process technology	Specified GAAFET development/production technology, including process recipes	3E905	NS, RS, AT	License required; worldwide NS/RS controls
Advanced computing / AI	Specified advanced computing ICs and HBM meeting applicable thresholds	3A090.a–c	RS, AT	Varies: 3A090.a subject to worldwide RS licensing; 3A090.b/c generally NLR to PH on destination basis

Source: Adapted from OECD (2025) and Frederick & Gereffi (2016).
Note: The green boxes indicate priority stages in the proposed Philippine upgrading pathway. ATP as the existing industrial base, advanced packaging as the most direct upgrading opportunity, and IC design as a key higher value capability.

Table 1 presents illustrative examples of semiconductor products and technologies subject to US export controls and licensing requirements. **Export control exposure is not uniform across the semiconductor value chain and generally becomes more significant as activities become more technologically sophisticated, knowledge-intensive, and strategically important.** The relationship is not strictly linear, however, and not every higher-value activity is subject to restrictive controls. The examples illustrate this pattern; for instance, specified assembly and testing equipment falls under ECCNs 3B991 and 3B992 while more advanced manufacturing equipment is covered under 3B001, 3B993, and 3B994. Additionally, the examples demonstrate that controls extend beyond physical equipment to strategically important design software and process technology, including specified gate-all-around field-effect (GAAFET)-related electronic computer-aided-design (ECAD) software under 3D006, extreme ultraviolet (EUV) computational lithography software under 3D003, and specified GAAFET production technology, including process recipes, under 3E905.

Under the EAR, the Philippines is listed in **Country Group B** and is not included in the D:1–D:5 groups associated with heightened national-security, proliferation, missile-technology, or arms-embargo concerns.[6] This does not exempt the Philippines from US export controls, and the country remains subject to licensing requirements under several National Security and Regional Stability controls; however, its status nevertheless provides more favorable treatment under certain EAR provisions and license exceptions. This regulatory position complements the country's broader **trusted partner positioning**, although actual licensing continues to depend on the specific ECCN, applicable control, destination, end user and end use, and available exceptions.

[6] For export control purposes, foreign countries are organized into four groups designated by the letters A, B, D, and E. A country's placement into a country group is used to determine eligibility to use certain license exceptions in part 740 of the EAR.
Country group A includes members of the four multilateral export control regimes and countries eligible to receive items under license exception Strategic Trade Authorization.
Country group B is eligible for several license exceptions, and they are subject to relatively less stringent license review policies.
Country group D identifies countries for specified proliferation concerns and those countries subject to US arms embargoes. D:1 National Security, D:2 Nuclear, D:3 Chemical & Biological, D:4 Missile Technology, D:5 US Arms Embargoed Countries
Country group E lists terrorist supporting countries and those subject to a unilateral embargo.
Source: Supplement No.1 to Part 740 Country Groups https://www.bis.gov/regulations/ear/740#supplement-1-740

For the Philippines, conventional semiconductor assembly and testing equipment generally faces limited destination-based licensing requirements. Some technologies associated with upgrading, including specified through-silicon-via (TSV) equipment used in advanced packaging and certain advanced node manufacturing equipment, may also be exported to ordinary Philippine recipients without a license based solely on their ECCN and destination. **Technological sophistication, therefore, does not automatically trigger a Philippine licensing requirement.**

Export control exposure increases when technologies cross particular strategic thresholds. Certain advanced semiconductor fabrication equipment requires licensing to the Philippines, while specified GAAFET-related ECAD and EUV computational lithography software trigger National Security licensing requirements. At the technological frontier, specified GAAFET process technology is subject to worldwide controls, as are the highest-performing advanced-computing ICs under the applicable Regional Stability provision. Advanced computing illustrates this differentiation: 3A090.a is subject to worldwide RS licensing, whereas 3A090.b and 3A090.c face narrower destination-based restrictions that generally do not capture ordinary exports to the Philippines. **The key distinction, therefore, is not simply how advanced or high-value an activity is, but whether the underlying technology provides a strategically sensitive manufacturing, design, process, or computing capability.**

Advanced packaging illustrates both the opportunities and limits of this regulatory environment. Specified TSV etch equipment and high bandwidth memory (HBM) are controlled under the EAR but do not generally require a license for ordinary exports to the Philippines based solely on destination, leaving significant regulatory space for Philippine upgrading. Controls become more significant when packaging intersects with the most sensitive AI-computing, manufacturing, or process technologies, or with restricted end users and end uses.

These examples show that contemporary semiconductor export controls increasingly target technological capability, not simply trade of finished products. Controls on advanced equipment, software, and process technology can influence where sensitive technologies and higher-value activities are located. The evidence therefore suggests that US export controls constrain **particular technological frontiers rather than semiconductor upgrading as a whole**.

For the Philippines, this creates both possibility and constraint. Its established ATP/OSAT base, Country Group B classification, and broader trusted partner positioning provide scope for progressive upgrading into advanced testing, advanced packaging, process and product engineering, and selected IC design activities. At the same time, access to the most strategically sensitive manufacturing, design, process, and computing capabilities increasingly depends on licensing and technology security requirements. **Thus, export controls do not preclude Philippine semiconductor upgrading but increasingly shape which technologies and capabilities can be accessed and under what conditions.**

III. The Philippine Electronics and Semiconductor Industry: Government Policy Framework, Industry Structure, and Performance

The Philippine electronics and semiconductor industry comprises two broad segments: semiconductor manufacturing services (SMS) and electronics manufacturing services (EMS). SMS activities focus on the assembly, packaging, and testing of semiconductor products such as integrated circuits (ICs), transistors, diodes, sensors, and other semiconductor components. EMS, by contrast, involves the assembly and testing of printed circuit boards and a broader range of electronics products, including computer and data-processing equipment, office automation products, consumer electronics, telecommunications equipment, industrial controls and instrumentation, automotive electronics, and solar photovoltaic products. This distinction is important because the two segments occupy different positions in the electronics value chain and involve different technological capabilities and upgrading opportunities.

The Philippine electronics and semiconductor industry emerged during the country's import substitution period but subsequently evolved toward a more open, export-oriented, and FDI-led model. The Philippines became an early semiconductor manufacturing location in Asia, with Intel establishing an assembly facility in 1974 (exiting in 2009), followed by Texas Instruments and Motorola in 1979, Philips Semiconductors in 1981, Analog Devices in 1982, and Amkor Technology in 1989. Beginning in the 1980s and accelerating during the 1990s, trade liberalization, investment reforms, and the expansion of export processing and economic zones further strengthened the country's integration into global semiconductor production networks. These investments established a significant manufacturing base concentrated particularly in ATP.

Electronics subsequently became the country's dominant export sector, with semiconductors accounting for its largest component. By the 2000s and early 2010s, however, Philippine participation in the semiconductor supply chain remained largely concentrated in back-end manufacturing, with relatively limited capabilities in front-end fabrication, IC design, R&D, and domestic supplier development. This led industrial policy to place increasing emphasis on upgrading through advanced packaging, IC design, higher-value electronics manufacturing, technological upgrading and capability development, priorities that continue to shape the industry's development agenda today.

The industry is dominated by multinational corporations and subsidiaries of major global semiconductor and electronics firms, including Texas Instruments, Analog Devices, NXP Semiconductors, Nexperia, Onsemi, Amkor Technology, STMicroelectronics, Infineon Technologies, Microchip Technology, ROHM Electronics, Murata, and SFA Semicon. Their Philippine operations cover ATP, product and process engineering, and other manufacturing support functions. Major electronics manufacturers such as Western Digital, Toshiba, Samsung, Canon, Brother, Epson, and Integrated Micro-Electronics, Inc. likewise form part of the country's extensive participation in regional and global electronics production networks.

Complementing these multinational enterprises are a number of domestic firms, including Fastech Synergy Philippines, ATEC, Megachip Semicon Electronics, and XiNYX Semiconductor Design Services, engaged in specialized manufacturing, ATP, RF and microwave solutions, and semiconductor design services. XiNYX is particularly noteworthy as a Filipino-owned firm engaged in IC design and design verification, illustrating the emergence—although still limited—of indigenous capabilities in more knowledge-intensive semiconductor activities.

Today, the electronics and semiconductor industry remains an important pillar of the country's economy. From 2019 to 2025, the sector accounted for an average of approximately **12.3 percent of manufacturing gross value added (GVA)** and **56.3 percent of total merchandise exports**, underscoring its importance to domestic production, employment, and foreign-exchange earnings. In 2025, Philippine semiconductor and electronics exports reached approximately US$50.17 billion, equivalent to 59.4% of total merchandise exports**.** Semiconductors accounted for US$30.13 billion, or about 60.1% of total semiconductor and electronics exports**, while other electronics contributed** US$20.04 billion, or 39.9%**.**

By destination, **China and Hong Kong together accounted for 29.4%** of exports, followed by the **United States at 17.5%**, **ASEAN at 15.9%**, and the **European Union at 12.2%**, with other markets comprising the remaining **25.0%**. Notably, the **United States, European Union and ASEAN together accounted for about 45.6% of Philippine semiconductor and electronics exports**, providing a substantial base for further market and supply chain diversification. These trade patterns support a strategy of **de-risking through diversification**: deepening trusted partner linkages with the US, EU and ASEAN while maintaining commercially important connections with China and the broader Asian production network.

Recognizing both the opportunities and constraints facing the industry, the **Semiconductor and Electronics Industry Roadmap 2026–2030** (2026) provides the strategic framework for upgrading the country's position within global semiconductor and electronics value chains. The Roadmap identifies several structural constraints to industry growth and upgrading, including critical talent and workforce gaps, relatively high electricity and water costs, elevated logistics costs, and a complex business environment characterized by inconsistent regulatory implementation. As Table 2 shows, the country faces significant operating-cost disadvantages relative to several competing ASEAN manufacturing locations, particularly in electricity, water, and logistics. These constraints can weaken the country's competitiveness in attracting and retaining higher-value semiconductor activities despite its long-established participation in global production networks.

Table 2: Operating Cost Comparison across Selected ASEAN Economies

Country	Electricity (USD/kWh)	Diesel (USD/liter)	Water (USD/m^3)	Logistics (% of total cost)
Philippines	0.21	0.87	0.71	27.50
Thailand	0.14	0.98	0.25	13.8
Vietnam	0.08	0.68	0.24	18.0
Indonesia	0.09	0.83	0.46	21.0
Malaysia	0.06	0.73	0.33	14.0
Singapore	0.25	2.01	1.25	8.0

Source: Semiconductor and Electronics Industry in the Philippines, Inc (SEIPI), 2026.

Among the major ASEAN manufacturing locations shown, excluding Singapore, the Philippines records the highest electricity and water costs and the highest logistics cost as a share of total operating costs. The contrast is particularly pronounced with Malaysia and Vietnam, where electricity costs are substantially lower. Singapore, however, demonstrates that high utility costs need not preclude semiconductor competitiveness when they are offset by highly efficient logistics, reliable infrastructure, strong technological capabilities, and participation in higher-value activities.

To strengthen the country's overall investment proposition, the government rationalized and enhanced fiscal incentives through the Corporate Recovery and Tax Incentives for Enterprises (**CREATE) and CREATE to Maximize Opportunities for Reinvigorating the Economy (CREATE MORE) Acts.** Qualified projects may receive income tax holidays, followed by either a **five percent Special Corporate Income Tax** or an **Enhanced Deductions Regime**, with CREATE MORE further improving the flexibility and duration of incentives and reducing the tax rate to **20 percent**. Particularly relevant to semiconductor investments are enhanced deductions for **power, R&D, training, labor, and domestic inputs**, as well as value added tax and duty incentives for export enterprises. Highly strategic projects may also qualify for customized fiscal and non-fiscal support packages.

The Roadmap's 2030 vision is to position the Philippines as a trusted global partner in advanced semiconductor ATP, a leading electronics manufacturing hub in Southeast Asia, and a provider of world-class IC design services. Central to this vision is a **Dual Imperative Approach**: first, to sustain and strengthen the country's established capabilities in ATP and EMS; and second, to accelerate upgrading into higher-value activities such as advanced packaging, IC design, and engineering services. Rather than seeking immediate entry into leading-edge wafer fabrication, the Roadmap adopts a phased strategy that builds on existing strengths while progressively developing the capabilities required for participation in more technology-intensive segments of the semiconductor value chain.

The Roadmap identifies five strategic priorities for industrial upgrading:

- **Expand advanced packaging capabilities,** reflecting the growing importance of chiplets, heterogeneous integration, TSVs, and three-dimensional packaging in AI, cloud computing, and high-performance computing applications
- **Strengthen the domestic IC design ecosystem** through investments in engineering talent, design verification, EDA tools, and university-industry collaboration
- **Develop higher-value and niche EMS capabilities** in growth sectors such as automotive electronics, industrial automation, communications equipment, clean-energy technologies, and AI-related hardware
- **Expand participation in AI and high-performance computing infrastructure**, including semiconductor-intensive data centers, cloud services, and related digital infrastructure
- **Build front-end readiness** by progressively developing the talent, infrastructure, supplier ecosystem, research capabilities, and institutional capacity required for more advanced semiconductor manufacturing activities.

To support these upgrading priorities, the Roadmap also identifies five enabling thrusts: prioritizing niche EMS and next-generation IC design, strengthening government as a proactive partner, fostering sustained partnerships and collaboration, building a highly skilled and future-ready workforce, and developing tailored infrastructure and smart ecozone solutions.

Implementation is coordinated through the **Semiconductor and Electronics Industry Advisory Council (SEIAC)**, which provides the principal platform for government-industry coordination, policy alignment, program implementation, and monitoring of progress toward the Roadmap's objectives. SEIAC is supported by technical working groups focused on industry promotion and policy, talent development and innovation, and infrastructure and supply chain resilience.

The Philippines already possesses important institutional foundations for trusted participation in global semiconductor supply chains. The **Strategic Trade Management Act (STMA), Republic Act No. 10697**, enacted in 2015, established the country's strategic trade management system and created the Strategic Trade Management Office (STMO) under the Department of Trade and Industry to administer registration, authorization, monitoring, compliance, and enforcement mechanisms covering strategic goods and related services. This framework is complemented by the country's intellectual property regime, administered by the **Intellectual Property Office of the Philippines (IPOPHL)**. The Philippines has remained outside the US Special 301 Watch List for 13 consecutive years, providing an indication of sustained progress in intellectual property protection and enforcement. Together, these institutions provide an important foundation for protecting sensitive technologies, proprietary processes, trade secrets, and other commercially valuable know-how. Their effectiveness in supporting higher-value semiconductor activities, however, will depend on sustained enforcement, inter-agency coordination, industry compliance, and the capacity to securely manage increasingly sensitive technologies.

The Philippines also has a substantial potential human-capital base for semiconductor industry expansion and upgrading. In Academic Year 2024–2025, the Commission on Higher Education (CHED) recorded approximately **972,000 higher-education graduates**, including around **107,000 in engineering, manufacturing and construction; 83,000 in information and communication technologies; and 17,000 in natural sciences, mathematics and statistics**. Together, these fields produced approximately **207,000 graduates, equivalent to about 21 percent of all higher-education graduates**, while around **1.42 million students** were enrolled in these fields. The potential technical talent pool is geographically concentrated: NCR, CALABARZON, and Central Luzon together accounted for approximately **94,000 graduates**, or about **46 percent of graduates in these three fields**, broadly corresponding with the country's principal semiconductor and electronics manufacturing corridors. The technical vocational system provides an additional pipeline, with the Technical Education and Skills Development Authority (TESDA) recording approximately **1.37 million graduates in 2025**, including around **98,000 in Electrical and Electronics, 61,000 in Metals and Engineering, and 43,000 in Information and Communication Technology**.

These figures, however, do not represent workers immediately qualified for semiconductor employment. Industry evidence points to shortages of specialized technicians and engineers in advanced assembly and testing, process and product engineering, automation, semiconductor design, R&D, AI, robotics, and Industry 4.0 technologies. The key challenge is therefore not simply the size of the graduate pool but the ability to **convert a large education and training pipeline into specialized, industry-ready capabilities for higher-value semiconductor activities**.

Achieving the Roadmap's vision will depend on combining this talent base with reliable infrastructure, innovation capacity, intellectual property protection, and trusted technology governance to support higher-value investment and compliance with evolving export control requirements.

IV. Impact of Export Controls on Semiconductor Upgrading: Implications for Industrial Policy and US-Philippines Cooperation

A. Philippine Revealed Comparative Advantage and Current Specialization

Table 3 maps Philippine semiconductor trade onto selected segments of the semiconductor global value chain. The table shows that Philippine semiconductor trade is overwhelmingly concentrated in semiconductor products, particularly integrated circuits, which accounted for almost 96 percent of semiconductor product exports in 2024. The country recorded a substantial trade surplus in integrated circuits while remaining a net importer of semiconductor devices, manufacturing and testing equipment, and selected production inputs. This pattern is consistent with the Philippines' strong integration into downstream semiconductor production networks, particularly ATP, although merchandise trade data alone do not identify the specific value chain functions performed domestically.

Table 3: Semiconductor Trade: 2024 Exports and Imports

Semiconductor Segment	Exports (US$)	Imports (US$)	Trade Balance (US$)
Semiconductor Products	23,591,577,078	14,377,509,220	9,214,067,858
---Semiconductor Devices	968,975,700	1,864,065,062	-895,089,362
---Integrated Circuits	22,622,601,378	12,513,444,158	10,109,157,220
Selected Semiconductor Manufacturing, Testing, and Inspection Equipment	241,067,277	456,593,541	-215,526,264
Selected Semiconductor Materials and Production Inputs	298,995	53,724,223	-53,425,228
Total	23,832,943,350	14,887,826,984	8,945,116,366

Source: UN Comtrade Data Base.

The trade structure also highlights an important asymmetry between **export strength and technological dependence**. While equipment and selected production inputs account for only a small share of total semiconductor trade, access to advanced machinery, materials, and related technologies is critical to production capability and future upgrading. **This dependence on externally sourced enabling technologies is particularly relevant to the analysis of export controls.**

Before examining the effects of export controls on semiconductor upgrading, it is useful to establish the country's current trade specialization. To complement the trade profile presented in Table 3, Table 4 examines the Philippines' **revealed comparative advantage (RCA)** in selected semiconductor products using Harmonized System (HS) six-digit classifications. An RCA greater than 1 indicates that the Philippines exports a particular product more intensively than the world average, suggesting revealed export specialization, but RCAs do not necessarily reflect technological capability or domestic value added.

Table 4: Semiconductor Products' Revealed Comparative Advantage Indicators

HS Code	Description	2020	2021	2022	2023	2024
854110	Electrical apparatus; diodes, other than photosensitive or light-emitting diodes (LED)	2.32	3.37	4.38	3.83	3.47
854121	Electrical apparatus; transistors, (other than photosensitive), with a dissipation rate of less than 1W	2.08	3.08	4.8	4.77	4.07
854129	Electrical apparatus; transistors, (other than photosensitive), with a dissipation rate of 1W or more	5.51	5.33	5.66	4.84	3.82
854130	Electrical apparatus; thyristors, DIACs and TRIACs, other than photosensitive devices	1.2	1.51	0.56	3.46	0.56
854141	Electrical apparatus; photosensitive semiconductor devices, light emitting diodes (LED)	-	-	-	1.66	1.3
854142	Electrical apparatus; photosensitive semiconductor devices, photovoltaic cells not assembled in modules or made up into panels	-	-	-	2.74	0.02

854143	Electrical apparatus; photosensitive semiconductor devices, photovoltaic cells assembled in modules or made up into panels	-	-	-	0.33	0.73
854149	Electrical apparatus; photosensitive semiconductor devices, diodes other than light emitting diodes and photovoltaic cells whether or not assembled in modules or made up into panels	-	-	-	2.19	2.16
854151	Electrical apparatus; photosensitive semiconductor devices, semiconductor-based transducers	-	-	-	45.4	24.94
854159	Electrical apparatus; photosensitive semiconductor devices n.e.c. in heading no. 8541	-	-	-	12.3	1.67
854160	Crystals; mounted piezo-electric	0.01	0	0.06	0.01	0.02
854190	Electrical apparatus; parts for diodes, transistors and similar semiconductor devices and photosensitive semiconductor devices	0.96	1.35	1.4	1.7	1.37
854231	Electronic integrated circuits; processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits	13.6	11.93	11.8	9.61	6.33
854232	Electronic integrated circuits; memories	1.56	3.29	2.61	3.93	4.39
854233	Electronic integrated circuits; amplifiers	0.27	0.2	0.26	0.18	6.18
854239	Electronic integrated circuits; n.e.c. in heading no. 8542	7.82	5.59	8.6	10.6	8.53
854290	Parts of electronic integrated circuits	0.53	1.68	1.85	1.38	1.36

Source: Author's calculations based on UN Comtrade Data.

The results show strong and relatively persistent specialization in several semiconductor products. The Philippines consistently recorded RCAs above 1 in **diodes (HS 854110), transistors (HS 854121 and 854129), processors and controllers (HS 854231), memories (HS 854232), and other integrated circuits (HS 854239)**. Particularly strong specialization is evident in processors and controllers and other integrated circuits, although the RCA for processors and controllers, while still well over 1, declined from 13.6 in 2020 to 6.33 in 2024. Memories, in contrast, strengthened from 1.56 to 4.39 over the same period. Several newer product categories also recorded high RCAs in 2024, including semiconductor-based transducers (HS 854151).

Table 5 compares the Philippines' RCA profile with selected ASEAN economies. The Philippines records RCA values greater than 1 in **13 of the 17 semiconductor product categories**, indicating relatively broad export specialization. Malaysia exhibits the broadest specialization, with **15 categories** above 1 compared to **7 for Thailand** and **5 for Vietnam**. The Philippine profile is particularly strong in integrated circuits and selected discrete semiconductor devices while showing little specialization in photovoltaic cells and modules. Malaysia demonstrates broader strength across ICs, semiconductor parts, and components, while Thailand and Vietnam exhibit more concentrated specialization in photovoltaic products and selected semiconductor devices.

Table 5: Revealed Comparative Advantage in Selected Semiconductor Products: Philippines and Selected ASEAN Economies, 2024

HS-Code	Description	MAL	THA	VN	PH
854110	Electrical apparatus; diodes, other than photosensitive or light-emitting diodes (LED)	2.92	0.86	0.02	3.47
854121	Electrical apparatus; transistors, (other than photosensitive), with a dissipation rate of less than 1W	0.13	3.73	0.03	4.07

854129	Electrical apparatus; transistors, (other than photosensitive), with a dissipation rate of 1W or more	2.64	0.37	0.03	3.82
854130	Electrical apparatus; thyristors, DIACs and TRIACs, other than photosensitive devices	0.09	0.06	0.01	0.56
854141	Electrical apparatus; photosensitive semiconductor devices, light emitting diodes (LED)	3.34	0.71	1.72	1.30
854142	Electrical apparatus; photosensitive semiconductor devices, photovoltaic cells not assembled in modules or made up into panels	8.66	10.31	2.26	0.02
854143	Electrical apparatus; photosensitive semiconductor devices, photovoltaic cells assembled in modules or made up into panels	3.00	3.60	7.71	0.73
854149	Electrical apparatus; photosensitive semiconductor devices, diodes other than light emitting diodes and photovoltaic cells whether or not assembled in modules or made up into panels	9.17	1.38	0.09	2.16
854151	Electrical apparatus; photosensitive semiconductor devices, semiconductor-based transducers	4.43	0.07	2.94	24.94
854159	Electrical apparatus; photosensitive semiconductor devices n.e.c. in heading no. 8541	5.49	0.40	0.69	1.67
854160	Crystals; mounted piezo-electric	1.43	1.07	0.19	0.02
854190	Electrical apparatus; parts for diodes, transistors and similar semiconductor devices and photosensitive semiconductor devices	13.92	0.39	0.25	1.37
854231	Electronic integrated circuits; processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits	7.03	0.29	1.98	6.33
854232	Electronic integrated circuits; memories	1.58	0.11	0.02	4.39
854233	Electronic integrated circuits; amplifiers	10.48	0.36	0.20	6.18
854239	Electronic integrated circuits; n.e.c. in heading no. 8542	3.57	1.17	0.20	8.53
854290	Parts of electronic integrated circuits	27.20	3.18	0.94	1.36

Source: Author's calculations based on UN Comtrade Data 2024 export data except for Vietnam which used 2023 data.

The RCA results reinforce the Philippines' established strength in semiconductor products but also underscore the distinction between current export specialization and future upgrading capability. As the country seeks to move into more technology-intensive activities, access to advanced equipment, design tools, production technologies, and technical know-how becomes increasingly important. **Export controls may therefore have greater implications for the Philippines' future upgrading trajectory than for its existing semiconductor exports.**

B. From Current Specialization to Feasible Upgrading Pathways

Taken together with the GVC analysis in Part II, the country's existing ATP capabilities, and the priorities of the Semiconductor and Electronics Industry Roadmap, the RCA results suggest a phased capability-building pathway:

ATP → Advanced Packaging → Verification → Analog and Mixed-Signal IC Design → Embedded Systems and AI-Enabled Devices → Selected Fabless Activities

Rather than seeking an immediate move into leading-edge wafer fabrication, this pathway builds progressively on existing manufacturing and engineering strengths while moving toward activities with greater technological content and potential value capture. It begins with the Philippines' established strength in ATP and progresses toward activities requiring greater engineering, design, software, and intellectual property capabilities. **Advanced packaging** builds directly on existing back-end manufacturing strengths, **verification** provides a relatively accessible bridge into semiconductor design, and **analog and mixed-signal IC design** offers opportunities in areas such as power management, sensors, automotive, industrial, and communications applications. These capabilities can subsequently support **embedded systems and AI-enabled devices**, where semiconductors, hardware, software, and system integration increasingly converge, and eventually selected **fabless activities**, allowing Philippine firms to participate in chip design and intellectual property creation without the capital requirements of wafer fabrication. Consistent with this cumulative upgrading approach, the Philippine Semiconductor and Electronics Industry Roadmap 2026–2030 prioritizes the development of technology, intellectual property, specialized research capabilities, and advanced talent as foundations for eventual front-end participation.

The **SEIPI and Texas Instruments (TI) case studies** (Boxes 1 and 2) broadly support this gradual capability-building strategy. TI in particular provides a concrete example of this incremental upgrading: its Clark operations have expanded beyond conventional assembly and testing into wafer bumping, probe operations, advanced packaging, and selected design-related engineering functions. TI nevertheless emphasizes that future higher-value investment depends strongly on domestic competitiveness, particularly in terms of infrastructure, utility costs, regulatory efficiency, and skilled engineering talent.

The Philippine strategy should also be viewed against increasingly ambitious semiconductor strategies across ASEAN (Table 6). **Malaysia** is seeking to deepen an already mature ecosystem through advanced packaging, IC design, semiconductor equipment, front-end manufacturing, and a **RM25 billion** targeted support package. **Thailand** is pursuing more specialized niches, particularly photonics, advanced packaging, silicon design, sensors, and power-management chips, with targets that include two advanced packaging facilities and eight IC design firms by 2030. **Vietnam**, meanwhile, is pursuing rapid scale-building, targeting 100 design enterprises, ten packaging and testing facilities, one semiconductor fabrication facility, and 50,000 skilled engineers and specialists by 2030.

Box 1: Industry Perspective on Upgrading and Export Controls

With more than 340 members, SEIPI is the largest association of foreign and Filipino electronics companies in the Philippines. The industry remains concentrated in back-end ATP, with capability gaps in front-end fabrication, IC design, advanced R&D, and the domestic supplier base. However, firms are gradually expanding into **advanced packaging, process and product engineering, and design support services**, providing a pathway for upgrading from the country's established ATP base.

Export controls increasingly shape this transition. While they have not significantly disrupted existing production, they influence where firms locate sensitive equipment, software, process technologies, R&D, and specialized engineering capabilities. Firms manage these constraints through internal compliance systems, export authorizations, technology partnerships, supply chain diversification, and compliance with the **Strategic Trade Management Act**. Export controls therefore matter less for current production volumes than for the **technological depth and location of future investment**.

This creates both a constraint and an opportunity. Strong export control compliance, intellectual property protection, cybersecurity, and strategic trade management can strengthen the Philippines' credibility as a **trusted semiconductor partner** and its position in friendshoring and secure technology partnerships. Regulatory credibility should therefore be viewed not merely as a compliance requirement but as part of the country's broader semiconductor competitiveness strategy. US–Philippines cooperation, including through the International Technology Security and Innovation (**ITSI) Fund or successor mechanisms**, can further support capability development in advanced packaging, IC design and verification, R&D, supplier development, and specialized skills.

Looking ahead, SEIPI identifies three priorities: **specialized workforce development, semiconductor-ready infrastructure, and stronger trusted technology governance**. Workforce development must increasingly focus on advanced engineering, technician, digital, and design capabilities rather than simply expanding graduate numbers. Infrastructure must provide reliable and competitively priced energy and water, efficient logistics, specialized facilities, and semiconductor-ready industrial locations. At the same time, stronger strategic trade management, intellectual property protection, cybersecurity, international standards alignment, and predictable regulation will be increasingly important as the industry moves toward more technology-intensive activities.

Key insight: Export controls may have limited effects on existing production but can materially influence **which technologies and capabilities firms are willing and able to locate in the Philippines**. Upgrading therefore requires not simply more investment, but the **skills, infrastructure, supplier capabilities, and trusted regulatory environment** needed to attract higher-value activities.

Source: Interview with Dr. Dan Lachica, President, Semiconductor and Electronics Industry in the Philippines, Inc (SEIPI).

Box 2: Incremental Upgrading and Capability Development

Texas Instruments, a major multinational semiconductor company, is incrementally upgrading its Philippine operations. While its Baguio facility remains largely focused on conventional assembly and testing, TI's Clark operations have expanded into wafer bumping, probe operations, advanced packaging, and selected design-related engineering functions. TI views this as **evolutionary rather than transformational** pattern, progressively adding higher-value activities that complement existing capabilities, as the most realistic pathway for Philippine semiconductor upgrading.

TI considers **wafer fabrication presently economically unviable in the Philippines** given its high capital requirements, relatively high electricity costs, and constraints in reliable water supply. Its Philippine strategy therefore continues to build on the country's strengths in assembly, testing, advanced packaging, and engineering support functions rather than immediately moving into front-end manufacturing. TI also reported **no direct operational impact from U.S. export controls** on its current Philippine operations, identifying regulatory complexity, utility costs, infrastructure, and the supply of highly skilled engineering talent as more immediate determinants of competitiveness. The firm cited **overlapping regulatory requirements** for importing and exporting production materials and chemicals, differences across investment zones, and in Clark, higher water costs and electricity distribution rates as factors affecting operating costs and future investment decisions.

TI identified the **capabilities of the Filipino workforce as a key source of long-term competitiveness.** The company regards the availability, technical aptitude, and cost competitiveness of Filipino engineers and technicians as important advantages but notes that specialized competencies remain below those in more mature semiconductor economies such as Taiwan and Singapore, where curricula are more specialized and industry-academe linkages and exposure to advanced technologies are stronger. As production becomes increasingly automated, data driven, and digitally integrated, demand is shifting toward highly skilled technicians, process and automation engineers, and professionals with capabilities in AI, robotics, and data analytics.

TI emphasizes closer collaboration among industry, universities, **CHED, TESDA, and DepEd** to align curricula and training with evolving semiconductor requirements, including benchmarking against mature semiconductor education systems while adapting these approaches to Philippine conditions. Overall, TI sees a credible pathway toward higher-value activities based on **advanced packaging, engineering services, and workforce upgrading** but stresses that capturing future investment will ultimately depend on improvements in regulatory governance, infrastructure, education, and industry-academe collaboration.

Key insight: Trusted partner status and geopolitical supply chain shifts can create opportunities, but **domestic competitiveness and sustained capability accumulation determine whether those opportunities translate into higher-value semiconductor investment.**

Source: Interview with Mr. Ralph Morales (Government Relations), Mr. Pastor Yllana (Assembly/Test Technical Ladder Council), Mr. Rommel Garcia (Human Resources), and Ms. Christine Jane de Guzman (Talent Acquisition), TI Philippines.

Table 6: Selected Features of Semiconductor Strategies in the Philippines, Malaysia, Thailand, and Vietnam

Country	Strategic Direction	Key Priorities / 2030 Focus	Distinctive Feature
Philippines	Upgrade from established **ATP/EMS** base	Advanced packaging, IC design, specialty devices, high-value EMS/ODM; eventual front-end readiness	**Trusted semiconductor partner** positioning; at least 3 advanced packaging FDIs and shared IC design infrastructure
Malaysia	Deepen an already mature semiconductor ecosystem	Advanced packaging, IC design, semiconductor equipment, specialized manufacturing and expanded wafer fabrication	Strong public backing, including **RM25 billion** in targeted support; explicit development of local champions
Thailand	Build specialized technology niches and deepen ASEAN integration	Photonics, advanced packaging, silicon design, sensors and power-management chips	Targets **8 IC design firms, 2 advanced packaging facilities and 1 fab by 2030**; strong international technology and skills partnerships
Vietnam	Rapidly build scale and a more comprehensive semiconductor ecosystem	IC design, packaging/testing, specialized chips, fabrication and advanced electronics	Targets **100 design firms, 10 packaging/testing facilities, 1 fab and 50,000 skilled workers by 2030**; strong state financing and infrastructure support

Sources: Philippine Department of Trade and Industry (2026), Vietnam Briefing (2025), Thailand The Nation (2026), Malaysian Investment Development Authority (2024).

Regional investment trends underscore the urgency of this upgrading agenda. The Philippines has also attracted significant semiconductor investment and expansion plans. TI has announced plans to invest up to US$1 billion to expand its facilities, while Analog Devices announced a US$200 million R&D expansion alongside the development of a 300-mm Center of Excellence. MinebeaMitsumi has likewise announced a P25-billion expansion in the Philippines, part of which will support the continued expansion of Cebu Mitsumi's semiconductor operations. Malaysia, however, has attracted major investments in high-end IC substrates, with AT&S investing €1.7 billion; advanced memory assembly/test, with Micron investing US$1billion and planning up to $1billion more; and silicon-carbide wafer fabrication, with Infineon investing up to €5 billion. Thailand is expanding into semiconductor-equipment components through Foxsemicon's $306 million investment and advanced photonics production and R&D through Lumentum's 2.3 billion baht expansion. Vietnam has also secured Amkor's US$1.6 billion next-generation packaging facility, including advanced System-in-Package production and design-to-test capabilities.

These investments show that the Philippines is participating in the regional investment race, but ASEAN competitors are also translating semiconductor strategies into substantial investments in precisely the higher-value segments that the Philippines is seeking to enter. The challenge is therefore not simply to attract more semiconductor investments, but to secure investment that deepens technological capabilities in advanced packaging, engineering, design, and R&D. This, in turn, requires access to the equipment, technology, knowledge, and international partnerships needed to move up the GVC, making export controls and trusted technology cooperation with the United States increasingly relevant.

C. Export Control Exposure, Trusted Technology Governance, and Regional Position

Two complementary approaches in US semiconductor policy are particularly relevant to the Philippines: "protect" and "promote". The "protect" approach seeks to safeguard strategic technologies and supply chains through export controls, investment screening, end-user restrictions, and other technology-security measures. The "**promote" approach** supports domestic semiconductor manufacturing and supply chain resilience, R&D, workforce development, and cooperation with trusted allies and partners, including through the Creating Helpful Incentives to Produce Semiconductors (CHIPS) program and related technology initiatives. Increasingly, these two approaches operate together, with access to sensitive US technologies and deeper technology partnerships shaped by security, governance, and trusted partner considerations.

As discussed in Part II Section B, export controls become more relevant as the Philippines moves beyond ATP toward more technology-intensive activities. Their principal impact may therefore be **less on existing production and exports than on the technological depth, composition, and location of future investment**. The case studies support this distinction. **SEIPI** indicates that export controls increasingly influence firms' decisions on where to locate sensitive technologies, equipment, software, R&D, advanced packaging, and specialized engineering capabilities. **TI**, by contrast, reports no direct operational impact from US export controls on its current Philippine manufacturing activities. Both nevertheless emphasize domestic capability development, infrastructure, specialized talent, and regulatory efficiency as critical determinants of upgrading.

Export controls therefore interact with, rather than replace, traditional investment determinants. **Industrial capability determines whether the Philippines can perform more sophisticated semiconductor functions, while trusted technology governance increasingly influences whether sensitive technologies can be located in the country.** For the Philippines, the US "protect" agenda should therefore be viewed not simply as stronger export controls but as part of a broader technology security architecture that the country must be able to navigate if it is to attract higher-value semiconductor activities.

The Philippines already has an important legal foundation in **the Strategic Trade Management Act (STMA)**, which covers exports, imports, re-exports, transit and transshipment of strategic goods, including transactions involving special economic and freeport zones (Fernando, Sacedon-Dimayacyac, & Salazar, 2021). As semiconductor activities become more technology-intensive, however, the challenge shifts increasingly from putting rules in place to ensuring their effective implementation. This requires stronger end-user and end-use verification, restricted-party screening, technology control plans, cybersecurity and trade secret protection, and coordinated enforcement among the STMO, the Bureau of Customs, economic zone authorities, law enforcement agencies, and other relevant institutions. These capabilities will also need to extend beyond firms to universities, research institutions, data centers, and shared technology facilities as Philippine participation expands into IC design, advanced packaging, AI and semiconductor R&D.

The objective should not be the wholesale adoption of another country's restrictions but the development of a **credible, risk-based, and internationally interoperable system consistent with Philippine national interests and regulatory sovereignty**. Strong safeguards should be accompanied by streamlined general authorizations and trusted-firm arrangements for legitimate, lower-risk transactions so that technology security supports rather than impedes competitiveness.

In this sense, the "protect" and "promote" approaches can become mutually reinforcing. Credible technology governance can reduce the risks perceived by firms and partner governments and facilitate investment, technology transfer, research collaboration, and industrial upgrading. The strategic objective is therefore to establish the Philippines as a **credible and competitive location for advanced technologies**, leveraging trusted partner relationships not only with the US but also with Japan, the European Union, Korea, Taiwan and other technology partners.

The broader question, therefore, is how effectively the country's legal and institutional arrangements function in practice. The following analysis compares the Philippines with competing ASEAN semiconductor locations across three areas of trusted technology governance: strategic trade management, intellectual property protection, and cybersecurity. These indicators are imperfect but together provide a useful benchmark of the country's capacity to control sensitive technologies, protect proprietary knowledge, and secure critical technology systems.

Strategic trade controls help prevent the unauthorized diversion of sensitive semiconductor chips, equipment, software and technical know-how. The Peddling Peril Index (Table 7) ranks the Philippines 48th globally, behind Singapore (5th) and Malaysia (40th) but ahead of Thailand (55th) and Vietnam (146th). Its legislation score is particularly strong at 189/200, while enforcement, monitoring/detection, and proliferation financing controls remain weaker.

Table 7: Strategic Trade Control Capacity in Selected ASEAN Countries Peddling Peril Index (2023-2024)

Country	Rank	International Commitment (100 Max)	Legislation (200 Max)	Ability to Monitor and Detect Strategic Trade (200 Max)	Ability to Prevent Proliferation Financing (400 Max)	Adequacy of Enforcement (400 Max)
Singapore	5	70	192	166	265	348
Malaysia	40	43	198	145	190	305
Philippines	48	61	189	136	173	247
Thailand	55	59	180	153	152	233
Indonesia	90	57	93	135	149	166
Vietnam	146	63	90	110	23	109

Source: Institute for Science and International Security (https://isis-online.org/peddling-peril-index)
International Commitment: measures memberships and adherence to a range of nonproliferation conventions, treaties, regimes, and groups
Legislation: assesses whether a country has legislation, authorities, and regulations in place to control trade in strategic commodities, with a focus on nuclear and nuclear-related goods
Ability to Monitor and Detect Strategic Trade: assesses the mechanisms that allow a state to monitor and control strategic or sensitive trade, and the hospitableness of the state environment to achieving the mission.
Ability to Prevent Proliferation Financing: evaluates a country's ability to prevent the raising and using of funds for weapons of mass destruction (WMD) proliferation, encompassing a relatively new approach to detecting and preventing strategic commodity trafficking
Adequacy of Enforcement: assesses the adequacy of a state's enforcement activities or efforts against strategic commodity trafficking

This relative advantage, however, cannot be taken for granted as competing locations strengthen their own strategic trade regimes. The priority is therefore to translate the Philippines' relatively strong legal framework into more effective enforcement, monitoring, firm-level compliance, trade facilitation, and inter-agency coordination.

Intellectual property and trade secret protection is particularly important for attracting design, R&D, and proprietary processes. The Philippines' 2025 International Property Rights Index IPR subindex score of **4.726** (Table 8) is below Singapore (7.513) and Malaysia (6.493) but slightly above Thailand (4.696) and Vietnam (4.514). The **2026 USTR Special 301 assessment** provides an additional indicator directly relevant to the US trusted partner context: Thailand remains on the Watch List and Vietnam was designated a Priority Foreign Country while the Philippines is not included on either list. Nevertheless, further improvements in **IP enforcement, trade secret protection, judicial effectiveness, and safeguards for proprietary technology and know-how** would strengthen the country's attractiveness for higher-value semiconductor activities.

Table 8: IPR Protection in Selected ASEAN Countries, 2025

Economy	IPR score	Global rank	Asia & Oceania rank
Singapore	7.513	7	1
Malaysia	6.493	26	6
Indonesia	4.960	71	10
Philippines	4.726	83	11
Thailand	4.696	85	12
Vietnam	4.514	94	13

Source: Property Rights Alliance. (https://internationalpropertyrightsindex.org)
2025 International Property Rights Index (IPRI) IPR Component

Cybersecurity is also essential to protect design files, EDA tools, manufacturing data, and critical digital and industrial infrastructure. The International Telecommunication Union (ITU) Global Cybersecurity Index 2024 places the Philippines in Tier 2 ("Advancing"), while Singapore, Malaysia, Thailand and Vietnam are classified as Tier 1 ("Role-modelling"),[7] indicating an important area where the Philippines needs to strengthen its trusted technology governance.

Overall, these indicators suggest that the Philippines enters the competition for trusted semiconductor investment from a relatively favorable but uneven governance position. Its strongest foundation is strategic trade legislation, complemented by a reasonably credible intellectual property framework, while implementation and cybersecurity remain important areas for improvement. The policy challenge is therefore to convert these legal and institutional foundations into a best-in-class trusted technology operating environment that combines effective safeguards with efficient trade and technology facilitation. Doing so would strengthen the Philippines' ability to leverage its trusted partner status for technology access, investment, and industrial upgrading.

D. Industrial Policy and US-Philippines Cooperation for Semiconductor Upgrading

The central challenge facing the Philippine semiconductor industry is no longer simply maintaining its participation in global value chains but **upgrading within them**. The country's established ATP base and revealed export specialization provide a foundation for moving into higher-value activities—particularly advanced packaging, verification, semiconductor design, and systems engineering. Higher-value investment, however, remains constrained by specialized skills gaps, infrastructure and utility costs, regulatory complexity, limited research capacity, and a shallow domestic supplier ecosystem, while export controls increasingly affect access to advanced equipment, software, technical knowledge, and sensitive technologies. This calls for an **industrial policy centered on capability development,** build progressively from **ATP to advanced packaging, verification, analog and mixed-signal design, embedded systems and AI-enabled devices, and selected fabless activities**, while aligning investments in skills, infrastructure, R&D, technology access, suppliers, innovation, and institutions.

Upgrading also requires **ecosystem development**. More sophisticated semiconductor activities depend on networks connecting firms, suppliers, universities, research institutions, technology providers, infrastructure, and government agencies. The **Luzon Economic Corridor**, including the proposed AI-native industrial and innovation hub in New Clark City, provides an opportunity to develop such a concentrated ecosystem by linking semiconductor manufacturing, research and innovation facilities, universities, workforce-development institutions,

[7] **Tier 1: Role-modelling** represents countries that obtained an overall GCI score of at least 95/100 by demonstrating a strong cybersecurity commitment to coordinated and government-driven actions that encompass evaluating, establishing and implementing certain generally accepted cybersecurity measures across all five pillars or up to all indicators.
Tier 2: Advancing represents countries that have obtained an overall score of at least 85/100 by demonstrating a strong cybersecurity commitment to coordinated and government-driven actions that encompass evaluating, establishing or implementing certain generally accepted cybersecurity measures in up to four pillars or a substantial number of indicators.
Source: https://www.itu.int/epublications/zh/publication/global-cybersecurity-index-2024/en

logistics infrastructure, and specialized industrial services.

Within this framework, **international cooperation should be treated as an instrument of capability upgrading and supply chain security rather than simply a means of attracting additional foreign investment**. US-Philippines cooperation can help accelerate access to technologies, specialized knowledge, research networks, skills, finance, and trusted supply chains that the Philippines cannot easily develop alone. At the same time, cooperation should complement rather than substitute for domestic reform. Trusted partner status can expand the Philippines' opportunity set, but infrastructure, talent, innovation capacity, regulatory efficiency, and trusted technology governance will determine whether those opportunities are converted into higher-value investment.

A Philippine industrial policy supported by US–Philippines cooperation should concentrate on **five mutually reinforcing areas**:

1) **Human capital development.** Policy should build a deeper pipeline of semiconductor ready technicians, engineers, researchers, and specialists through curriculum modernization, faculty development, industry immersion, apprenticeships, graduate education, certifications, and stronger industry-education partnerships. The objective should go beyond expanding STEM graduates toward specialized competencies in advanced manufacturing, process engineering, automation, AI, robotics, data analytics, semiconductor design, and related fields.

2) **Technology and design capability.** Upgrading requires greater access to EDA tools, verification platforms, laboratories, prototyping facilities, and semiconductor engineering ecosystems. US–Philippines cooperation could support shared design facilities, field-programmable gate array (FPGA) and verification laboratories, university-industry design programs, and training in analog and mixed-signal design, hardware-software co-design, embedded systems, and semiconductor systems engineering. Initial efforts should build on Philippine capabilities in sensors, power electronics, automotive and industrial applications, and embedded systems, rather than immediately targeting leading edge processor design.

3) **Advanced packaging and manufacturing upgrading.** Advanced packaging offers the most direct extension of the country's existing ATP base. Capabilities in System-in-Package, heterogeneous integration, chiplets, and 2.5D and 3D packaging can raise engineering content and domestic value capture without requiring the capital intensity of leading-edge fabrication. Cooperation can support specialized training, collaborative R&D, engineering capability, industry standards, technology partnerships, and investment in advanced packaging facilities.

4) **Research, innovation, supplier development, and commercialization.** Upgrading should eventually create domestic technological assets rather than merely more sophisticated foreign-owned production. Collaborative R&D, industry supported university laboratories, supplier development programs, technology transfer offices, startup incubation, patenting and licensing support, and research in advanced packaging, sensors, power electronics, semiconductor materials, and AI-enabled devices can help generate Philippine-owned intellectual property, stronger domestic suppliers, and eventually, local design houses and selected fabless firms.

5) **Trusted supply chains and economic security cooperation.** Technology governance should be integrated with improvements in the domestic investment environment. Regulatory cooperation with the US can strengthen strategic trade management, export control compliance, cybersecurity, intellectual property and trade secret protection, standards alignment, supplier security, and supply chain resilience. These measures must be complemented by reliable electricity and water, efficient logistics, semiconductor-ready infrastructure, streamlined permitting and customs procedures, and stronger inter-agency coordination. Enhanced STMO and

firm-level compliance capabilities can reduce technology-security risks while facilitating legitimate technology flows.

Industrial policy, domestic capability development, and international cooperation should operate as complementary parts of a single upgrading strategy. Success should be measured not only by exports, employment, or foreign direct investment, but by what the Philippines becomes increasingly capable of doing as it upgrades. The ultimate objective is to leverage the country's manufacturing base and trusted partner relationships to achieve deeper technological capability, **greater domestic value capture, and more secure and resilient semiconductor supply chains.**

V. Conclusions and Policy Recommendations

The foregoing analysis points to seven principal conclusions.

***First,* the Philippines has a substantial semiconductor base, but the central challenge is upgrading rather than simply expanding existing production.** Its established position in ATP capabilities and export specialization provide a foundation for moving into higher value and more technology-intensive activities.

***Second,* the most realistic upgrading strategy is progressive, with advanced packaging and semiconductor design offering particularly promising near- to medium-term opportunities.** These activities build on existing manufacturing and engineering capabilities while developing the technological, workforce, and innovation capacities required for more advanced activities.

***Third,* export controls constrain particular technological frontiers rather than Philippine semiconductor upgrading as a whole.** Their direct impact on existing production appears limited, but they become increasingly important where activities involve strategically sensitive manufacturing equipment, design software, process know-how, advanced computing, and other controlled technologies. Their major effect is likely to be on the technological depth and location of future investment and capability development.

***Fourth,* the Philippines' trusted partner positioning is an important strategic asset, but it is not sufficient on its own to secure higher value investment.** Its relatively favorable regulatory position creates opportunities for technology cooperation, but effective strategic trade management, intellectual property protection, cybersecurity, end-use safeguards, and firm-level compliance increasingly influence whether sensitive technologies and higher-value activities can be securely located in the country.

***Fifth,* domestic competitiveness remains fundamental to translating geopolitical opportunity into investment.** Reliable and competitively priced power and water, efficient logistics, predictable regulation, streamlined permitting, semiconductor-ready infrastructure, research and supplier capabilities, and a skilled workforce remain critical determinants of investment.

***Sixth,* the workforce challenge is increasingly one of specialization and workplace capability rather than simply graduate numbers.** Upgrading requires deeper technical and engineering competencies, stronger industry–academe alignment, and substantially greater hands-on exposure to advanced semiconductor technologies and production environments.

***Seventh,* US–Philippines semiconductor cooperation should be treated as an instrument of capability development, industrial upgrading, and supply chain security rather than simply a means of increasing investment or exports.** Its success should ultimately be reflected in stronger Philippine technology, engineering and design capabilities, specialized talent, suppliers, R&D and innovation, domestic value capture, and a greater contribution to secure and resilient semiconductor supply chains.

These findings point to a coordinated upgrading strategy that combines domestic reform and capability building with targeted US–Philippines cooperation. Philippine policy should strengthen the infrastructure, workforce, supplier, research, innovation, and governance capabilities needed to attract and absorb higher-value investment, while bilateral cooperation can accelerate access to technology, specialized knowledge, research networks, finance, and trusted supply chains. These priorities can be translated into a sequenced US-Philippines Semiconductor Upgrading Program for 2026–2030.

Table 9 identifies eight priority actions grouped into three mutually reinforcing parts of the upgrading strategy: (1) Actions 1-4 strengthen the enabling environment through coordination, infrastructure, trusted technology governance, and workforce development; (2) Actions 5-7 build technological and domestic capabilities in advanced packaging, IC design, supplier development, R&D, and commercialization; and (3) Action 8 mobilizes US financing and technology partnerships to anchor and scale higher-value investment.

The program should be implemented in three stages: 2026–2027 should establish the institutional framework, address immediate bottlenecks, and launch flagship initiatives; 2027–2028 should build visible workforce, technology, research, and infrastructure capabilities; and 2029–2030 should scale successful initiatives and demonstrate measurable upgrading into higher-value activities.

The Philippine Government should retain primary responsibility for building the domestic conditions required for upgrading. Priorities include reliable power and water, logistics and industrial infrastructure, regulatory and customs reform, coordinated workforce development, stronger domestic suppliers and research capabilities, and effective strategic trade, intellectual property and cybersecurity governance. Fiscal incentives should complement, not substitute for, these underlying capabilities.

Table 9: Proposed US-Philippines Semiconductor Upgrading Action Plan (2026-2030)

Priority Action	Philippine Lead	US Partner	Timeline	Principal Deliverable
1. Establish a Joint Semiconductor Upgrading Work Program and Scorecard	DTI, SEIAC, BCDA, DOST, DepEd, CHED, TESDA	State, Commerce	**Q4 2026–Q1 2027; annual review to 2030**	Joint 2027–2030 upgrading program and scorecard covering technology capability, skills, suppliers, higher-value investment and domestic capability
2. Improve the Semiconductor Investment Environment and Build Semiconductor-Ready Infrastructure	DTI, SEIAC, BCDA, DOE, DENR, DOTR, DPWH, DEPDEV, PEZA, BOC, ARTA	USTDA, DFC and other LEC partners	**Planning/reforms 2026–27; financing and implementation 2027–30**	Semiconductor-grade power and water infrastructure,[8] logistics and digital connectivity, faster permitting/customs, semiconductor-ready zones
3. Strengthen Trusted Technology Governance	DTI-STMO, BOC, IPOPHL, DICT, PEZA/BCDA	Commerce/BIS, State	**2026–28; continuous improvement to 2030**	Predictable licensing and technology-transfer procedures, stronger monitoring and enforcement, firm and university internal compliance programs (ICPs), enhanced cybersecurity and IP safeguards
4. Launch a Semiconductor Workforce and Talent Compact	DTI/SEIAC, DepEd, TESDA, CHED, DOLE, SEIPI, PQF NCC	State/ITSI, ASU	**Design 2026–27; scale 2027–30**	Industry-defined competencies, faculty development, technician and engineering programs,

[8] Characterized by high reliability, power quality, secure and sufficient water supply, ultra-pure water capability, wastewater treatment, high levels of industrial water recycling and reuse.

				apprenticeships, graduate pipelines
5. Establish an Advanced Packaging Flagship Program	SEIAC, CHED, UP Engineering, DOST-PCIEERD, SEIPI	Commerce/ State, USTDA DFC, UC Berkeley, CITRIS and the Banatao Institute	**Launch 2027; operational capability 2028; scale to 2030**	Pilot-scale packaging, reliability/testing, metrology, and industry-university R&D and investment pipeline toward Roadmap targets[9]
6. Build shared IC Design, EDA, Verification and Prototyping Capabilities	DOST, CHED, DTI-BOI, SEIAC, universities, IPOPHL	Commerce/ State, US technology companies and universities	**First hub 2027–28; network by 2030**	Shared design, EDA, verification, FPGA/prototyping, and multi-project wafer (MPW) access, university-industry design programs
7. Develop Domestic Suppliers, R&D and Commercialization Capabilities	DTI-BOI, SEIAC, DOST-PCIEERD, CHED, SEIPI, IPOPHL	Commerce/ DFC, US anchor firms, universities	**Launch 2027; scale 2028–30**	Supplier qualification and certification, technology extension, collaborative R&D, local sourcing, startups and design house development, and Philippine-owned IP
8. Mobilize US Financing and Technology Partnerships for Higher-Value Investment	DTI-BOI, DOF, BCDA, SEIAC	USTDA, DFC, State, Commerce	**Project preparation 2026–27; financing, investment 2027–30**	Bankable, investment-ready projects in advanced packaging, IC design, R&D, semiconductor infrastructure, and other technology-intensive activities

PH: ARTA*: Anti-Red Tape Authority,* ***BOC****: Bureau of Customs,* ***BOI****: Board of Investments,* ***BCDA****: Bases Conversion and Development Authority,* ***CHED****: Commission on Higher Education,* ***DepEd****: Department of Education,* ***DEPDEV****: Department of Economy, Planning, and Development,* ***DENR****: Department of Environment and Natural Resources,* ***DICT****: Department Information and Communications Technology,* ***DOE****: Department of Energy,* ***DOF****: Department of Finance,* ***DOST****: Department of Science and Technology,* ***DOTR****: Department of Transportation,* ***DPWH****: Department of Public Works and Highways,* ***DTI****: Department of Trade and Industry,* ***IPOPHL****: Intellectual Property Office of the Philippines,* ***LEC****: Luzon Economic Corridor,* ***PCIERRD****: Philippine Council for Industry, Energy, and Emerging Technology Research and Development,* ***PEZA****: Philippine Economic Zone Authority,* ***PQF NCC****: Philippine Qualifications Framework National Coordinating Council,* ***SEIAC****: Semiconductor and Electronics Industry Advisory Council, SEIPI: Semiconductor and Electronics Industry of the Philippines,* ***TESDA****: Technical Education and Skills Development Authority* ***US****:* ***ASU****: Arizona State University,* ***BIS****: Bureau of Industry and Security,* ***Commerce****: US Department of Commerce,* ***CITRIS****: Center for Information Technology Research in the Interest of Society and the Banatao Institute,* ***DFC****: Development Finance Corporation****, ITSI****: International Technology Security and Innovation Fund,* ***State:*** *US Department of State****, UC****: University of California,* ***USTDA****: US Trade and Development Agency*

[9] The Roadmap's existing targets, including at least three advanced packaging investments, three shared IC design hubs, at least 20 IC design startups/MSMEs, expanded specialist talent, and national research capabilities by 2030, can provide quantitative anchors for this bilateral program

The principal contribution of the US Government should be to accelerate access to capabilities that the Philippines cannot easily build alone. This includes specialized workforce and faculty development, advanced packaging and design partnerships, research cooperation, access to design and prototyping ecosystems, project preparation and infrastructure finance, and regulatory cooperation on trusted technology. US support should combine technology security with trade and technology facilitation so that stronger safeguards enable legitimate cooperation between trusted partners.

The sequencing of these actions is critical. Improvements in infrastructure, regulation, workforce capability, and trusted technology governance should proceed alongside efforts to attract higher-value investment. Similarly, technology cooperation should be tied to concrete capability-building objectives in advanced packaging, design, research, supplier development, and commercialization. This allows domestic reform and international cooperation to reinforce one another.

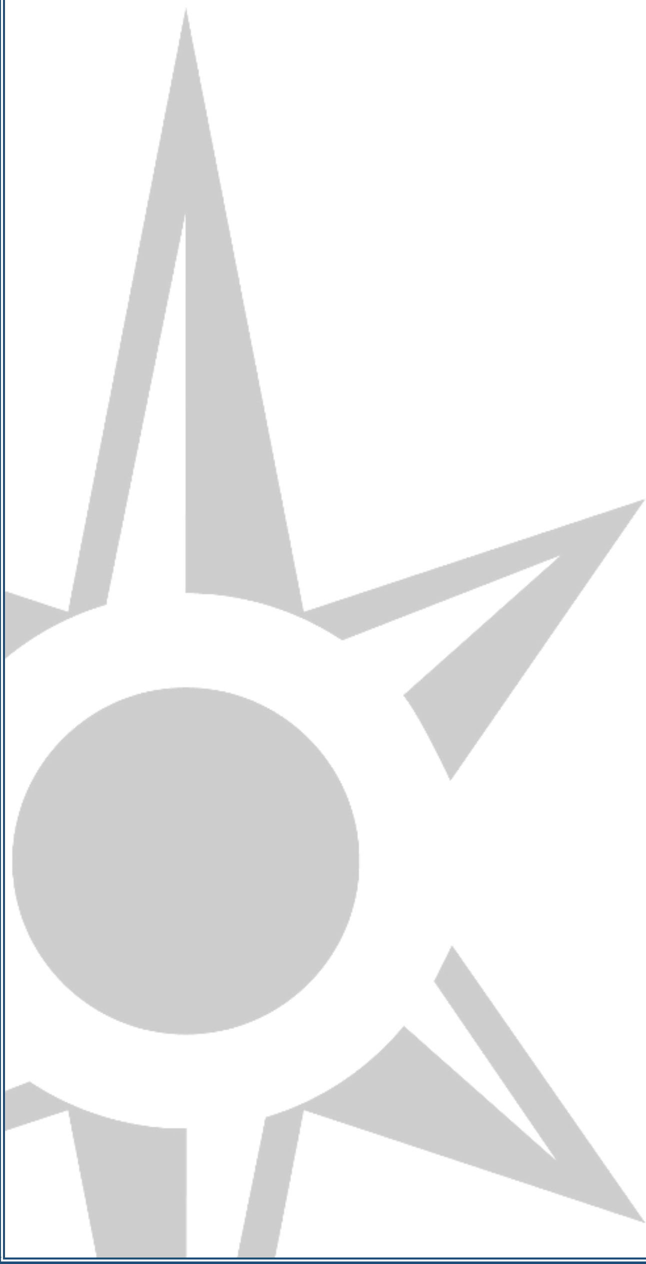
In short, **the Philippines should use industrial policy to build the capabilities that make higher-value semiconductor investment economically attractive, while US–Philippines cooperation should accelerate access to the technology, knowledge, capital, skills, and trusted networks required to develop those capabilities and strengthen semiconductor supply chain security.** By 2030, success should mean more than higher exports or additional foreign direct investment. It should be visible in **what the Philippines is increasingly able to do**: undertake more advanced packaging, verification, and design; produce more specialized engineers and technicians; build stronger domestic suppliers; generate more R&D and intellectual property; and capture a larger share of value within the semiconductor ecosystem **while contributing to more secure, diversified, and resilient semiconductor supply chains.**

ABOUT THE AUTHOR

RAFAELITA MERCADO ALDABA, PhD, is an economist and strategic policy advisor with research leadership at the intersection of industrial policy, global value chains, artificial intelligence, Industry 4.0 technologies, digital transformation, and national skills and qualifications systems supporting education–industry integration. She is an Emeritus Research Fellow at the Philippine Institute for Development Studies and previously served as Undersecretary at the Philippine Department of Trade and Industry, where she led the design and implementation of major innovation- and technology-driven industrial policy reforms. She is the author of influential research on the Philippines' participation in global value chains and on innovation-driven industrial policy, including the design of performance-based, transparent incentive mechanisms to support industrial upgrading, technology adoption, and high-quality investment. Her research portfolio combines rigorous economic analysis, value-chain mapping, and institutional diagnostics to examine how economies move from low-value participation toward higher-value roles in global production networks. Her work informs policy debates on economic security, supply-chain resilience, and workforce transformation for advanced manufacturing and digital transformation. Through her research and advisory roles, she supports effective governance of critical and emerging technologies by aligning industrial policy, skills systems, and institutional readiness.

Developing a Legal and Policy Framework for Technology Protection, Intellectual Property Enforcement, and Trade Compliance

By
Andrea Christina Caymo-Kauhanen



Executive Summary

Andrea Christina Caymo-Kauhanen

The global semiconductor industry has become a principal arena of strategic competition, prompting the United States to strengthen supply chains through partnerships with trusted jurisdictions. Although the Philippines cannot match the scale of investment incentives offered by regional competitors, it possesses a distinct strategic combination: a US treaty alliance, an established assembly, testing, and packaging (ATP) industry, and mineral resources relevant to downstream electronics, clean energy, and defense manufacturing. These assets position the Philippines to support more resilient end-to-end semiconductor supply chains from mineral processing to finished products. Converting this potential into advanced, dual-use investment requires credible institutions for export controls, intellectual property (IP) protection, technology security, and trade compliance, alongside addressing energy, logistics, and infrastructure constraints.

This paper develops an integrated legal and policy framework for strengthening the US-Philippines semiconductor cooperation. It maps the existing defense, trade, bilateral, and plurilateral architecture; assesses Philippine strategic trade and intellectual property (IP) institutions; and presents a phased implementation roadmap.

The research posits that strengthening IP and export control policy frameworks in the Philippines creates a positive-sum outcome; it extends enforcement reach and fortifies supply chain security for the United States while offering the Philippines opportunity for investment, defense capability strengthening, tariff relief, capacity-building, and value chain elevation. Beyond bilateral relations, robust strategic trade and IP regimes establish a predictable environment not just for US firms but also for global companies contemplating the deployment of sensitive process technology in Philippine territory. Strengthening technology therefore becomes not merely a compliance exercise but a prerequisite for the Philippines to become a secure and trusted semiconductor partner and advance its position in the global value chain.

1. Introduction

Semiconductors, advanced computing infrastructure, and critical minerals have become central to economic competitiveness, military capability, and technological leadership. US policymakers increasingly treat these assets as national security priorities and seek to secure them through resilient, diversified, and trusted supply chains rather than domestic reshoring or trade restrictions alone.[1] Initiatives such as Pax Silica and the Forum on Resource Geostrategic Engagement (FORGE) reflect this approach by linking critical minerals, energy, advanced manufacturing, semiconductors, artificial intelligence (AI) infrastructure, and logistics within a network of trusted partners.[2]

The Philippines has gained greater strategic relevance within this emerging architecture. As a US treaty ally with an established assembly, testing, and packaging (ATP) industry and mineral resources relevant to electronics, clean energy, and defense manufacturing, it can contribute to a more resilient and secure "minerals-to-chips" supply chain, providing both raw material inputs and finished goods. Its accession to Pax Silica on April 16, 2026 as the initiative's thirteenth member and the announcement of a 4,000-acre Economic Security Zone in the Luzon Economic Corridor (LEC) signal an effort to position the country as an allied manufacturing, logistics, and investment node for advanced technology supply chains.[3] The Philippines' value lies not in competing directly with larger incentive packages or more mature fabrication hubs but in combining alliance-based strategic alignment, established back-end semiconductor capacity, and mineral potential within a single jurisdiction.

Political alignment, however, has progressed faster than the institutional capabilities required for advanced technology cooperation. Philippine strategic trade management and intellectual property (IP) frameworks were developed largely around non-proliferation, counterterrorism, trademark counterfeiting, and copyright piracy. They were not designed to address all the requirements of contemporary technology competition, including rapidly evolving export control lists, re-export obligations, intangible technology transfers, diversion risks, foreign-linked technology misappropriation, and protection of confidential semiconductor process know-how. These pressures are reinforced by the fragmentation of export control rules beyond traditional multilateral arrangements and by the Philippines' need to meet US and allied requirements without unnecessarily disrupting its economic relationship with China, its largest trading partner and principal import source.[4]

The country also faces broader constraints on greenfield advanced manufacturing investment, including high electricity costs, infrastructure gaps, and logistics bottlenecks.[5] These structural conditions are material to long-term competitiveness, but they fall outside this paper's central inquiry. The analysis instead focuses on the institutional conditions that determine whether the Philippines can credibly receive, protect, and deploy sensitive foreign technology.

This paper argues that the Philippines can strengthen US semiconductor supply chain resilience and advance its own industrial upgrading by becoming a secure and trusted technology partner. Achieving that status requires more than treaty ties or political alignment. It necessitates demonstrated capacity to

[1] White House (2025). *America's AI action plan.* https://www.whitehouse.gov/wp-content/uploads/2025/07/Americas-AI-Action-Plan.pdf; US Department of State (2026a, February 4). *2026 critical minerals ministerial.* https://www.state.gov/releases/office-of-the-spokesperson/2026/02/2026-critical-minerals-ministerial

[2] US Department of State (2026b). *Pax silica.* https://www.state.gov/pax-silica

[3] US Department of State (2026c, April 16). *First AI-native industrial acceleration hub under Pax Silica.* https://www.state.gov/releases/office-of-the-spokesperson/2026/04/the-united-states-and-the-philippines-launch-plans-for-4000-acre-economic-security-zone-to-shore-up-supply-chains-first-ai-native-industrial-acceleration-hub-under-pax-silica

[4] Philippine Statistics Authority (2025). *Highlights of the international merchandise trade statistics: First semester 2025.* https://psa.gov.ph/statistics/export-import/semester; McKinsey & Company. (2025, April 3). *Restricted: How export controls are reshaping markets.* https://www.mckinsey.com/capabilities/geopolitics/our-insights/restricted-how-export-controls-are-reshaping-markets

[5] Organisation for Economic Co-operation and Development (2024). *Promoting the growth of the semiconductor ecosystem in the Philippines. OECD Publishing.* https://www.oecd.org/en/publications/promoting-the-growth-of-the-semiconductor-ecosystem-in-the-philippines_01497fea-en.html

prevent diversion, conduct end-use and end-user due diligence, protect controlled technical data, secure facilities and personnel, enforce IP rights, and provide effective remedies for misappropriation. The proposed framework does not recommend wholesale adoption of US law. Instead, it calls for targeted recalibration of Philippine institutions to meet the practical requirements of advanced, dual-use, and security-sensitive industries.

The study draws on documentary research and key informant consultations conducted during the author's Pacific Forum fellowship from March to August 2026. These consultations included individuals from the Department of Trade and Industry (DTI), Board of Investments (BOI), Strategic Trade Management Office (STMO), Intellectual Property Office of the Philippines (IPOPHL), Department of Foreign Affairs (DFA), and Semiconductor Industry Association of the Philippines (SEIPI), the US Embassy in Manila, the US Departments of State and Energy, and industry associations as well as US semiconductor executives.

Sections 2 and 3 establish the strategic context and evaluate Philippine assets and constraints. Section 4 maps the defense, trade, bilateral, and plurilateral mechanisms available to deepen cooperation. Sections 5 and 6 compare Philippine export control and IP frameworks with relevant US statutes while Section 7 presents a phased implementation roadmap. Sections 8 and 9 assess the expected benefits, risks, and limitations of the proposed approach.

The central proposition is that technology protection must be paired with reciprocal economic benefit. Stronger Philippine strategic trade and IP institutions should support advanced ATP friendshoring, critical mineral processing, technology transfer, defense industrial cooperation, workforce development, financing, and potential tariff or licensing advantages. By using existing defense, trade, bilateral, and plurilateral mechanisms to link compliance with investment and market access opportunities, the Philippines and the United States can develop a durable minerals-to-chips partnership that advances Philippine value chain upgrading and US economic security objectives.

2. The strategic context: Protecting US semiconductor leadership

2.1 Semiconductor leadership as a national security concern

The United States views semiconductor leadership as vital to national security and economic strength.[6] Advanced microchips underpin critical infrastructure, including defense systems, AI, energy grids, and telecommunications. Maintaining this leadership requires both domestic innovation and a resilient global ecosystem spanning materials, fabrication, and design while protecting sensitive technologies from theft or misuse.[7]

The US semiconductor supply chain strategy thus rests on two interrelated principles: security and resilience.[8] Security involves protecting semiconductor supply chains from physical theft, cyber intrusions, sabotage, and excessive reliance on foreign sources that could expose critical industries to strategic pressure or disruption. Resilience refers to the ability to identify and prepare for systemic risks, withstand operational shocks, and rapidly adjust production and logistics arrangements to sustain the supply of essential goods. This requires diversified and redundant supplier networks, stronger domestic manufacturing capacity, and trusted international partnerships that reduce dependence on any single country, facility, or transportation route.

2.2 Supply chain concentration

The United States faces a serious manufacturing vulnerability because key stages of the semiconductor supply chain remain geographically concentrated in East Asia and Europe. US firms rely

[6] White House (2025). *America's AI action plan.* https://www.whitehouse.gov/wp-content/uploads/2025/07/Americas-AI-Action-Plan.pdf

[7] US Department of Commerce, Bureau of Industry and Security. (2024). *Don't let this happen to you: An introduction to US export control enforcement.* https://www.bis.gov/media/documents/dlthty-nov-2024-1-7-25; White House. (2021, June). *Building resilient supply chains, revitalizing American manufacturing, and fostering broad-based growth: 100-day reviews under Executive Order 14017.* https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf

[8] CHIPS and Science Act of 2022, Pub. L. No. 117-167, 136 Stat. 1366. https://www.govinfo.gov/content/pkg/PLAW-117publ167/html/PLAW-117publ167.htm

heavily on Taiwan for leading edge logic chips and on South Korea for advanced memory, while much of the assembly, testing, and advanced packaging ecosystem is also located overseas, particularly in Taiwan, South Korea, Japan, and China. Taiwan alone accounts for as much as 67 percent of the global foundry capacity through Taiwan Semiconductor Manufacturing Company Limited (TSMC) [9] and roughly 90 percent of the highest end chips. The Netherlands, meanwhile, has firm control on advanced extreme ultraviolet lithography (EUV) technologies through ASML.

This arrangement creates a structural dependency: even when US companies lead in chip design, they may lack assured access to the foundry and back-end capacity needed to turn designs into usable components. A disruption in one regional production hub could therefore cascade into communications networks, vehicles, medical devices, cloud computing, US defense systems, and consumer electronics production.

Concentration risks are similarly acute in critical minerals. China commands dominant positions not only in the extraction of key raw materials but, more critically, in the refining and processing of inputs vital to semiconductors, advanced batteries, permanent magnets, defense platforms, and clean energy systems. [10] This heavy reliance on a single primary supplier leaves global supply chains inherently exposed to coercion and structural shocks. Beijing highlighted this vulnerability in 2025 by instituting export restrictions on essential elements, including rare-earth minerals, gallium, germanium, graphite, and antimony. [11] Such trade restrictions illustrate that heavy dependence on critical minerals extends beyond a simple commercial concern; it represents a major strategic vulnerability capable of disrupting industrial output and competitiveness of US firms.

These dependencies are compounded by external pressures. A Taiwan Strait crisis, regional military conflict, blockade, natural disaster, or another pandemic could interrupt access to Asian fabrication and packaging facilities and constrain the supply of minerals and components required to sustain US industrial production.[12]

2.3 The case for friendshoring and trusted partners

The US cannot realistically achieve full self-sufficiency in semiconductors or critical minerals because these supply chains are highly specialized, capital-intensive, and internationally distributed. [13] Semiconductor production depends on hundreds of inputs, specialized equipment and software, fabrication and packaging facilities, skilled labor, reliable utilities, and large markets, capabilities no single country can efficiently supply. Recreating the entire value chain domestically would duplicate allied capacity, require years of investment, and raise costs substantially. A 2021 BCG–SIA study estimated that establishing fully self-sufficient regional semiconductor supply chains would require at least $1 trillion in incremental upfront investment and increase overall chip prices by 35–65 percent.[14] US strategy must therefore combine reshoring of essential capabilities with friendshoring across trusted jurisdictions that can provide minerals, materials, fabrication equipment, leading edge chips, advanced ATP capacity, and secure logistics.[15]

[9] SEMI. (2025, October 28). *How nations can achieve realistic semiconductor self-sufficiency*. https://www.semi.org/en/blogs/how-nations-can-achieve-realistic-semiconductor-self-sufficiency; The Economist (2023, March 6). *Taiwan's dominance of the chip industry makes it more important.* https://www.economist.com/special-report/2023/03/06/taiwans-dominance-of-the-chip-industry-makes-it-more-important

[10] Council on Foreign Relations (2026, February 3). *Leapfrogging China's critical minerals dominance.* https://www.cfr.org/reports/leapfrogging-chinas-critical-minerals-dominance

[11] Baskaran, G. (2025, October 9). *China's new rare earth and magnet restrictions threaten US defense supply chains*. Center for Strategic and International Studies. https://www.csis.org/analysis/chinas-new-rare-earth-and-magnet-restrictions-threaten-us-defense-supply-chains

[12] US Chamber of Commerce. (2025, May 13). *US Chamber of Commerce comments on Section 232 investigation of imports of semiconductors*. https://www.uschamber.com/international/u-s-comments-on-section-232-investigation-of-imports-of-semiconductors

[13] US Department of the Treasury. (2022, July 19). *Remarks by Secretary of the Treasury Janet L. Yellen at LG Sciencepark.* https://home.treasury.gov/news/press-releases/jy0880?utm_source=chatgpt.com

[14] Boston Consulting Group, & Semiconductor Industry Association. (2021, April). *Strengthening the global semiconductor value chain.* Semiconductor Industry Association. https://www.semiconductors.org/strengthening-the-global-semiconductor-supply-chain-in-an-uncertain-era

[15] *CHIPS and Science Act of 2022*, Pub. L. No. 117-167

3. Philippines as a trusted partner: assets and constraints

3.1 Military alliance and converging security interests

The Philippines' status as a US treaty ally under the 1951 Mutual Defense Treaty provides a foundation of trust shaped by end-use assurances, security protocols, and regulatory dialogue that extends beyond conventional military cooperation. This foundation of trust is particularly relevant to supply chains involving export-controlled components, sensitive design data, specialized equipment, and dual-use technologies.

Furthermore, escalating regional tensions in the South China Sea closely connect Manila's security interests with Washington's strategy to build resilient supply networks. Establishing manufacturing facilities in the Philippines reinforces forward defense postures while directly serving a growing market, offering US companies an ideal intersection of production capacity, strategic alignment, and commercial demand.

3.2 Mature electronics and semiconductor supply chains

The Philippines brings useful endowment to US friendshoring strategy: availability of existing supply chains and skilled labor. The country has a five-decade-old semiconductor and electronics industry which is strong in ATP. Electronics exports reached $49.64 billion in 2025, with semiconductors alone contributing $34.62 billion. [16] Together, these comprise well over half of the country's total merchandise exports, with more than 500 global firms, including Texas Instruments, Analog Devices, onsemi, STMicroelectronics, and NXP, collectively producing roughly 10 percent of global ATP output.[17] This makes the Philippines the world's ninth-largest chip exporter.[18]

The existence of multinational production networks, an English-capable technical workforce, and long experience in export-oriented electronics manufacturing give the Philippines a practical base from which to support the growth of trusted semiconductor supply chains.

3.3 Mineral resources

The Philippines offers not just a mature ATP manufacturing base but mineral endowment within the jurisdiction of a treaty ally. This trifecta is what makes the Philippines unique. Every country in the US "trusted supplier" network offers part of the equation. Australia and Canada have ores but limited packaging industries. Japan and South Korea have the alliance and packaging capabilities but no minerals. Other countries in the region, such as Malaysia and Vietnam, have manufacturing but do not have a strong policy and interest convergence with the United States. Meanwhile, Indonesia has the ore, but its processing capacity was built substantially with Chinese capital and technology. The presence of these three elements (alliance, manufacturing base, minerals) in the Philippines means a mineral-to-chips supply chain can be assembled with less border crossing, strengthening supply chain efficiency and resilience and lessening the US' exposure and the Philippines' vulnerability to coercive actions.

The Philippines possesses a substantial endowment of mineral wealth, comprising nickel, copper, cobalt, gold, chromium, zinc, iron ore, magnetite, silver, scandium, silica sand, perlite, and zeolites (see Table 1). It is a top global producer of nickel while maintaining major deposits of copper and cobalt.[19]

---

[16] BusinessWorld (2026, March 12). *Philippine semiconductor exports may reach $50B this year.* https://www.bworldonline.com/editors-picks/2026/03/12/735732/philippine-semiconductor-exports-may-reach-50b-this-year/

[17] ASEAN Business Advisory Council (2025). *ASEAN's emerging semiconductor giant: The Philippines' rising role in the global supply chain.* https://asean-bac.org/news-and-press-releases/asean-s-emerging-semiconductor-giant-the-philippines-rising-role-in-the-global-supply-chain

[18] Organisation for Economic Co-operation and Development (2024). *Promoting the growth of the semiconductor ecosystem in the Philippines. OECD Publishing.* https://www.oecd.org/en/publications/promoting-the-growth-of-the-semiconductor-ecosystem-in-the-philippines_01497fea-en.html

[19] Causey, J. P., IV. (2025, September 2). *The Philippines' rich mineral endowment still largely untapped*. Vantage FDI. https://www.vantagefdi.com/briefs/philippines-untapped-mineral-wealth; US Geological Survey. (2025, November 14). *Interior Department releases final 2025 list of critical minerals*. US Department of the Interior. https://www.usgs.gov/news/science-snippet/interior-department-releases-final-2025-list-critical-minerals; US International Trade Administration. (n.d.). *Philippines critical minerals*. US Department of Commerce. Retrieved

Table 1. Philippine Minerals and its Semiconductor Applications

Mineral Reserves	Semiconductor and Advanced ATP Applications	Production and Geographic Distribution
Copper	Copper forms the backbone of leadframe manufacturing, bonding wires, microbumps, redistribution layers, and high-density interconnect architectures in advanced packaging. It provides essential thermal management and electrical conductivity for chip metallization, through-silicon vias, and plastic package leadframes, as highlighted in NIST technical literature.	Output reached ~283,000 metric tons of concentrate in 2024 (valued at ~$480 million); the Philippines holds the fourth-largest global reserve of copper ore at ~4.41 billion tons.[20] Active sites include Carmen Copper (Toledo, Cebu) and Padcal (Benguet), with Tampakan (South Cotabato) remaining an unexploited deposit. Smelting operations center on PASAR in Isabel, Leyte—the sole national refinery, maintaining a 1.2 million MT annual concentrate capacity for ~200,000 tons of cathode. Operations were suspended in 2025 following its acquisition by the Villar group, with resumption subject to market conditions.[21]
Nickel	Nickel is vital for surface plating, barrier layers, under-bump metallurgy, and specialized alloys used in high-density packaging and processing hardware. As interconnect spacing tightens, these packaging configurations depend on robust surface finishes to endure severe thermal and mechanical stresses.	Accounts for ~10% of global output and ranks sixth in global reserves per USGS 2025, producing 67 million WMT of ore in 2025.[22] Key mining areas cover Rio Tuba (Bataraza, Palawan), Taganito (Claver, Surigao del Norte), Dinagat Islands, and Zambales. The Coral Bay and Taganito HPAL plants extract mixed nickel-cobalt sulfide for export to Sumitomo's Niihama and Harima facilities in Japan for final refining, leaving domestic capacity for plating-grade chemical inputs undeveloped.
Cobalt	Cobalt is co-extracted alongside nickel, cobalt contributes to specialized high-performance alloys, energy storage systems, defense hardware, and mission-critical electronics, reinforcing allied security and industrial supply chain resilience.	Estimated at ~286,000 metric tons, representing roughly 4% of global reserves.[23] Recovered as a byproduct from laterite deposits in Palawan and Surigao, cobalt is shipped entirely in HPAL mixed-sulfide streams due to the absence of domestic refining infrastructure.

August 23, 2026, from https://www.trade.gov/market-intelligence/philippines-critical-minerals

[20] Causey, "Philippines' Rich Mineral Endowment."

[21] "Glencore to Sell Philippine Copper Smelter: Bloomberg," *SEAISI*, July 9, 2025, https://www.seaisi.org/details/26871?type=news-rooms.

[22] Philippine Nickel Industry Association, "Philippines Positions as Stable Critical Minerals Partner as Indonesia Recalibrates Nickel Supply Policy," *Philippine Nickel Industry Association*, accessed September 14, 2026, https://www.philippinenickel.org/news-and-updates/press-release/philippines-positions-as-stable-critical-minerals-partner-as-indonesia-recalibrates-nickel-supply-policy/

[23] Causey, "Philippines' Rich Mineral Endowment."

Gold	Gold's exceptional conductivity, oxidation resistance, and bondability make it indispensable for wire bonding, contact plating, and high-reliability packaging across aerospace, defense, and automotive electronics, as documented in NIST studies on integrated circuit connections.	Output reached ~928,000 troy ounces (~29 metric tons) in 2024 valued at ~$2.21 billion, marking it as the leading commercial mining sector.[24] Key sites include Masbate (Filminera), Padcal, Didipio, and Diwalwal (Davao de Oro), alongside small-scale mining. The Bangko Sentral ng Pilipinas operates an LBMA-certified refinery in Quezon City as the sole legal purchasing authority;[25] however, local downstream wire-drawing remains unavailable.[26]
Silver	Silver serves as a key input for conductive adhesives, die-attach pastes, and specialized interconnect solutions within advanced electronics manufacturing ecosystems.	Extracted as a byproduct of copper and gold mining, silver ranks among the nation's principal mineral assets.[27] The domestic sector currently lacks capabilities for high-purity refining or formulation of electronic-grade pastes.
Scandium	Scandium is used in scandium-doped aluminum nitride (AlScN) thin films for high-frequency RF filters, ferroelectric memory, and advanced structural alloys for electronics hardware.	Extracted from nickel laterite processing at the Taganito HPAL plant since 2018.[28] Intermediate concentrates are shipped to Harima, Japan for final processing into scandium oxide, leaving the Philippines in an upstream role within a limited global market.[29]
Chromite / Chromium	Chromium is essential for corrosion-resistant alloys, surface treatments, and specialized semiconductor equipment components, featuring prominently in facility electroplating process standards as noted by NIST.	Deposits are concentrated in Zambales, with additional recovery from Taganito HPAL laterite processing since 2021.[30] Material is primarily exported as raw ore or unprocessed concentrate.

[24] Causey, "Philippines' Rich Mineral Endowment."
[25] Maria Ramona Gertrudes T. Santiago, "The Bangko Sentral ng Pilipinas and Gold," *Alchemist*, no. 96, London Bullion Market Association, accessed September 14, 2026, https://www.lbma.org.uk/alchemist/issue-96/the-bangko-sentral-ng-pilipinas-and-gold.
[26] Elvis Chou, "Philippines' Gold Market," *Singapore Bullion Market Association*, accessed September 14, 2026, https://sbma.org.sg/asean-bullion-market/philippines/.
[27] Eddie Ramer, "Pax Silica and the Philippines: What the New Economic Security Zone Means for Global Supply Chains," *Avasant*, May 2026, https://avasant.com/report/pax-silica-and-the-philippines-what-the-new-economic-security-zone-means-for-global-supply-chains/
[28] Sumitomo Metal Mining Co., Ltd., "Overseas Core Facilities," *Sumitomo Metal Mining Co., Ltd.*, accessed September 14, 2026, https://www.smm.co.jp/en/corp_info/location/overseas/.
[29] Sumitomo Metal Mining Co., Ltd., "Establishment of Scandium Recovery Business," press release, April 28, 2016, PDF, https://www.smm.co.jp/en/news/release/uploaded_files/20160428en.pdf.
[30] Sumitomo Metal Mining, "Overseas Core Facilities."

Silica / Quartz	Silica provides raw material for polysilicon, fused quartz crucibles, furnace tubes, and CMP slurries used in semiconductor fabrication.	Deposits across Zambales, Palawan, Ilocos Norte, Surigao del Norte, Bohol, Camarines, and Marinduque yield 90–99% SiO_2 suited for industrial glass and construction. High-purity quartz required for semiconductor crucibles remains unverified in domestic reserves.
Zinc	Zinc serves as a primary host ore for recovering critical electronic materials such as gallium, germanium, and indium during downstream refining.	Recognized among national mineral assets, though domestic production remains minor.[31] The suspension of PASAR operations eliminated the country's primary zinc recovery route.
Rare Earth Elements	Rare earth elements are critical for permanent magnets, optical systems, defense hardware, precision manufacturing tools, ceria CMP polishing slurries, and high-k dielectric materials.	Commercial reserves remain unconfirmed despite reported deposits in Mindanao. The government initiated a national mapping initiative to evaluate potential resources.[32]

Copper is used in semiconductor packaging components, including bonding wires and copper alloy leadframes, while nickel may be incorporated into copper-plated iron/nickel alloy leadframes. As chips become more complex, demand is expected to grow for reliable advanced packaging materials that support electrical connectivity, thermal management, and high-density integration.[33] Because traditional transistor scaling can no longer yield the same efficiency gains, advanced packaging bridges this performance gap by tightly integrating multiple specialized chips into a single, highly dense stackable architecture. With this trend, the demand for secure, high-purity plating inputs and raw materials will continue to expand.[34]

Beyond commercial electronics, key Philippine mineral reserves—specifically, nickel, cobalt, copper, and chromium—are pivotal to strengthening the security and resilience of US defense supply chains. These four minerals are on the US 2025 List of Critical Minerals, making them eligible for assessment under the expanded Project Vault initiative.[35] Furthermore, their extensive integration into the development of batteries, high-strength alloys, electrical infrastructure, and defense hardware ties them directly to the strategic priorities of the US National Defense Stockpile.[36]

In terms of rare-earth elements, geological surveys point to prospective deposits within Palawan ion adsorption clays, Mindanao nickel laterites, and Samar bauxite, along with scandium concentrations

[31] Ramer, "Pax Silica and the Philippines."

[32] Causey, "Philippines' Rich Mineral Endowment."; "Philippines Rare Earth: Key Deposits & Strategic Role," *Rare Earth Mining*, accessed September 14, 2026, https://rare-earth-mining.com/philippines-rare-earth/.

[33] Proto Express. (n.d.). *ENEPIG surface finish*. Retrieved August 23, 2026, from https://www.protoexpress.com/kb/enepig-surface-finish/; Custom Market Insights. (2026, July 8). *Global semiconductor packaging market size, share 2032: Industry overview, statistical data, competitive analysis, and forecast 2024–2033* (Report No. CMI24188). https://www.custommarketinsights.com/report/semiconductor-packaging-market/

[34] McKinsey & Company, "The Growth of Advanced Semiconductor Packaging," May 24, 2023, https://www.mckinsey.com/industries/semiconductors/our-insights/advanced-chip-packaging-how-manufacturers-can-play-to-win.

[35] Baskaran, "China's New Rare Earth and Magnet Restrictions."

[36] Thaler, A. (2025, April 29). *Exploring the potential of deep-sea mining to expand American mineral production* [Oversight hearing, 119th Congress]. https://www.congress.gov/119/meeting/house/118089/documents/HHRG-119-II15-20250429-SD002.pdf

across Zambales, Palawan, and Surigao del Norte.[37] Their commercial viability, though, is still unestablished. To fast-track the extraction and utilization of these critical resources, the government has launched a national exploration initiative under Executive Order No. 122, s. 2026.[38]

By linking Philippine mineral resources to downstream ATP capacity, the United States could strengthen a trusted Indo-Pacific supply chain node that improves traceability, limits diversion risks, and supports a more resilient allied semiconductor ecosystem.

3.4 Industrial policy

Recent Philippine industrial policies establish a comprehensive ecosystem designed to attract strategic investment and foster advanced manufacturing. The Tatak Pinoy Act (R.A. 11981) streamlines administrative procedures and establishes "green lanes" for capital equipment and exports in order to enhance product complexity; the CREATE MORE Act (R.A. 12066) provides robust fiscal relief through income tax holidays, competitive corporate tax rates, custom duty exemptions, and enhanced operational deductions; and the SRDP Revitalization Act (R.A. 12024) incentivizes local defense industrial production and joint ventures.[39] Together, these complementary legal frameworks integrate administrative efficiency, targeted tax incentives, and defense co-production opportunities to position the Philippines as a secure, competitive, and high-value node in global supply chains.

3.5 Constraints

Despite its strategic appeal, the Philippines continues to face formidable structural impediments to securing greenfield investment in semiconductor manufacturing. Persistent challenges include exorbitant electricity rates, significant infrastructure deficits, and logistical inefficiencies that elevate operational overhead for high-tech manufacturing.[40] The LEC and small modular reactor initiatives may eventually improve infrastructure and energy availability, but their benefits will take time to materialize. [41] These bottlenecks are further exacerbated by institutional hurdles, ranging from fragmented multi-agency permitting processes to constitutional foreign equity policies limiting foreign ownership of certain industries and delayed fiscal mechanisms like VAT refunds, all of which impede the nation's immediate competitiveness despite long-term infrastructure improvements currently underway.

While all of the issues raised above are important aspects of competitiveness that need to be addressed, many constitute deeply ingrained structural challenges that demand comprehensive analysis and dedicated policy solutions beyond the scope of this study. The layer governing trade and technology transfer that affects the country’s designation not just as a trusted partner, but as a “secure and trusted partner,” is where succeeding chapters will focus.

4. Mapping the diplomatic, legal, and policy architecture

Cataloging the diplomatic, legal, and policy mechanisms that structure US-Philippines technology cooperation is essential for translating political alignment into functional semiconductor partnerships. The mapping exercise reveals a dense architecture spanning defense agreements, trade relations, and plurilateral initiatives that serves as a foundation for deeper collaboration. By

---

[37] Panlaqui, A. (2018, June). *Determination and quantification of scandium and rare earth elements in Philippine nickel laterite deposits* [Conference presentation]. 15th Annual Meeting of the Asia Oceania Geosciences Society. https://doi.org/10.13140/RG.2.2.10042.36802; Rare Earth Mining. (n.d.). *Philippines rare earth: Key deposits & strategic role*. https://rare-earth-mining.com/philippines-rare-earth/

[38] Philippine News Agency. (2026, August 26). EO 122 to advance PH critical minerals industry. https://www.pna.gov.ph/articles/1282583

[39] Tatak Pinoy (Proudly Filipino) Act, Republic Act No. 11981 (2024). https://www.lawphil.net/statutes/repacts/ra2024/ra_11981_2024.html; Corporate Recovery and Tax Incentives for Enterprises to Maximize Opportunities for Reinvigorating the Economy Act, Republic Act No. 12066 (2024). https://www.lawphil.net/statutes/repacts/ra2024/ra_12066_2024.html; Self-Reliant Defense Posture Revitalization Act, Republic Act No. 12024 (2024). https://lawphil.net/statutes/repacts/ra2024/ra_12024_2024.html

[40] Organisation for Economic Co-operation and Development, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines.*

[41] US Trade and Development Agency. (2025). *USTDA brings US small modular reactor technology to strengthen Philippines energy security*. https://ustda.gov/ustda-brings-u-s-small-modular-reactor-technology-to-strengthen-philippines-energy-security/

demonstrating how robust technology protection enhances the commercial viability of these existing mechanisms, this paper argues that an enhanced strategic regime should be viewed not just as a compliance burden but as a foundational confidence-building measure.

4.1 Defense partnership

The United States and the Philippines already possess the legal and institutional tools necessary to deepen defense industrial cooperation (see Table 2).

Table 2. Defense Cooperation Instruments

Instrument/ Mechanism	Primary purpose	Relevance to defense industrial cooperation / technology transfer
1951 Mutual Defense Treaty (MDT)	Provides strategic mutual defense	Creates the political rationale for maintaining compatible capabilities and collective capacity without establishing a technology transfer or industrial production mechanism.
1998 Visiting Forces Agreement (VFA)	Establishes legal framework for visiting US military personnel	Enables recurring exercises, training, technical interaction, and military activities that build familiarity with US systems and operating practices, information that can feed into defense industrial production.
Enhanced Defense Cooperation Agreement (EDCA)	Authorizes US rotational access and infrastructure cooperation	Establishes physical infrastructure, logistics, and access arrangements that support distributed sustainment, prepositioning, maintenance, training, and interoperability.
Bilateral Defense Guidelines (2023)	Operationalizes alliance across defense domains	Establishes priorities for modernization, interoperability, information sharing, cyber defense, maritime awareness, and EDCA, creating a policy bridge toward industrial cooperation.
Partnership for Indo-Pacific Industrial Resilience (PIPIR)	Promotes multilateral defense industrial resilience	Connects Philippine and US industrial cooperation with broader allied supply chains, co-production, logistics, repair, and component sourcing.
Joint Vision Statement (2025)	Advances dedicated US-Philippine defense industrial agenda	Serves as the primary mechanism for advancing co-production, technology transfer, MRO, component manufacturing, unmanned systems, critical minerals, and additive manufacturing.
General Security of Military Information Agreement (GSOMIA)(2024)	Protects the exchange of classified military information	Provides a foundational framework for exchanging higher-end technology, technical data, secure industrial collaboration, and advanced systems cooperation.
Philippines Enhanced Resilience Act (PERA) in the FY2026 National Defense Authorization Act (NDAA)	Expands US security assistance	Provides financial resources for modernization and interoperability while building domestic industrial and sustainment capacity.
Foreign Military Financing (FMF)	Finances foreign defense purchases	Lowers financing barriers for Philippine acquisitions and supports packages that integrate training, sustainment, technical support, and industrial participation.

Mutual Defense Board–Security Engagement Board (MDB-SEB)	Coordinates joint military exercises	Bridges security and industrial policy by integrating the Philippine SRDP with US forward defense and supply chain resilience goals.
Bilateral Strategic Dialogue (BSD)	Coordinates broad bilateral strategic priorities	Provides a high-level dialogue platform to address defense industrial cooperation across key domains.
2+2 Joint Ministerial Dialogue	Aligns foreign affairs and defense strategy	Aligns economic security and resilient supply chains with strategic bilateral security priorities.

The Mutual Defense Treaty (MDT) provides the strategic umbrella for linking Philippine self-defense requirements with US supply chain security.[42] Operational agreements, including the Visiting Forces Agreement (VFA) and the Enhanced Defense Cooperation Agreement (EDCA), can transition from purely operational cooperation to domestic industrial capacity building.[43] This "exercise-to-industry" process would leverage EDCA sites to identify and address maintenance and logistics gaps while utilizing Philippine firms for sustainment, systems testing, and regional industrial clusters. Furthermore, initiatives such as the Partnership for Indo-Pacific Industrial Resilience (PIPIR) and the Regional Sustainment Framework (RSF) offer structured paths for collaborative projects in ammunition components, unmanned systems, critical mineral processing, and spare parts production.[44]

For the Philippines, these mechanisms should shift the focus from simple off-the-shelf procurement to building long-term lifecycle capabilities. Financing tools like Foreign Military Financing (FMF), Foreign Military Sales (FMS), and Direct Commercial Sales (DCS) should prioritize local workforce development, maintenance, repair and overhaul (MRO) capacity, component production, and joint ventures.[45] To coordinate these efforts, a Defense Industrial Cooperation Working Group under the Mutual Defense Board–Security Engagement Board (MDB-SEB) could integrate policy across the defense, trade, science, and industry sectors.[46] Supported by the Bilateral Strategic Dialogue (BSD) and the 2+2 Ministerial Dialogue, this body could oversee supply chain diversification and advocate for Philippine eligibility for strategic US financing instruments, such as Defense Production Act Title III and DFC support.[47]

[42] Mutual Defense Treaty between the United States of America and the Republic of the Philippines, US-Phil., August 30, 1951, 3 UST. 3947. https://treaties.un.org/doc/Publication/UNTS/Volume%20177/volume-177-I-2315-English.pdf

[43] Agreement between the Government of the Republic of the Philippines and the Government of the United States of America on enhanced defense cooperation [Enhanced Defense Cooperation Agreement]. (2014, April 28). US Department of State. https://www.state.gov/wp-content/uploads/2019/02/14-625-Philippines-Defense-Cooperation.pdf

[44] US Department of Defense. (2025, June 2). Fact sheet: Partnership for Indo-Pacific Industrial Resilience. https://media.defense.gov/2025/Jun/02/2003730341/-1/-1/1/FACT-SHEET-PARTNERSHIP-FOR-INDO-PACIFIC-INDUSTRIAL-RESILIENCE.PDF; US Department of Defense. (2024, May 15). Department of Defense announces the Regional Sustainment Framework. https://www.war.gov/News/Releases/Release/Article/3776541/department-of-defense-announces-the-regional-sustainment-framework/; US Department of War. (2026, March 18). *Joint statement reaffirming a shared commitment to defense industrial resilience*. https://www.war.gov/News/Releases/Release/Article/4439861/joint-statement-reaffirming-a-shared-commitment-to-defense-industrial-resilience/

[45] Feickert, A. (2026, July 27). Transfer of defense articles: Foreign Military Sales (FMS) (CRS In Focus No. IF11437). Congressional Research Service. https://www.congress.gov/crs-product/IF11437

[46] US Indo-Pacific Command. (2026, August 8). Philippines, US mark 75th anniversary of the Mutual Defense Treaty, reaffirm alliance at MDB-SEB meeting. https://www.pacom.mil/Media/Press-Releases-and-Readouts/Press-Releases-and-Readout-view/Article/4566845/philippines-us-mark-75th-anniversary-of-the-mutual-defense-treaty-reaffirm-alli/

[47] Levin, A. G. (2025, June 12). *Evaluating the Defense Production Act* (CRS Testimony No. TE10112).

Deeper cooperation, however, hinges on credible technology protection. While the General Security of Military Information Agreement (GSOMIA) enables government-level information sharing, Philippine industry requires stronger institutional capacity to securely manage controlled technical data, engineering specifications, and dual-use technologies.[48] Consequently, establishing robust export controls, end-user verification protocols, and facility security standards is a prerequisite for defense industrial partnership. Sections 7 and 8 detail the strategic trade and IP reforms necessary to support these objectives.

4.2 Trade relations

The US-Philippines Trade and Investment Framework Agreement (TIFA) remains the primary mechanism for bilateral commercial engagement (see Table 3).[49] Rather than serving merely as a routine dialogue while the country is negotiating for a Free Trade Agreement and Comprehensive Strategic Partnership, TIFA can be strategically leveraged to discuss semiconductor market access, align regulatory frameworks, and establish a joint Economic Security and Trade Policy Roadmap to position the Philippines as a secure manufacturing hub for semiconductors and dual-use goods.

Table 3. Trade Cooperation Instruments

Instrument / Mechanism	Primary function	Relevance to semiconductor cooperation / strategic trade
1989 Trade and Investment Framework Agreement (TIFA)	Serves as the principal bilateral trade dialogue	Resolves trade barriers, regulatory issues, customs bottlenecks, labor standards, agricultural matters, intellectual property concerns, procurement policies, and supply chain vulnerabilities.
2025 reciprocal tariff/trade arrangement and subsequent Section 301 forced labor action	Facilitates market access and tariff negotiations	Establishes explicit reciprocity in bilateral trade relations, introduces compliance risks, and provides an opportunity for the Philippines to demonstrate trusted supplier status.
Customs/trade facilitation arrangements	Accelerates and standardizes the movement of goods	Accelerates just-in-time and high-value semiconductor supply chains.
TIFA Ministerial / senior-level meetings	Provides political direction for TIFA initiatives	Shifts focus from routine issue resolution toward a strategic trade and economic security agenda.
Bilateral Strategic Dialogue (BSD)	Coordinates whole-of-relationship strategic priorities	Integrates trade, investment, technology, and economic security priorities across bilateral relations.

Congressional Research Service. https://www.congress.gov/crs-product/TE10112; US International Development Finance Corporation. (2026). *DFC secures expanded authorities with FY26 NDAA signed into law.* https://www.dfc.gov/media/press-releases/dfc-secures-expanded-authorities-fy26-ndaa-signed-law

[48] Agreement between the Government of the United States of America and the Government of the Republic of the Philippines concerning security measures for the protection of classified military information [General Security of Military Information Agreement]. (2024, November 18). US Department of State. https://www.state.gov/philippines-25-319

[49] Trade and Investment Framework Agreement between the Government of the United States of America and the Government of the Republic of the Philippines concerning a framework of principles and procedures and the establishment of a consultative mechanism for the expansion of trade and investment. (1989, November 9). Office of the United States Trade Representative. https://ustr.gov/sites/default/files/US-Philippines%20TIFA.pdf

Recent shifts in the bilateral trade environment related to tariffs, notably the invalidation of the 2025 reciprocal tariff arrangement and subsequent Section 301 actions regarding forced labor compliance, underscore the volatility of traditional trade channels. [50] National security concerns are increasingly reshaping global trade, requiring the Philippines to demonstrate trusted origin, labor compliance, traceability, export control capacity, cybersecurity, data integrity, environmental and anti-corruption standards, and IP protection. Verifiable performance in these areas would strengthen the Philippines' case for investment, technology transfer, and preferential treatment in future US trade, tariff, and supply chain arrangements.

4.3 Bilateral cooperation and plurilateral initiatives

Bilateral and plurilateral initiatives can translate US-Philippines political alignment into practical semiconductor cooperation (see Table 4).

Table 4. Bilateral and Plurilateral Initiatives

Instrument / Mechanism	**Primary function**	**Relevance to semiconductor cooperation / strategic trade**
Pax Silica	Provides a trusted ecosystem for semiconductors, AI, and advanced technologies	Advances semiconductor operations from back-end services to higher-value ATP manufacturing and AI supply chains
Luzon Economic Corridor (LEC)	Establishes a physical infrastructure and investment platform linking Subic, Clark, Manila, and Batangas	Creates an integrated advanced manufacturing and logistics corridor
Critical Minerals Cooperation MOU / framework	Diversifies critical mineral supply chains	Transforms Philippine mining, processing, and downstream manufacturing
Forum on Resource Geostrategic Engagement (FORGE)	Coordinates multilateral critical minerals development and project financing	Shifts industry focus from raw mineral extraction to processing, refining, investment, and downstream manufacturing
IPEF	Builds regional economic and supply chain architecture	Connects the Philippines to broader trusted supply chain and crisis-response networks
123 Agreement	Establishes the legal basis for peaceful US nuclear cooperation	Expands opportunities in nuclear technology, engineering, technical services, project financing, workforce development, and energy supply chains
Science & Technology Agreement	Fosters research collaboration, scientific exchanges, and technology transfer	Bridges scientific cooperation with technology commercialization and advanced manufacturing trade
CHIPS Act / ITSI Fund	Delivers US technical assistance and ecosystem support for semiconductor supply chains	Upgrades Philippine semiconductor capabilities, workforce skills, technical standards, and investment readiness

[50] Congressional Research Service (2026). *Supreme Court rules against tariffs imposed under the International Emergency Economic Powers Act (IEEPA) (LSB11398).* https://www.congress.gov/crs-product/LSB11398

DFC / USTDA / EXIM and other US financing tools	Provides strategic investment and project financing tools	Converts trade diplomacy into tangible investment and industrial capacity
Bilateral Strategic Dialogue (BSD)	Drives whole-of-relationship strategic coordination	Integrates trade, investment, technology, and economic security priorities

The February 2026 Critical Minerals MOU promotes diversified mineral supply chains and domestic processing, while the Science and Technology Agreement (STA) and the CHIPS Act's International Technology Security and Innovation (ITSI) Fund advance semiconductor workforce development, research, and technical exchanges.[51] The 123 Agreement can also contribute indirectly by strengthening technical education, regulatory capacity, and long-term planning for reliable energy, which is an essential requirement for advanced manufacturing.[52]

Broader initiatives, including the Indo-Pacific Economic Framework (IPEF), Pax Silica, and the LEC, can link Philippine ATP facilities and mineral producers to allied networks of suppliers, equipment makers, chip designers, and customers.[53] Pax Silica and the planned 4,000-acre Economic Security Zone (ESZ) can serve as platforms for trusted technology investment, while the LEC aims to improve the rail, ports, energy, digital infrastructure, and logistics links needed to move semiconductor materials and finished products efficiently.[54] FORGE complements the Critical Minerals MOU by coordinating diplomatic and public finance engagement for high-impact mineral projects and providing a price mechanism to encourage mining investment.[55]

Converting these strategic frameworks into operational capacity requires substantial capital investment. To this end, the White House has proposed the $5 billion America First Opportunity Fund and a $250 million Pax Silica Fund to support essential mineral processing, energy, workforce, and advanced ATP infrastructure.[56] The ability to secure this financing will increasingly hinge on Manila's demonstrated adherence to rigorous trusted partner

[51] US Department of State. (2024, October 3). The US Department of State International Technology Security and Innovation Fund. https://2021-2025.state.gov/the-u-s-department-of-state-international-technology-security-and-innovation-fund/; Agreement between the Government of the United States of America and the Government of the Republic of the Philippines on scientific and technological cooperation [Science and Technology Agreement]. (2019, July 16). US Department of State. https://www.state.gov/philippines-20-603

[52] US Department of State, Office of the Spokesperson. (2024, July 8). *US-Philippines civil nuclear cooperation agreement enters into force*. https://2021-2025.state.gov/u-s-philippines-civil-nuclear-cooperation-agreement-enters-into-force/

[53] US Department of State. (2026, August 27). Pax Silica. https://www.state.gov/pax-silica; US Department of State. (2024, April 17). The United States, the Philippines, and Japan launch the Partnership for Global Infrastructure and Investment Luzon Economic Corridor. https://2021-2025.state.gov/the-united-states-the-philippines-and-japan-launch-the-partnership-for-global-infrastructure-and-investment-luzon-economic-corridor/; Agreement on the Indo-Pacific Economic Framework for Prosperity. (2024, June 6). US Department of State. https://www.state.gov/ipef-overarching-agreement

[54] US Department of State, Office of the Spokesperson. (2026, April 16). *US and Philippines plan the launch of historic 4,000-acre economic security zone to shore up supply chains*. https://www.state.gov/releases/office-of-the-spokesperson/2026/04/u-s-and-philippines-plan-the-launch-of-historic-4000-acre-economic-security-zone-to-shore-up-supply-chains

[55] US Department of State, Bureau of Economic, Energy, and Business Affairs. (2026, July 10). Forum on Resource Geostrategic Engagement guiding principles. https://www.state.gov/releases/bureau-of-economic-energy-and-business-affairs/2026/07/forum-on-resource-geostrategic-engagement-guiding-principles; Embassy of the Republic of the Philippines in Washington, D.C. (2026, February 6). Philippines signs MOU on critical minerals supply chains with the United States. https://philippineembassy-dc.org/philippines-signs-mou-on-critical-minerals-supply-chains/

[56] Office of Management and Budget. (2026). *Budget of the US Government: Fiscal year 2027*. Executive Office of the President. https://www.whitehouse.gov/wp-content/uploads/2026/04/budget_fy2027.pdf; US Department of State. (2026e, March 26). *Department of State launches Pax Silica Fund*. https://www.state.gov/releases/office-of-the-spokesperson/2026/03/department-of-state-launches-pax-silica-fund

standards. By formalizing robust protections in export controls, IP, cybersecurity, and supply chain traceability, the Philippines can effectively position itself to capture these vital development resources.

Actionable strategies for reinforcing the Philippines' standing as a secure and trusted supply chain partner are elaborated on in the subsequent sections of this study.

5. Assessing strategic trade regime

Strategic trade has become increasingly important to US semiconductor and economic security policy. US rules increasingly shape cross-border production through controls on exports, reexports, and certain foreign-made products, making trusted partner capacity a practical condition for participation in higher-value supply chains. For the Philippines, assessing and improving its own strategic trade system is essential to identify where its licensing, screening, customs coordination, technology security, and enforcement capabilities must be strengthened to attract sensitive investment, prevent diversion, and operate credibly alongside US and allied firms.

5.1 US strategic trade regime

The US export control system is a decentralized, multi-agency framework in which jurisdiction depends on the item, technology, destination, end user, and end use.[57] The Department of Commerce's Bureau of Industry and Security (BIS) administers the Export Administration Regulations (EAR) for commercial and dual-use goods under the Export Control Reform Act of 2018.[58] Other agencies administer distinct controls: the Department of State's Directorate of Defense Trade Controls regulates defense articles and services under the International Traffic in Arms Regulations (ITAR) while the Department of Energy and Nuclear Regulatory Commission exercise distinct authorities over specified nuclear technologies, materials, facilities, exports, and regulated nuclear activities.[59]

The EAR regulates the export, re-export, and in-country transfer of controlled items, software, and technology. Crucially, it exerts extraterritorial jurisdiction over foreign-made goods through mechanisms including the *de minimis* rule based on US-origin content and the Foreign Direct Product (FDP) Rules.[60] The FDP Rules are particularly significant as they extend EAR control to foreign-produced items that are the direct product of specified US technology or manufactured in facilities relying on such technology.[61]

Licensing decisions rely on item classification, destination, end user, and intended end use. Controlled items are generally identified through Export Control Classification Numbers (ECCN) on the Commerce Control List (CCL) while EAR99 items may still require authorization depending on the transaction.[62] Notably, the US has increasingly employed geographic-specific controls; since October 2022, regulatory actions have curtailed China's access to advanced computing chips, semiconductor manufacturing equipment, high bandwidth memory, and advanced packaging technologies.[63]

---

[57] Bureau of Industry and Security, US Department of Commerce. (2026). *15 C.F.R. Part 734—Scope of the Export Administration Regulations*. *Electronic Code of Federal Regulations*. Retrieved August 27, 2026, from https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-734; US Department of State. (2011). *Overview of US export control system*. https://2009-2017.state.gov/strategictrade/overview/index.htm

[58] Export Control Reform Act of 2018, Pub. L. No. 115-232, div. A, tit. XVII, subtit. B, 132 Stat. 2208 (2018). https://www.govinfo.gov/content/pkg/PLAW-115publ232/html/PLAW-115publ232.htm

[59] US Department of State, Directorate of Defense Trade Controls. (2025, January 10). Directorate of Defense Trade Controls. https://www.state.gov/bureaus-offices/under-secretary-for-arms-control-and-international-security-affairs/bureau-of-political-military-affairs/directorate-of-defense-trade-controls-pm-ddtc; US Department of Energy, National Nuclear Security Administration. (2026, June 12). Nuclear nexus: Export control compliance. https://www.energy.gov/nnsa/nuclear-nexus-export-control-compliance

[60] De minimis US content, 15 C.F.R. § 734.4 (2026). https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-734/section-734.4

[61] Foreign-direct product (FDP) rules, 15 C.F.R. § 734.9 (2026). https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-734/section-734.9

[62] Bureau of Industry and Security, US Department of Commerce. (2026). *15 C.F.R. Part 734—Scope of the Export Administration Regulations*. *Electronic Code of Federal Regulations*. Retrieved August 27, 2026, from https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-734

[63] Bureau of Industry and Security (2022, October 13). *Implementation of additional export controls: Certain advanced computing and semiconductor manufacturing items; supercomputer and semiconductor end use; Entity List*

US enforcement combines significant penalties and proactive verification with incentives for demonstrable compliance.[64] BIS, the Department of Justice, and the Disruptive Technology Strike Force can pursue criminal, civil, and administrative remedies, including denial orders, Temporary Denial Orders, Entity List designations, and placement on the Unverified List. At the same time, License Exception, Strategic Trade Authorization, Validated End-User treatment, and voluntary self-disclosure (VSD) incentives can reduce the compliance burden for trusted firms.

5.2 Philippine strategic trade regime

The Philippine strategic trade regime is anchored in the Strategic Trade Management Act (STMA) (Republic Act No. 10697).[65] Enacted in 2016 to implement the Philippines' obligations under UN Security Council Resolution 1540, the STMA regulates the export, import, transit, transshipment, re-export, reassignment, and related services involving strategic goods, software, and technology. The National Strategic Goods List (NSGL) identifies controlled military goods, dual-use goods, and nationally controlled items involving transactions with UN-sanctioned states. Although the Philippines is not a member of the principal multilateral export control regimes, the NSGL adopts the European Union Consolidated List, thereby incorporating controls associated with the Wassenaar Arrangement, Nuclear Suppliers Group, Australia Group, and Missile Technology Control Regime.[66] The STMA also establishes catch-all controls for unlisted goods where there is a risk of diversion to weapons of mass destruction (WMD) programs. The National Security Council Strategic Trade Management Committee serves as the central policy body while the DTI-supervised STMO processes licenses and authorizations, maintains the registry of covered entities, and operates the strategic goods database.[67]

STMA implementation has proceeded through memorandum circulars (see Table 5).

Table 5. Philippines Strategic Trade Memorandum Circulars

Memorandum Circular (MC)	Subject	Key operative content
MC 21-16	Recordkeeping	Ten-year retention of transaction records, accounts, and documents
MC 21-35	End-use / catch-all controls	Implements STMA §11. Trigger: covered person knows or has reasonable grounds to suspect diversion
MC 21-39 (s. 2021)	Guidelines on Voluntary Self-Disclosure	Six qualification criteria; preliminary disclosure within 45 calendar days of discovery; full disclosure within 120 calendar days of STMO receipt; one extension only, ≤45 days, case-by-case; contents include root cause analysis, chronology, NSGL code, comprehensive action plan; certification by top

modification. *Federal Register*. https://www.federalregister.gov/documents/2022/10/13/2022-21658/implementation-of-additional-export-controls-certain-advanced-computing-and-semiconductor; Bureau of Industry and Security (2024, December 2). *Commerce strengthens export controls to restrict China's capability to produce advanced semiconductors for military applications [Press release]*. https://www.bis.gov/press-release/commerce-strengthens-export-controls-restrict-chinas-capability-produce-advanced-semiconductors-military

[64] US Department of Commerce, Bureau of Industry and Security. (2024). *Don't let this happen to you: An introduction to US export control enforcement*. https://www.bis.gov/media/documents/dlthty-nov-2024-1-7-25

[65] Strategic Trade Management Act, Republic Act No. 10697 (2015). https://lawphil.net/statutes/repacts/ra2015/ra_10697_2015.html

[66] Strategic Trade Management Office (2026). *Written responses to the author's questionnaire and comments on the draft policy analysis: Export controls regulatory frameworks [Consultation document provided to the author, Department of Trade and Industry, Republic of the Philippines]*.

[67] National Security Council–Strategic Trade Management Committee. (2018). Implementing rules and regulations of Republic Act No. 10697 (Strategic Trade Management Act of 2015). Official Gazette of the Republic of the Philippines. https://www.officialgazette.gov.ph/downloads/2017/08aug/20170831-RA-IRR-10697-RRD.pdf

		official; filed to STMO Investigation and Compliance Division; four review outcomes - no action, warning letter, administrative investigation and/or audit, referral. Mitigation is discretionary
MC 21-42	Administrative proceedings and imposition of administrative fines and penalties	The instrument against which VSD mitigation runs. No published penalty schedule identified
MC 22-02	Authorization exemptions	Sets the revised process for using a Certificate of Authorization Exemption under the Strategic Trade Management Act (RA No. 10697). It permits specified government military, police, law-enforcement, and humanitarian or peacekeeping activities involving strategic goods to proceed without a standard STMO authorization, but requires advance notification, commodity classification, and submission of an endorsement letter and Form A4
MC 22-14	Export clearance	Requires license information in the BOC Export Declaration
MC 24-16	Transit and transshipment authorization	Covered persons: transport companies, freight forwarders, logistics providers, shipping lines, airlines, customs brokers, cargo consolidators, operating carriers, air cargo express operators. No pre-registration required. Apply ≥7 calendar days before carrier arrival; STMO processes within 3 working days; automatic approval if conditions met; validity ≤6 months. Exemptions for military, peacekeeping, government humanitarian, and law enforcement activity
MC 25-15	ICP as precondition for Global Authorization	Makes an Internal Compliance Program a precondition for global authorization. Binary eligibility gate, not a graduated tier
MC 25-17	Export authorization guidelines	Superseded in part by MC 26-05
MC 25-20	Re-export and reassignment	Effective 18 December 2025. Valid export authorization automatically covers corresponding re-export or reassignment where end-users and destinations remain identical. Reassignment defined to include reallocation by any means, including electronic transmission of software and technology
MC 26-05	Export authorization guidelines (amending MC 25-17)	Processing: Individual 22 working days; Global 76 working days. Amendments: 20 working days to add end-user, country, consignee, or good, or to change technical specifications; 3 working days for clerical changes and deletions; 7 working days for exporter information changes. Caps per amendment: 3 end-users, 5 countries, 3 consignees, 3 NSGL codes. Extension must be filed ≥11 working days before expiry. Failure to submit periodic reports blocks amendment applications
MC 26-06	Simple Individual Export Authorization	7 working days. One NSGL code, one item type, one end-use, one end-user, specified countries. Tangible items under NSGL Annex 2 only. No amendment

		except for clerical correction and no extension. Validity ≤6 months. Not available for End-Use/Catch-All Controls. Comparison table lists ICP as "Recommended"

Notes: *Unimplemented statutory elements as of September 2026: import authorization has not been operationalized; general authorization guidelines have not been issued.*

Mandatory export licensing began in January 2023. MC 24-16 established authorization requirements for transit and transshipment, while MC 25-20 addressed re-export and reassignment effective December 18, 2025. Under MC 26-05 and MC 26-06, stated processing times are seven working days for Simple Individual Authorizations, 22 working days for Individual Authorizations, and 76 working days for Global Authorizations. Other circulars address recordkeeping, catch-all controls, and VSD. Under MC 21-39, VSDs involve a preliminary disclosure within 45 calendar days of discovery and a full disclosure within 120 calendar days, supported by management certification and a root-cause analysis.

The STMO uses a Risk Assessment Matrix that considers the goods, end use, end user, and destination country.[68] End-user screening draws on resources that include the Wisconsin Project database, INTERPOL channels, UN consolidated lists, and commercial platforms such as Kharon and Datenna, which are integrated into the Stratlink e-licensing platform. The STMO also maintains a List of Prohibited End-Users and publishes due-diligence guidance. Its institutional structure includes subcommittees on risk assessment, technical reachback, enforcement, and trade facilitation.

The Customs Modernization and Tariff Act (CMTA) (Republic Act No. 10863) complements this framework through risk-based customs controls, electronic systems, post-entry verification, and an Authorized Economic Operator program that provides qualified traders with streamlined processing.[69] Coordination with the Bureau of Customs is governed by a memorandum of agreement and supported by a 24/7 channel linking customs officials, the STMO, and exporters for strategic trade clearance.

5.3 Comparison of US-PH strategic control regimes

5.3.1 Jurisdiction and rulemaking

US export controls can reach activities conducted entirely in the Philippines through the Foreign Direct Product Rules, *de minimis* thresholds, and restrictions on US persons. By contrast, the Philippine system does not assert comparable extraterritorial jurisdiction.

5.3.2 Strategic intent

The Philippine STMA is a non-proliferation instrument drafted to discharge UNSCR 1540, oriented to WMD and delivery systems. The contemporary US regime is that as well as an instrument of technology competition and industrial strategy. The Philippine regime is not built to answer questions about advanced computing diversion, technology separation between customer blocs, or research security because those are not proliferation questions in the 1540 sense.

5.3.3 Coverage and list agility

Because the NSGL adopts the EU Consolidated List, structural alignment with US and EU dual-use controls is already built in. Domestic list incorporation, however, lagged behind global list evolution with its NSGL updated periodically rather than dynamically, leaving recently added EU regulations on advanced semiconductor technologies currently unaddressed in the domestic framework. This creates a regulatory blind spot. If the EU, for example, bans the direct export of advanced semiconductor technologies to a restricted destination, malicious actors will exploit the legal lag. They may route those newly restricted components through an intermediate nation where the items are technically still unaddressed or "legal" to import and re-export without a localized license.

[68] Strategic Trade Management Office, "Written Responses to the Author's Questionnaire."
[69] Customs Modernization and Tariff Act, Republic Act No. 10863 (2016). https://www.lawphil.net/statutes/repacts/ra2016/ra_10863_2016.html

5.3.4 Entity list

Relatedly, and as a matter of foreign policy, the Philippines does not automatically implement unilateral foreign measures such as the US Entity List; a foreign restricted party listing operates as a significant risk indicator within the Risk Assessment Matrix rather than as a binding prohibition, although the STMA does empower the NSC-STMCom to place strategic goods transacted with specific countries under unilateral controls should policy ever warrant it.[70] The STMO's own characterization is instructive; the trajectory is one of strategic convergence on supply chain security and diversion protection through stronger due diligence, risk assessment, and industry engagement, not wholesale adoption of the US export control list.[71]

5.3.5 Enforcement integration

Effective controls rely heavily on customs targeting. While the US Bureau of Industry and Security (BIS) executes proactive pre-license checks and post-shipment verifications abroad, assessing transactions against a published matrix and utilizing the Unverified List as a graduated sanction, the STMO and Bureau of Customs currently operate primarily through case-by-case technical reachback and classification protocols.[72]

5.3.6 Pricing cost of non-compliance

Although the STMO has established procedures for investigations and administrative cases as well as statutory ranges for penalties, it has not published a clear method for calculating administrative fines. In comparison, the US framework sets out a base-penalty matrix, identifies specific mitigating and aggravating factors, and explains the degree of penalty reduction available for qualifying disclosures. Under this approach, a valid VSD can reduce a penalty, while intentionally failing to disclose a significant apparent violation can increase it.[73] For non-egregious violations, a qualifying disclosure can reduce the base penalty from maximum of 100% if not disclosed to up to 50% of the transaction value.[74] Without a similarly transparent benchmark, Philippine firms may understand that violations carry liability but cannot reliably estimate how much a voluntary disclosure will reduce their exposure. This uncertainty weakens the practical incentive for firms to disclose violations early and cooperate with regulators.

5.3.7 Incentive architecture

The US strategic trade system combines rigorous compliance obligations with tangible benefits for trusted firms. License Exception Strategic Trade Authorization and Validated End-User designations can reduce transaction-specific licensing requirements. In the Philippines, Global Authorization requires an Internal Compliance Program, long-term recordkeeping, and periodic reporting, but authorization timelines (seven, 22, and 76 working days) do not vary by compliance maturity.

South Korea offers a more transferable middle-power model for a Philippine trusted exporter program.[75] Its framework grades manufacturers, logistics providers, research institutions, and other entities according to compliance capability, with progressively stronger requirements matched by faster review and reduced reporting burdens.

5.4 Implementation challenges

The Philippines has largely aligned its strategic trade framework with international practice, but implementation remains incomplete and requires more resources. Under Department Administrative Order No. 19-07, the STMO adopted a phased implementation of the Strategic Trade Management

---

[70] DTI-STMO, "Written Responses to the Author's Questionnaire."
[71] DTI-STMO, "Written Responses to the Author's Questionnaire."
[72] DTI-STMO, "Written Responses to the Author's Questionnaire."
[73] US Department of Commerce, Bureau of Industry and Security. (2024). *Don't let this happen to you: An introduction to US export control enforcement*. https://www.bis.gov/media/documents/dlthty-nov-2024-1-7-25
[74] Nash, J. (2026). *Voluntary self-disclosures under the US export control system* [PowerPoint slides]. Philippines Industry Outreach Event on Strategic Trade Management, Technology Protection, and Compliance, Manila, Philippines.
[75] Kim, S. (2026). *Korea's compliance program (CP) system for strategic trade* [PowerPoint slides]. Philippines Industry Outreach Event on Strategic Trade Management, Technology Protection, and Compliance, Manila, Philippines.

Act, beginning with stakeholder registration and export authorization before progressively extending controls to other regulated activities.[76] Import authorization requirements for military goods under Annex 1 and dual-use goods under Annex 2 of the National Strategic Goods List are scheduled to take effect on January 1, 2028.[77] This final stage will overlap with planned development of the New Clark City Economic Security Zone, requiring the STMO and Bureau of Customs to coordinate implementation of strategic goods import controls with any zone-specific governance, customs, investment, and security arrangements.[78]

The challenge is compounded by the rapidly evolving US control environment. Semiconductor controls depend on highly technical specifications and continuous screening of customers, ownership, destinations, and end uses. Philippine firms, particularly SMEs and smaller electronics suppliers, often lack the mature internal compliance programs, technical expertise, and screening tools needed to manage these risks. The STMO has promoted compliance programs, pre-authorization audits, and outreach,[79] but guidance and capacity building must remain central to compliance rather than relying primarily on penalties.

Enforcement capacity is also limited. The STMO's small staff (currently 39 staff) must manage commodity classification, licensing, end-user consultations, technical analysis, and e-licensing functions across the full strategic trade mandate, while the BOC faces parallel constraints at the border. These pressures are particularly acute for semiconductor firms with mixed US, Chinese, and other global customers, where credible separation of controlled technology, data, personnel, and research activities is essential but not yet addressed by a tailored domestic framework.

Intangible technology transfers present a further gap. Customs procedures can inspect physical goods and verify licenses for cargo, transit, and transshipment, but controlled software and technical data may be transferred by email, cloud access, remote support, or other digital channels without crossing a border. Although Philippine rules cover electronic transfers and require secure channels, effective enforcement will depend on company audit trails, data-security procedures, staff training, and closer coordination among the STMO, BOC, cybersecurity bodies, and industry.

Finally, overlapping compliance regimes create avoidable burdens. The BOC's Authorized Economic Operator Program and the STMO's Internal Compliance Program audits both assess security, documentation, and internal controls, yet they operate separately. Greater coordination or mutual recognition could reduce duplicative compliance demonstrations, and proposed STMO enforcement staffing and broader legislative reforms could help address the current enforcement and investigative bottlenecks.

The stakes of these gaps are not hypothetical. Manila has previously served as a node in proliferation networks; in 2012, Iranian national Parviz Khaki was arrested in Manila on a US provisional arrest request in connection with an indictment for exporting dual-use maraging steel suited to nuclear applications, and months later, Daniel Frosch, an Austrian designated by the United States as a key supplier to Iran's ballistic missile program, was likewise arrested in Manila.[80]

These cases underscored the urgency of preventing the Philippines from becoming a hub for illicit trafficking by proliferators, and they illustrate the diversion risk that would attend a larger, more

[76] Department of Trade and Industry–Strategic Trade Management Office. (2019). Guidance on the implementation of the Strategic Trade Management Act (Department Administrative Order No. 19-07). Republic of the Philippines.
[77] World Trade Organization. (2025, August 19). Strategic goods: Import licensing notification—Philippines. Import Licensing Notification Portal. https://lic-public.wto.org/en/legislations/1523
[78] US Embassy in the Philippines. (2026, April 17). Fact sheet: US and Philippines plan the launch of historic 4,000-acre economic security zone to shore up supply chains. https://ph.usembassy.gov/fact-sheet-u-s-and-philippines-plan-the-launch-of-historic-4000-acre-economic-security-zone-to-shore-up-supply-chains/
[79] DTI-STMO, "Written Responses to the Author's Questionnaire."
[80] US Department of Justice, Office of Public Affairs. (2012, July 13). Two indicted for alleged efforts to supply Iran with US materials for gas centrifuges to enrich uranium. https://www.justice.gov/archives/opa/pr/two-indicted-alleged-efforts-supply-iran-us-materials-gas-centrifuges-enrich-uranium; BDB Law. (2020, August 4). DTI-STMO's authorization for exporting strategic goods begins. https://bdblaw.com.ph/index.php/newsroom/articles/tax-law-for-business/652-dti-stmo-s-authorization-for-exporting-strategic-goods-begins

sophisticated Philippine role in the semiconductor supply chain absent commensurate enforcement capacity. That concern is reinforced by reports that Philippine-manufactured parts have appeared in drones used in Ukraine based on a conversation with an official from the US Embassy in Manila, suggesting that even ordinary commercial components can be diverted into military end uses when controls are weak.

6. Assessing IP protection and enforcement

6.1 US IP regime

The US IP system provides protection for patents, copyrights, trademarks, trade secrets, and semiconductor chip designs. Patents are governed principally by Title 35 of the US Code and follow a first inventor to file approach under the America Invents Act, while copyrights and trademarks are governed by the Copyright Act and Lanham Act.[81] The US Patent and Trademark Office administers patent and trademark registrations, and the Copyright Office administers copyright and mask work registration. For semiconductors, the Semiconductor Chip Protection Act provides a separate ten-year protection period for integrated circuit mask works.[82]

Trade secrets receive both civil and criminal protection. The Defend Trade Secrets Act creates a federal civil remedy for misappropriation connected to interstate or foreign commerce, while the Economic Espionage Act criminalizes trade secret theft, including theft intended to benefit a foreign government or instrumentality.[83] In practice, protection depends on the owner's ability to show that it used reasonable safeguards, such as access controls, confidentiality agreements, and documented internal procedures.[84]

The US also connects IP enforcement to trade and industrial policy. Section 337 of the Tariff Act of 1930 allows the US International Trade Commission to exclude infringing imports, while the Bayh-Dole Act and CHIPS Act link public research and semiconductor incentives to commercialization, domestic production, and technology security requirements.[85]

6.2 Philippine IP regime

The Philippine IP system is centered on Republic Act No. 8293, or the Intellectual Property Code, which consolidated the legal framework for patents, trademarks, copyrights, industrial designs, and technology transfer.[86] The Intellectual Property Office of the Philippines (IPOPHL) administers registrations and technology transfer arrangements, adjudicates administrative disputes through its Bureau of Legal Affairs, and can issue cease-and-desist orders and other administrative remedies.

Subsequent legislative updates have been refined to cover semiconductor technology protection: Republic Act No. 9150 (2001) established protections for layout designs (topographies) of integrated circuits, creating a Philippine counterpart to the US Semiconductor Chip Protection Act, while Republic

[81] Patents, 35 USC. §§ 1–390 (2024). https://uscode.house.gov/view.xhtml?path=/prelim@title35&edition=prelim; Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011). https://www.govinfo.gov/app/details/PLAW-112publ29; Copyright Act of 1976, Pub. L. No. 94-553, 90 Stat. 2541 (1976). https://www.govinfo.gov/content/pkg/USCODE-2024-title17/html/USCODE-2024-title17.htm; Lanham Act, Pub. L. No. 79-489, 60 Stat. 427 (1946). https://www.govinfo.gov/app/details/STATUTE-60/STATUTE-60-Pg427

[82] Semiconductor Chip Protection Act of 1984, Pub. L. No. 98-620, tit. III, 98 Stat. 3335, 3347 (1984). https://uscode.house.gov/view.xhtml?path=/prelim@title17/chapter9&edition=prelim

[83] Defend Trade Secrets Act of 2016, Pub. L. No. 114-153, 130 Stat. 376 (2016). https://www.govinfo.gov/content/pkg/PLAW-114publ153/html/PLAW-114publ153.htm; Economic Espionage Act of 1996, Pub. L. No. 104-294, tit. I, 110 Stat. 3488 (1996). https://www.govinfo.gov/content/pkg/PLAW-104publ294/pdf/PLAW-104publ294.pdf

[84] Protection of trade secrets, 18 USC. §§ 1831–1839 (2024). https://uscode.house.gov/view.xhtml?path=/prelim@title18/part1/chapter90&edition=prelim

[85] Unfair practices in import trade, 19 USC. § 1337 (2024). https://www.usitc.gov/intellectual_property/about_section_337.htm; Policy and objective, 35 USC. § 200 (2024). https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title35-section200&num=0&edition=prelim; National Institute of Standards and Technology. (n.d.). CHIPS for America. US Department of Commerce. Retrieved September 4, 2026, from https://www.nist.gov/chips

[86] Intellectual Property Code of the Philippines, Republic Act No. 8293 (1997). The Lawphil Project. https://www.lawphil.net/statutes/repacts/ra1997/ra_8293_1997.html

Act No. 10372 (2013) modernized copyright protections for the digital age.[87]

The Philippine Technology Transfer Act of 2009, Republic Act 10055 serves a role comparable to the US Bayh-Dole Act by providing a framework for ownership, management, and commercialization of IP generated through government-funded research.[88] IP enforcement is supported by specialized courts and by the National Committee on Intellectual Property Rights, a 15-agency body chaired by the DTI and coordinated by IPOPHL.

6.3 Comparison of US-PH IP regimes

When evaluated against the US regime, the Philippines' IP framework presents the following areas for improvement:

6.3.1 Strategic orientation

The prevailing Philippine IP framework is largely oriented toward addressing trademark counterfeiting and copyright piracy, long-standing priorities under Special 301 concerns regarding public health and the creative economy. Semiconductor-related IP, however, presents distinct challenges: it requires robust trade secret protection for proprietary ATP process know-how, proactive enforcement against misappropriation of testing and packaging recipes, effective safeguarding of chip layout designs, and the capacity to meet the sophisticated evidentiary demands of technology transfer litigation.

6.3.2 Trade secret protection

Despite existing protections for layout designs (R.A. 9150) and modernized copyright (R.A. 10372), trade secret protection remains a significant structural gap due to the lack of a standalone Trade Secrets Act. Currently, firms rely on a fragmented composite of IP Code provisions, Civil Code doctrines, and limited penal sanctions, placing heavy reliance on non-disclosure and non-compete agreements. This reliance is insufficient for advanced semiconductor operations, where competitive advantage lies not in patents but in unpatented know-how (i.e. thermal profiles, bonding parameters, and yield optimization recipes) that necessitates robust, statutory protection against misappropriation.

6.3.5 Evidentiary discovery and protection

Both the United States and the Philippines require trade secret owners to show reasonable measures to preserve confidentiality, but US courts commonly use protective orders, sealed filings, and *in camera* review to allow misappropriation claims to proceed without publicly disclosing the secret. In contrast, *Air Philippines Corp. v. Pennswell, Inc.* treats trade secrets principally as privileged from compelled discovery, leaving Philippine plaintiffs with limited procedural tools to prove theft while protecting sensitive information.[89]

6.3.3 State-linked technology misappropriation

Philippine law has no direct analogue to 18 USC. § 1831, which criminalizes theft or misappropriation of trade secrets committed with intent or knowledge that the offense will benefit a foreign government, foreign instrumentality, or foreign agent.[90] The closest Revised Penal Code provisions (Article 291 on revealing secrets with abuse of office and Article 292 on revelation of industrial secrets) principally address insider disclosure and do not expressly establish a distinct offense for organized or state-sponsored economic espionage.[91]

---

[87] An act providing for the protection of layout designs (topographies) of integrated circuits, amending for the purpose certain sections of Republic Act No. 8293, otherwise known as the Intellectual Property Code of the Philippines, and for other purposes, Republic Act No. 9150 (2001). The Lawphil Project. https://lawphil.net/statutes/repacts/ra2001/ra_9150_2001.html; An act amending certain provisions of Republic Act No. 8293, otherwise known as the Intellectual Property Code of the Philippines, and for other purposes, Republic Act No. 10372 (2013). The Lawphil Project. https://www.lawphil.net/statutes/repacts/ra2013/ra_10372_2013.html

[88] Philippine Technology Transfer Act of 2009, Republic Act No. 10055 (2010). Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. https://www.pcaarrd.dost.gov.ph/index.php/philippine-tech-transfer-act-of-2009

[89] Air Philippines Corporation v. Pennswell, Inc., G.R. No. 172835, 564 Phil. 774 (Supreme Court of the Philippines, 2007). https://lawphil.net/judjuris/juri2007/dec2007/gr_172835_2007.html

[90] Economic espionage, 18 USC. § 1831 (2024). https://www.law.cornell.edu/uscode/text/18/1831

[91] An act revising the penal code and other penal laws, Act No. 3815 (1930), arts. 291–292, as amended by Republic Act

6.3.4 Underutilized semiconductor-specific safeguards

While the legal instrument exists in the Philippines for protections of integrated circuit layout designs, it remains largely dormant in terms of visibility. Layout design protection is notably absent from investment promotion materials. This existing, sector-specific statutory protection is being overlooked in the very forums where it would most effectively bolster investor confidence.

6.4 Future directions

It is worth highlighting that the Philippine government, in its Semiconductor & Electronics Industry Roadmap 2026–2030, has explicitly committed to enacting legislation that criminalizes trade secret infringement and to establishing a National Export Control Framework aligned with international standards, supported by industry compliance education. These initiatives represent a promising advancement that could be significantly enhanced through direct technical cooperation with the United States.

Ultimately, the overarching policy imperative is not for the Philippines to adopt the American legal system wholesale but rather to strategically refine its existing institutional framework to address the gaps presented in this paper (see Table 6) and effectively support investments in advanced ATP—not just from US locators but from global firms seeking protections for their high-value IP assets.

Table 6. Strategic Trade and IP Gaps

Function	United States	Philippines	Status
Dual-use item controls	EAR / CCL	RA 10697 / NSGL	Present in both
Munitions controls	AECA / ITAR / USML	NSGL Annex 1	Present in both
End-use / catch-all	EAR Part 744 (WMD, military, military intelligence)	STMA §11, MC 21-35 (WMD only)	Narrower in PH
Party-based controls	Entity List, MEU, UVL, DPL, SDN	—	Absent in PH
Deemed export	EAR §734.13(b)	—	Absent in PH
Foreign-produced item reach	FDPR, de minimis	—	Absent in PH
Re-export / reassignment	Direct control	MC 25-20 (via authorization condition)	Present in both
Transit / transshipment	—	MC 24-16	Present in PH
Import authorization	Marginal	RA 10697 §10 — unimplemented	Statute only
Voluntary self-disclosure	EAR §764.5, two tracks	MC 21-39, single track	Present in both; PH lacks proportionality tier
Published penalty schedule	Supp. 1 to Part 766	—	Absent in PH
Quantified VSD credit	Halves base penalty	Discretionary	Absent in PH
Tiered compliance benefits	License exceptions, STA, VEU	—	Absent in PH
AEO cross-recognition	—	BOC AEO and STMA on separate tracks	Absent in PH
IC layout design protection	SCPA 1984	RA 9150	Present in both; PH dormant

No. 10951 (2017). The Lawphil Project. https://lawphil.net/statutes/acts/act1930/act_3815_1930b.html

Trade secret civil action	DTSA 2016	Composite (IP Code, Civil Code, *Pennswell*)	No dedicated PH statute
Trade secret criminal — general	EEA §1832	RPC Arts. 291–292	Present in both
Trade secret criminal — foreign state benefit	EEA §1831	—	Absent in PH
Protective orders in trade secret litigation	Developed practice	Rule 27; no developed practice	Absent in PH
IP border/trade remedy	Tariff Act §337	Customs measures, counterfeits only	Absent in PH
Federally funded research IP	Bayh-Dole	RA 10055	Present in both

Notes: *The gaps can be remedied through:*
Reachable by circular under existing authority: *party-based screening infrastructure, AEO cross-recognition, published penalty schedule, quantified VSD credit, VSD proportionality tier, activating RA 9150, import authorization, general authorizations.*
Requiring statutory amendment: *deemed exports and in-country transfers, catch-all scope beyond WMD, restricted party designation authority, and durable statutory grounding for tiered compliance benefits.*
Requiring separate legislative or judicial action: *a standalone Trade Secrets Act, a foreign-state-benefit criminal provision, and Rules of Court amendment for protective orders.*

7. Implementation roadmap

This section provides a phased implementation roadmap that addresses geopolitical risks and institutional realities based on consultations with relevant implementing agencies. A three-phase sequence, keyed to the implementation of the New Clark City ESZ, is proposed. For the Philippines, the recommendations center on building investor-confidence measures balancing compliance costs, while for the US, it is about providing the necessary support in terms of funding and technical assistance to strengthen the country's strategic trade and IP regimes.

7.1 Phase One: Building the foundation (2026-2027)

Phase One prioritizes institutional capacity-building and measures to strengthen investor confidence over imposing new regulatory obligations, and it can be drawn largely from the implementing agencies' own stated requirements and action plans.

7.1.1 Conclusion of DOC-DTI MOU on Information Sharing (PH)

The completion of the memorandum of understanding between the US Department of Commerce and the Philippine DTI regarding BIS-STMO information sharing represents a key diplomatic benchmark. Consultations indicate that functional cooperation between the BIS and the STMO is already active; the STMO has provided support for post-shipment verifications of US-regulated exports, and both entities have conducted technical sessions on regulatory ambiguities and operational hurdles. [92] Most notably, the US Department of Commerce and the Philippine DTI are concluding an MOU to establish a secure, formal framework for exchange on strategic trade controls. This agreement can be structured around three main pillars:

Technology Trade Security Working Group: A permanent body meeting semiannually comprising BIS, US Embassy Manila, DTI-STMO, BOC, DFA, and IPOPHL to evaluate licensing patterns, synchronize NSGL revisions with global norms, and provide a mechanism for Philippine input into US policy decisions.

Investment-Screening Dialogue: A collaborative forum uniting Philippine investment authorities with US counterparts to ensure cohesive security evaluations and incentive management for economic zone locators.

[92] DTI-STMO, "Written Responses to the Author's Questionnaire."

Enforcement Channel: A structured liaison network linking US and Philippine enforcement bodies to facilitate evidence exchange on illicit transshipment and diversion, adapted from the STMO's Governmental End-Use Assurance (GEUA) model for semiconductor process technologies.

7.1.2 Complete the implementation of RA 10697 (PH)

Operationalize import authorizations, issue comprehensive general authorization guidelines, and bolster catch-all enforcement under RA 10697. Notably, these action items are directly aligned with the STMO's internal executive agenda.

7.1.3 Develop a strategic trade portal (PH)

The Philippines should finalize semiconductor-specific risk indicator guidance, strengthen restricted party and diversion screening, establish clear compliance expectations for high-risk industries, and incorporate advanced analytics into the Stratlink system. A free public web portal could reduce compliance costs for domestic exporters by providing searchable access to applicable domestic restrictions and international sanctions lists, including UN and FATF resources, alongside timely advisories on red flags and regional diversion trends. Combined with the proposed information sharing protocol, these measures would support faster alignment of the NSGL with multilateral updates and enable the Philippines, where consistent with national interests and existing STMA catch-all and end-use authorities, to adopt relevant US semiconductor classifications.

7.1.4 Institutional strengthening (PH)

To strengthen institutional capabilities, Congressional funding is needed to back the STMO's proposed Enforcement Division and plantilla expansion under the pending STMA amendment and further integration of analytics into Stratlink.[93] These steps ensure the agency is fully equipped to enforce the regime prior to the January 2028 implementation of Annex 1 and Annex 2 import controls.

7.1.5 Joint STMO–IPOPHL guidance on TCP (PH)

STMO and IPOPHL could issue joint guidance establishing that a formal Technology Control Plan (TCP) covering security essentials such as access controls, deemed export assessments, visitor protocols, and audit trails counts as legal proof that a firm has taken "reasonable steps" to protect its confidential information. These provisions should also address how firms managing technology from multiple jurisdictions can keep those streams strictly separated. This strategy offers companies a dual return on existing compliance efforts; it fulfills export control obligations while simultaneously satisfying the legal standard for trade secret protection. Ultimately, this approach encourages broader TCP adoption without requiring new regulations, effectively bridging two previously disconnected regulatory functions.

7.1.6 Confidence-building investment promotions (PH)

IPOPHL should issue comprehensive guidance regarding the registration of layout designs, which is a protection already codified in existing law. This guidance should be systematically integrated into investment promotion materials, embedded within the DTI semiconductor roadmap, and incorporated into STMO industry outreach initiatives. Furthermore, the systematic tracking and publication of total registration volumes would serve as a vital mechanism for fostering investor confidence.

7.1.7 Technical assistance and capacity-building (US)

The US could provide capacity building training on topics identified by STMO: investigative techniques, case management, evidence handling, and intangible technology transfers.[94] On the IP side, areas for technical assistance include semiconductor-specific training for IP courts and prosecutors and support of IPOPHL's drafting of trade secret implementing rules under the IP Code.

7.2 Phase Two: Alignment (2027-2028)

Phase Two could focus on strengthening the foundation of the strategic trade and IP protection through legislative amendments and tightening of operational protocols.

7.2.1 Strategic Trade Act amendment (PH)

In the areas of strategic trade, STMO could propose a singular legislative vehicle comprising six critical

[93] DTI-STMO, "Written Responses to the Author's Questionnaire."

[94] DTI-STMO, "Written Responses to the Author's Questionnaire."

pillars to modernize the strategic trade regime is proposed to cover: clear rules for deemed exports and in-country technology transfers; expanding catch-all controls beyond WMD proliferation to cover conventional military, military-intelligence, and other technology-diversion risks contrary to Philippine national interests; and authorizing the STMO to maintain a national restricted party list subject to due process, delisting procedures, and judicial review. The amendment could also adopt a transparent civil penalty matrix with defined VSD mitigation and extend tailored compliance obligations to universities and research institutions, enabling the regime to address technology competition while preserving the distinct needs of academic research.

7.2.2 Enactment of stand-alone Trade Secrets Act (PH)

The Philippines should enact a standalone Trade Secrets Act, informed by the US Uniform Trade Secrets Act and Defend Trade Secrets Act but adapted to Philippine civil law principles. The law should define protectable trade secrets and clarify the *Pennswell* doctrine; establish a civil cause of action for misappropriation; provide injunctive relief, actual damages, unjust enrichment or reasonable royalty awards, and exemplary damages for willful and malicious conduct; and specify a limitations period running from discovery. It should also define the reasonable measures required of technology holders while expressly preserving employee mobility so that trade secret protection does not operate as a de facto non-compete regime.

7.2.3 Criminal provisions for foreign state economic espionage (PH)

Creating a domestic analogue to the US Economic Espionage Act would serve as the necessary statutory bridge between the IP and strategic trade regimes. By targeting misappropriation intended to benefit foreign state actors, the Philippines can signal its status as a secure jurisdiction for sensitive process know-how. It should be drafted narrowly (foreign state benefit, not ordinary commercial misappropriation) to avoid chilling legitimate labor mobility and reverse engineering and contain a defined referral pathway between IPOPHL, STMO, DOJ, and the NBI.

7.2.4 Increased appropriations for implementing agencies (PH)

Implementing agencies, notably the STMO, IPOPHL, BOC, and DOJ, face expanding mandates driven by the imperative to establish a robust strategic trade and IP regime that supports the Philippines' positioning as a secure and trusted semiconductor partner. Establishing the Philippines as a secure and trusted semiconductor partner requires robust strategic trade and IP regimes. However, key implementing agencies—specifically the STMO, IPOPHL, BOC, and DOJ—face rapidly expanding mandates. To move these bodies beyond basic administrative oversight and build true operational effectiveness, dedicated budgetary appropriations and specialized plantilla positions are essential. This institutional capacity expansion will directly enhance their verification, screening, enforcement, prosecution, and outreach capabilities.

7.2.5 Protective order and in-camera procedure for trade secret litigation (PH)

The Philippines should adopt rules for Special Commercial Courts permitting sealed filings, attorneys' eyes only designations, in-camera inspection, and protective orders sufficient to litigate a process technology claim without public disclosure. This addresses the evidentiary impasse left unresolved by Pennswell and can be achieved through the Court's inherent rulemaking authority while related legislation has yet to be finalized.

7.2.6 Adoption of tiered trusted exporter program (PH)

Formalize a tiered certification system calibrated by firm size and sector across five distinct categories, including specialized classes for large and SME manufacturers, logistics providers, and research institutions modelled on the Korean framework (see Table 7).

Table 7. Korea Tiered Compliance Program

	A	AA	AAA
Review, Group B countries	10–15 days	10 days	5 days
End-user statement exemption	×	×	own overseas HQ/branch
Comprehensive license	Where a transaction condition is met	On grade alone	On grade alone
Comprehensive validity	2 years (Region B)	2 years (Region B)	3 years (everywhere)
Reporting cadence	Semi-annual / biennial	Semi-annual / biennial	Annual

Notes: *Managed through the YesTrade digital window, the regime utilizes a three-year designation cycle renewable upon re-assessment. Obligation thresholds are progressive: Grade A requires a responsible officer, semi-annual reporting, and established internal regulations with standard review process of 10-15 days; AA demands a formal CEO commitment, semi-annual reporting, and planned periodic audits with 10 days standard review timeline; and AAA necessitates a dedicated export control unit within the organizational chart alongside corrective action plans, require just an annual report and passes standard review in 5 days. This structure is governed by the principle that procedural benefits must be graduated rather than binary, rewarding compliance maturity with measurable operational relief.*

Designations could operate on a three-year cycle, renewable upon re-assessment. To leverage existing efforts, the program should fold completion of the STMO Executive Program into the requirements as a Tier 1 input and a more advanced professional credential as a Tier 3 prerequisite; this effectively converts an existing training obligation into a developmental rung on a compliance ladder at no additional cost to the state.

7.2.6 STMO-BOC mutual recognition circular (PH)

Create an agreement between STMO and BOC to eliminate duplicate assessments for companies that hold Authorized Economic Operator (AEO) status. Where requirements for shipment, documentation, and security management overlap, firms should be exempt from redundant reviews. Using the South Korean model as a precedent, this reform would be low-cost to implement while providing significant efficiency benefits for mid-tier firms.

7.2.7 Deployment of credentialing platform piloted in Panama (US)

The US is currently piloting a credentialing platform with Panama's customs and port authorities to track and verify the provenance and transit of critical minerals, AI infrastructure, and semiconductors. Designed to interface directly with existing port operation and customs systems, the platform accelerates clearance for vetted shipments, with plans to expand into other Pax Silica economies during its second phase. By designating the Philippines as the primary deployment site for Phase Two, the United States could integrate this system into BOC operations across ports along the LEC. This integration would effectively eliminate the customs targeting gap while providing Philippine-origin exports with expedited access to the US market. At the domestic level, vetting for this shipping lane can leverage the STMO's established pre-authorization audit procedures and internal compliance framework.

7.3 Phase Three: Institutionalization (2028-2030)

Phase Three converts practice into architecture, timed to the Economic Security Zone's operational rollout.

7.3.1 Rollout of trusted shipment lane (US-PH)

Following successful testing of the credentialing system, the Philippines could expand the initiative nationally to establish a trusted shipment lane powered by the Pax Silica AI supply chain credentialing and provenance platform. Embedding this platform into the Philippine STMO and customs framework presents a strategic avenue to capitalize on AI-enabled efficiencies, thereby alleviating administrative constraints while guaranteeing the swift and compliant transit of critical technology assets.

7.3.2 Zone-level governance and locator agreements (PH)

Physical security must be paired with administrative safeguards. The 4,000-acre ESZ in New Clark City could operate under a distinct set of zone-level governance rules. These rules would require all semiconductor and advanced technology locators to embed rigorous protection standards directly into their binding locator agreements.

7.3.3 Performance metric evaluation framework (PH)

To demonstrate the effectiveness of the Philippine strategic trade and IP framework, the STMO could publish an annual performance scorecard with defined implementation metrics.[95] The scorecard could track licensing turnaround times, including whether the proposed Tiered Trusted Exporter Program reduces processing periods for higher-rated firms; detected diversion and enforcement outcomes, such as suspicious transactions flagged, re-export diversions intercepted, and administrative or criminal cases resolved; foreign direct investment in facilities certified under the secure and trusted partner framework; and workforce outcomes, including training, certification, and placement of semiconductor engineers and strategic trade compliance professionals in support of the national target of 128,000 semiconductor specialists.

7.3.4 Build the workforce pipeline to maintain effective controls (PH)

To establish and maintain robust strategic controls, the Philippines could introduce a professional practitioner-level certification in customs and trade compliance. This program would encompass technical classification, screening evaluations, Technology Control Plan (TCP) formulation, deemed export analysis, and investigative or disclosure protocols. Establishing partnerships with universities would build an entry-level talent pipeline beyond simply upskilling current industry personnel, while subsidies can ensure access for SMEs. Institutionalizing this program within a domestic home will ensure sustainability past donor funding cycles. Finally, integrating this credential directly into the tiered assessment structure will provide it with tangible commercial value beyond a formal regulatory requirement.

7.3.5 Regional expansion and co-sponsorship (US-PH)

The Philippines can solidify its position as leader in the strategic trade regime and export its ESZ technology protection model to other Pax Silica economies, initiating discussions for an ASEAN Leaders' Declaration on Strategic Trade Management and establishing an ASEAN Experts Group. The regional vehicle for that extension already exists; six ASEAN member states now operate strategic trade control systems, and the Philippines' ASEAN chairmanship has advanced a Priority Economic Deliverable comprising an ASEAN Leaders' Declaration on Strategic Trade Management and a proposed ASEAN Experts Group on STM as a voluntary platform for dialogue, information sharing, and capacity building.[96] A Philippines that has operationalized the bilateral framework proposed here would enter those regional discussions not as a rule-taker but as the member state with the most advanced working model of allied technology trade governance.

7.3.4 Strategic Tariff Leverage (US-PH)

The proposed technology protection framework should convert verified compliance into commercial leverage. Rather than treating export control alignment as a unilateral burden, the Philippines should use demonstrated performance in strategic trade, IP protection, labor compliance, and supply chain security to seek preferential treatment under US Section 232 semiconductor measures and Section 301 forced labor actions. The Philippines could seek favorable treatment under the US EAR, including placement in a more favorable country group, which may expand eligibility for certain license exceptions

[95] DTI-STMO, "Written Responses to the Author's Questionnaire."

[96] DTI-STMO, "Written Responses to the Author's Questionnaire."

such as Strategic Trade Authorization (STA).[97] Individual Philippine facilities may also seek designation as Validated End Users (VEUs) for specified eligible items and activities.[98]

This should operate through staged reciprocity. Philippine reforms on deemed export rules, national screening capability, a tiered trusted-exporter program, and published enforcement metrics could be matched with US commitments to reduce licensing friction, consider tariff exclusions, and support trusted facilities. Linking compliance to tangible investment and market access benefits would strengthen the domestic case for reform and give the ESZ a clearer regulatory advantage in competition for advanced semiconductor investment.

8. The case for an enhanced framework

Because BIS export controls often shape Philippine OSAT operations more directly than domestic STMO requirements, Philippine firms already invest substantially in US-driven compliance. The central policy question is therefore how stronger Philippine technology protection institutions can generate tangible returns. This paper argues that a convergent framework can create mutual gains through investment, technology transfer, supply chain resilience, and defense industrial cooperation when paired with reciprocal benefits through existing defense, trade, bilateral, and plurilateral mechanisms.

8.1 Benefits to the Philippines

Adopting this harmonized framework redefines compliance for the Philippines, shifting it from an operational overhead into an essential prerequisite for entering higher-value segments, particularly in military and dual-use technologies. The benefits to the country span six critical areas:

First, investment attraction: Building a reputable and secure compliance ecosystem places Philippine economic zones in a prime position to secure anchor locators for the ESZ, access funding through the Pax Silica Fund (subject to US Congressional authorization), and draw corporate supply chain realignment along with PIPIR-related investments.

Second, tariff leverage: With the Supreme Court striking down the reciprocal tariff model, American trade posture has shifted. Proven and verifiable compliance credentials afford Manila a solid, principled basis for securing favorable terms under Section 232 and 301 semiconductor provisions while strengthening its position in active bilateral trade negotiations.

Third, institutional capacity building: Direct financial and technical support encompassing training, technical assets, and operational resources for the STMO, BOC, and IPOPHL ensures that newly introduced regulatory demands arrive alongside the requisite tools for effective implementation.

Fourth, value chain elevation in alignment with national statutory goals: Under the Tatak Pinoy Strategy, the country is legally bound to clear targets, including expanding advanced packaging exports to a minimum 25 percent share by 2030, fostering fabless design enterprises, integrating domestic inputs, and generating over 15,000 high-value semiconductor jobs (Tatak Pinoy Council, 2025). This harmonized regime functions as the core trust infrastructure that makes those policy milestones commercial realities.

Fifth, expanded capital access: Achieving trusted partner status unlocks key funding channels, including Defense Production Act Title III mechanisms, the Pax Silica Fund, and PIPIR initiatives.

Sixth, talent development and technical spillovers: This compliance system streamlines professional credentialing and high-tech career placement for the nation's annual output of more than 80,000 engineering and technical graduates, directly advancing the OECD's recommended roadmap to cultivate 128,000 semiconductor specialists by 2028 (ASEAN Business Advisory Council, 2025).

[97] Country groups, 15 C.F.R. pt. 740, supp. no. 1 (2026). https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-740/appendix-Supplement%20No.%201%20to%20Part%20740; License Exception Strategic Trade Authorization, 15 C.F.R. § 740.20 (2026). https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-740/section-740.20

[98] Authorization Validated End-User (VEU), 15 C.F.R. § 748.15 (2026). https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-748/section-748.15

8.2 Benefits to the United States

For the United States, a compliant, capable Philippines directly serves the protection of American semiconductor leadership in five ways.

First, concentration risk: with as much as 60 percent of global chip manufacturing and roughly 90 percent of leading edge production concentrated in Taiwan, a scaled, trusted Philippine ATP and advanced packaging node materially de-risks the back end of the US supply chain, complementing new domestic fabrication capacity with allied downstream capacity.

Second, extending enforcement reach: The efficacy of BIS controls over advanced packaging and manufacturing equipment relies heavily on the strength of customs regimes in transshipment and processing jurisdictions. By implementing an aligned licensing framework and operating a provenance platform, a Philippine partner actively closes a potential diversion loophole, turning it into a robust enforcement asset.

Third, critical minerals: Philippine nickel, copper, cobalt, and chromite, developed through ESZ processing investment, give the United States and its partners supply of strategic inputs outside adversary control.

Fourth, proof of concept: New Clark City is the first ESZ in a planned multi-continent network. Demonstrating that the model works—that American legal predictability can indeed be fused with Asian speed and scale—is itself a US strategic interest, and the Philippines is where that demonstration will succeed or fail.

Fifth, alliance economics: a Philippines that prospers inside the allied technology ecosystem is a stronger treaty ally, better able to fund its own defense modernization and less susceptible to economic pressure. These are outcomes members of Congress have consistently supported.[99]
Greater Philippine capacity in advanced electronics, semiconductor ATP, critical mineral processing, secure logistics, and defense industrial production would reduce vulnerability to geographically concentrated or potentially coercible supply networks. It would also position the country to maintain access to essential systems during a regional contingency while enabling the United States and allied partners to distribute selected production activities across a network of trusted locations.

8.3 The convergence dividend

Beyond these ledgers, convergence itself generates value neither side can capture alone. A single, aligned rulebook lowers duplicative compliance costs for the multinationals that operate in both jurisdictions; predictable, expedited treatment for vetted shipments shortens cycle times in an industry where logistics speed is competitive advantages, and jointly administered standards create the investor confidence that no unilateral assurance can, because each government's commitments are verified by the other. Framed this way, technology protection ceases to be a burden Manila absorbs for Washington's benefit or a subsidy Washington extends for Manila's. Instead, it is the shared operating system of an allied industrial platform and the only framing under which sustained investment by both governments is politically and economically rational.

9. Risks and limitations

Four principal risks qualify these recommendations:

First, external pressure: Manila's economic interdependence with Beijing exposes visible strategic alignment to potential retaliatory action. The proposed framework mitigates this exposure through non-proliferation and trusted network framing, the absence of treaty-level country-specific prohibitions, and independent trade diversification efforts, though it cannot eliminate retaliatory risk entirely.

Second, regulatory volatility and list divergence: Export control frameworks have experienced frequent shifts globally. Multilateral control regimes face institutional deadlocks, making consensus on major list additions increasingly difficult. Consequently, individual jurisdictions are unilaterally expanding national control lists (e.g. the EU's "500 series" additions in 2025 covering specified quantum technologies, advanced computing ICs and electronic assemblies, and additive manufacturing machines and related materials). [100] Philippine

[99] Congressional Research Service (2026). *The Philippines (IF10250)*. https://www.congress.gov/crs-product/IF10250

[100] European Parliamentary Research Service. (2025). Dual-use export controls as tools of EU economic security. European Parliament.

exporters can no longer rely solely on tracking the four traditional regime lists; they must continuously monitor a fragmented, expanding set of national control lists. Furthermore, as trade bargains prove perishable, developing enduring statutory and institutional architecture becomes even more critical.

Third, execution risk: As of mid-2026, key operational details for the ESZ including anchor tenants, construction cost-sharing, and final governance frameworks remain undisclosed. Additionally, domestic concerns regarding land use, sovereignty, and environmental impacts must be resolved to secure the necessary social license.

Fourth, absorptive capacity and market demand: Administrative absorption within implementing agencies can lag behind funded capacity building. Furthermore, industry projections like SEIPI's indicate flat export cycles during periods of soft global demand, meaning underlying investment returns remain partially tied to broader market forces outside bilateral control.

These constraints advise pragmatic expectations regarding implementation timelines, though they do not alter the strategic imperative.

10. Conclusion

The United States and the Philippines share a vital strategic opportunity to transform their longstanding bilateral alliance into a resilient technology and industrial security partnership. While the Philippines cannot compete principally through the scale of incentives or leading edge fabrication capacity, its comparative advantage lies in the combination of treaty-based strategic alignment, an established ATP industry, an English-capable technical workforce, and mineral resources relevant to electronics, clean energy, and defense production. Together, these assets can support more resilient and traceable minerals-to-chips pathways for the United States and its allies.

This opportunity, however, is not automatic. Participation in Pax Silica, FORGE, the LEC, and related initiatives must be matched by domestic capacity to receive, protect, and deploy sensitive technology. A secure and trusted partner is defined not solely by alliance ties but by demonstrated capacity for end-use and end-user due diligence, diversion prevention, re-export controls, secure handling of technical data, facility and personnel security, trade secret protection, and coordination among trade, customs, IP, law enforcement, and investment promotion agencies.

The Philippines has an institutional base on which to build. The task is to adapt these institutions to advanced technology competition, including evolving control lists, foreign direct product rules, mixed customer manufacturing, intangible technology transfers, and confidential process know-how.

The recommended approach is a phased, Philippine-owned modernization agenda. In the near term, the Philippines should complete strategic trade implementation, strengthen STMO and BOC capacity, improve risk screening and information sharing, and clarify firm-level technology control and trade secret practices. Medium-term reforms should modernize the STMA, strengthen trade secret remedies and confidential litigation procedures, establish a tiered trusted exporter system, and reduce duplication between STMO and BOC compliance processes. Over time, these measures should be embedded in a bilateral technology trade security arrangement, zone-level governance for the ESZ, transparent performance metrics, and a sustained compliance workforce pipeline.

This agenda must be paired with reciprocal economic benefit. Stronger Philippine technology protection should be leveraged to advance growth of semiconductor friendshoring, develop the country's critical mineral processing capacities, increase technology transfers and defense industrial cooperation supported by financing, capacity-building, and potential tariff or licensing advantages. By using existing defense, trade, bilateral, and plurilateral mechanisms to link compliance with investment and market access opportunities, the Philippines and the United States can develop a durable minerals-to-chips partnership that advances Philippine value chain upgrading and US economic security objectives.

The risks remain substantial: economic exposure to China, volatility in US trade and export control policy, infrastructure and energy constraints, implementation capacity, and uncertain global

https://www.europarl.europa.eu/RegData/etudes/BRIE/2025/777960/EPRS_BRI(2025)777960_EN.pdf semiconductor demand. These constraints require realistic expectations, robust environmental and social safeguards, and continued investment in underlying competitiveness. They do not, however, change the strategic direction. A Philippines able to provide secure, transparent, and reliable manufacturing, mineral, and logistics capacity will be better positioned to attract higher-value investment and participate in trusted supply chains.

The framework is ultimately positive-sum. For the United States, it strengthens an allied ATP, minerals, logistics, and technology protection node in the Indo-Pacific. For the Philippines, it supports industrial upgrading, higher-value employment, stronger defense industrial capacity, and a more credible claim to secure and trusted partner status. By converting alliance-based trust into demonstrable institutional capability, the two countries can build a durable minerals-to-chips partnership and expand the Philippines' role in the global semiconductor value chain.

ABOUT THE AUTHOR

ANDREA CHRISTINA CAYMO-KAUHANEN is the Managing Partner of AnterBridge, a boutique advisory and market entry firm focused on the Philippines. Andrea's fellowship builds on a distinguished career in Philippine foreign service. She served as Director at the Philippine Department of Foreign Affairs' Office of International Economic Relations, where she shaped national economic and trade policy and represented the Department on four national policy boards, including the National Innovation Council's Executive Technical Board and the Inter-Agency Investment Promotion Coordination Committee. Earlier in her career, she served as Vice Consul and Head of the Economic, Cultural, and Visa Section at the Philippine Consulate General in Honolulu, where she advised more than eighty-five businesses on market entry and regulatory compliance and facilitated eleven trade missions connecting Hawaii and Philippine government agencies and private sector partners. She also held roles as a Foreign Service Officer in the Department's Office of Strategic Planning and Policy Coordination and, prior to her diplomatic career, as an Investment Associate at Metropolitan Bank & Trust Company. The author can be contacted through email: andrea@anterbridge.com.

Beyond Border Control:

Customs As A Strategic Partner Of Trusted Semiconductor Supply Chain In The Philippines

By
Rhoan P. Escarmosa

Executive Summary

Rhoan P. Escarmosa

Semiconductors underpin artificial intelligence, telecommunications, advanced manufacturing, transportation, medical technology, and national security systems. Their production depends on a geographically distributed network of design firms, wafer fabrication plants, equipment and materials suppliers, assembly, testing, and packaging (ATP) facilities, and logistics providers. Recent disruptions and geopolitical tensions have therefore demonstrated that semiconductor competitiveness depends not only on manufacturing capacity but also on resilient, transparent, and trusted supply chains.

The Philippines occupies an important position in this network, particularly in semiconductor ATP. Philippine facilities depend on the timely importation of wafers, components, equipment, specialty chemicals, and other production inputs, followed by the predictable exportation or re-exportation of finished devices. This production model makes border performance a material component of industrial competitiveness. Delays, uncertain customs treatment, fragmented regulatory requirements, weak data exchange, or inconsistent controls can interrupt production and discourage investment even when labor, infrastructure, and fiscal incentives remain competitive.

This paper examines how customs administration can support trusted semiconductor supply chains, with the Philippine Bureau of Customs (BOC) as its principal institutional focus, without displacing the mandates of industrial, science and technology, investment promotion, or strategic trade agencies. It argues that customs administration makes its most credible strategic contribution within its existing mandate: enabling the secure and predictable movement of production inputs and finished goods while using trusted trade data to identify and manage risk. Customs modernization should therefore be understood not only as administrative reform but also as part of the Philippines' investment and economic security infrastructure.

The paper applies policy and institutional analysis informed by the author's direct experience in implementing Philippine customs and paperless trade initiatives. It uses the following analytical pathway: ***customs modernization → trusted data → supply chain visibility → risk intelligence → trusted trade → trusted supply chains → investment confidence → national competitiveness***. This framework connects individual customs instruments and reforms to the broader institutional and economic capabilities they should produce.

The assessment yields five principal findings. First, the Philippines has established significant foundations for digital and trusted trade. These include customs automation, risk-based selectivity, post-clearance audit, advance rulings, the Authorized Economic Operator Program (AEO), the National Single Window (NSW), and Philippine participation in ASEAN exchanges of the electronic Certificate of Origin (e-CO), ASEAN Customs Declaration Document (ACDD), and electronic phytosanitary (e-Phyto) certificate. These initiatives demonstrate that technology alone does not create paperless trade. Enabling policies, capable people, simplified processes, interoperable platforms, and sustained partnerships must advance together.

Second, implementation remains fragmented. Government systems do not always use common definitions, data standards, or interoperable structures. Customs, industrial, statistical, licensing, and strategic trade authorities may classify or describe the same item differently. The benefits available under voluntary programs such as AEO must also become sufficiently clear, consistent, measurable, and commercially relevant to justify the compliance investments expected from participating companies. These issues constrain the conversion of transaction-level data into end-to-end supply chain intelligence.

Third, the semiconductor sector requires a calibrated customs approach. Applying the same level of intervention to every shipment would undermine time-sensitive manufacturing, while weak controls could expose the country to diversion, misdeclaration, intellectual property violations, and supply chain security risks. Customs should therefore combine advance information, risk-based clearance, non-intrusive inspection, post-clearance audit, voluntary disclosure, AEO accreditation, and coordinated border management. This approach moves appropriate verification activities away from the border while maintaining effective oversight and accountability.

Fourth, Customs needs a continuing mechanism that translates industry consultation into measurable action. The paper recommends establishing a “Customs for Exports Program” with semiconductors and electronics as its pilot sector. Its “Protect and Promote Framework” would treat enforcement and facilitation as mutually reinforcing functions. The “Protect” pillar would address strategic trade compliance, end-use and end-user due diligence, intellectual property protection, risk management, cybersecurity, and cargo security. The “Promote” pillar would address predictable clearance, the movement of imported production inputs, paperless trade, AEO participation, customs rulings, bonded arrangements, exporter assistance, logistics coordination, and cross-border market connectivity.

Customs could also support a proposed “Trusted or Top Exporters Program” for highly compliant and economically significant exporters. In addition, it could convene sectoral policy dialogues through which government and industry identify operational constraints, assign institutional responsibilities, establish timelines, and monitor agreed actions.

Fifth, Customs could also pursue customs diplomacy with priority semiconductor partners through AEO mutual recognition, bilateral agreements on electronic documents or advance data exchange, joint capacity building, and information sharing arrangements consistent with law and data protection safeguards. These measures could support the development of trusted semiconductor trade corridors connecting the Philippines with its principal production, technology, logistics, and export partners.

In summary, Customs cannot manufacture chips, select investors, or replace industrial policy. It can, however, reduce border uncertainty, protect supply chain integrity, and make regulatory compliance a source of commercial credibility. By organizing its existing instruments around clearly defined sectoral outcomes, Customs can help Philippine semiconductor firms operate more reliably, compete in trusted global networks, and support the country’s broader economic security investment and national competitiveness objectives.

Introduction

The semiconductor industry illustrates how the movement of goods has become inseparable from the movement of data. A chip may be designed in one country, fabricated in another, assembled and tested in the Philippines, and incorporated into a final product elsewhere. Each movement generates declarations, manifests, permits, certificates, commercial records, and logistics information. For firms operating synchronized production schedules, the accuracy and timely exchange of these data can matter as much as physical infrastructure.

The Philippines' role in this network gives customs administration strategic importance. Electronic products remained the country's largest export commodity group in 2025, accounting for $45.89 billion, or 54.3 percent of merchandise exports.[1] Much of the semiconductor industry's Philippine activity centers on assembly, testing, and packaging (ATP), which relies on imported inputs and the timely export or re-export of products after value-adding operations. Border delays, uncertainty in classification or valuation, fragmented permit requirements, and weak logistics coordination can therefore disrupt manufacturing continuity and undermine investment confidence.

This paper asks the following question: **How can Customs support trusted semiconductor supply chains while remaining within its legal and institutional mandate?** The question matters because semiconductor policy generally focuses on investment incentives, infrastructure, workforce skills and talents, research, and manufacturing capacity. Customs commonly appears only as a clearance or enforcement agency. That view overlooks how risk management, digital data exchange, post-clearance verification, trusted trader programs, and international customs cooperation affect the speed, security, and predictability of strategic trade.

The paper argues that Customs should not assume the responsibilities of industrial, science and technology, investment promotion, or export control authorities. Its distinct contribution lies in facilitating the secure and predictable movement of production inputs and finished goods while converting reliable trade data into risk intelligence. When organized around sectoral outcomes, existing customs instruments can reduce transaction costs, strengthen compliance, improve supply chain visibility, and enhance the Philippines' credibility as a trusted manufacturing location.

The analysis draws on international customs and trade facilitation measures, Philippine laws and modernization initiatives, semiconductor value chain literature, and the author's direct experiences. It applies a capability-based framework:

Customs Modernization → Trusted Data → Supply Chain Visibility → Risk Intelligence → Trusted Trade → Trusted Supply Chains → Investment Confidence → National Competitiveness

The paper proceeds in six parts. The first explains why digital trade and trusted data matter to modern customs administration. The second maps the Philippines' position in semiconductor value chains. The third assesses the principal capabilities of the Bureau of Customs. The fourth presents the author's implementation experiences and practical learning from the fellowship program. The fifth identifies operational and institutional gaps. The sixth synthesizes the study's principal findings and outlines practical measures and recommendations. It concludes by positioning Customs as a strategic contributor to trusted trade, semiconductor supply chain resilience, investor confidence, economic security, and national competitiveness.

1. The digital transformation of global trade from digital customs to trusted trade

The rapid digital transformation of global trade has fundamentally reshaped the movement of goods, information, and services across international borders. Advances in digital technologies, data-driven decision-making, and interconnected trade platforms have accelerated the transition from paper-based transactions to intelligent, technology-enabled trade ecosystems. As global supply chains become increasingly complex and interconnected, trusted trade data have emerged as a strategic asset, providing governments and businesses with greater visibility into transactions, supply chain actors, and

[1] Philippine Statistics Authority, "International Merchandise Trade Statistics of the Philippines 2025," accessed Sept. 2, 2026, https://psa.gov.ph/content/international-merchandise-trade-statistics-philippines-2025.

cross-border risks. Consequently, customs administrations are increasingly expected not only to facilitate legitimate trade and strengthen border security but also to manage and safeguard trusted trade data that support resilient, transparent, and competitive global supply chains.

Digital trade as an institutional transformation

Trade digitalization represents one of the most significant transformations in the evolution of international commerce. Traditional paper-based processes are progressively being replaced by electronic documentation, digital transactions, and interoperable information systems that enable governments and businesses to exchange trade data securely and in near real time. For Customs, however, digital transformation is principally an institutional change. Paper forms become structured data, sequential agency decisions become coordinated workflows, transaction-level checks evolve into risk analysis, and domestic systems become gateways for cross-border exchange.

The World Trade Organization (WTO) Trade Facilitation Agreement (TFA) provides a practical architecture for this shift. It covers pre-arrival processing, risk management, post-clearance audit, authorized operators, border-agency cooperation, and single windows.[2] The World Customs Organization (WCO) SAFE Framework similarly connects supply chain security, advance information, Customs-to-Customs cooperation, and Customs-to-Business partnerships, including AEO programs.[3] These instruments do not require Customs to choose between control and facilitation. Instead, they encourage administrations to concentrate intensive controls on higher-risk transactions while providing more predictable treatment to compliant traders.

A National Single Window (NSW) demonstrates the institutional character of digitalization. Article 10.4 of the TFA encourages members to enable traders to submit import, export, or transit documentation through a single entry point and to receive the results of participating authorities through that window.[4] The difficult work, however, is not merely building an online portal. Agencies must establish legal authority for electronic transactions, simplify procedures, agree on data definitions, allocate decision-making responsibilities, protect confidential information, and maintain reliable interfaces. A platform that merely reproduces fragmented paper requirements will digitize delays rather than eliminate them.

Cross-border paperless trade adds another layer of complexity. Domestic recognition of an electronic document does not guarantee its recognition abroad. Governments must align legal, technical, and operational arrangements so that a document generated in one jurisdiction can be authenticated, interpreted, and used in another. The United Nations Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific (CPTA) provides a regional mechanism for developing these conditions.[5]

Beyond replacing paper documents, digitalization has transformed trade data into a strategic resource for governments and the private sector alike. Major logistics and supply chain operators use Enterprise Resource Planning (ERP), Warehouse Management Systems (WMS), Transportation Management Systems (TMS), and real-time tracking technologies to monitor inventory movements, optimize transport routes, and support operational decision-making. Similarly, semiconductor and electronics manufacturers rely on integrated production planning, inventory control, and supplier management systems to coordinate complex operations involving multiple suppliers, manufacturing locations, logistics providers, and international markets.

---

[2] World Trade Organization, "Agreement on Trade Facilitation," especially arts. 7.1, 7.4, 7.5, 7.7, 8, and 10.4, accessed Sept. 2, 2026, https://www.wto.org/english/docs_e/legal_e/tfa_e.htm.

[3] World Customs Organization, *SAFE Framework of Standards to Secure and Facilitate Global Trade* (2025), accessed Sept. 2, 2026, https://www.wcoomd.org/en/topics/facilitation/instrument-and-tools/frameworks-of-standards/safe_package.aspx.

[4] World Trade Organization, "Agreement on Trade Facilitation," art. 10.4.

[5] United Nations Economic and Social Commission for Asia and the Pacific, "Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific," accessed Sept. 2, 2026, https://www.unescap.org/projects/cpta.

Trusted data, visibility, and risk intelligence

Customs declarations, cargo manifests, permits, certificates, commercial documents, and audit records form a detailed but fragmented representation of cross-border trade. When accurate, standardized, interoperable, and lawfully shared, **these data allow Customs to identify relationships that individual transactions cannot reveal, including recurring routes, patterns of trader behavior and valuation, regulatory dependencies, and anomalies over time.**

Visibility, however, does not mean unrestricted access to every private sector record. Rather, it means that authorized actors can obtain the timely and reliable information necessary for a defined regulatory purpose, subject to cybersecurity, confidentiality, and data protection safeguards. Better visibility allows Customs to assess risk earlier, apply proportionate interventions, and distinguish established, compliant operators from unusual or higher-risk transactions. This distinction is particularly important for semiconductors. A Harmonized System (HS) code identifies a commodity for tariff and statistical purposes, but it may not reveal the product's technical performance, intended end use or end user, incorporation into another product, or potential for processing and re-exportation. Semiconductor-related risks may concern classification and valuation as well as diversion, unauthorized technology transfer, counterfeit components, intellectual property infringement, cargo tampering, or dependence on a critical route. Customs data must therefore be combined, where legally permitted, with licensing information, company compliance records, logistics data, and industry intelligence. **Trusted data create value only when converted into decisions.** Advance information can support pre-arrival targeting, while historical declarations can inform post-clearance audit. AEO validation can reduce unnecessary intervention for firms with strong internal controls, and examination and audit findings can, in turn, refine risk profiles. This feedback loop transforms digitalization into risk intelligence and makes facilitation defensible: reduced intervention is based on evidence of lower risk, not an absence of control.

2. Mapping the global semiconductor supply chain

The semiconductor industry operates through one of the world's most complex and globally integrated value chains. Unlike traditional industries in which production may occur primarily in a single location, semiconductor manufacturing depends on highly specialized capabilities distributed across multiple countries and regions. This structure has evolved through global specialization, as countries and companies have developed expertise in particular stages of production based on their technological capabilities, capital requirements, workforce skills, infrastructure, and economic advantages. The semiconductor lifecycle encompasses several interconnected stages, including research and development, chip design, wafer fabrication, assembly, testing, packaging, logistics, and distribution.

A globally distributed production network

The OECD's 2025 policy paper *Mapping the Semiconductor Value Chain* demonstrates that semiconductor production does not follow a conventional linear chain. The ecosystem encompasses research and design; electronic design automation and intellectual property; wafer fabrication; production of manufacturing equipment, specialty chemicals, gases, and other materials; ATP; and distribution to downstream industries ranging from consumer electronics and vehicles to medical equipment, telecommunications, and defense systems.[6]

These functions cluster in different economies because each requires a distinct combination of capital, infrastructure, skills, technology, and supplier networks. This specialization improves efficiency and supports innovation, but it also creates concentrated dependencies and potential bottlenecks across the value chain.

The Philippines in the semiconductor value chain

The Philippines specializes principally in ATP and related electronics manufacturing. Philippine plants import wafers, integrated circuits, components, manufacturing and testing equipment, replacement parts, chemicals, packaging materials, and other

[6] OECD (2025), "Mapping the Semiconductor Value Chain: Working Towards Identifying Dependencies and Vulnerabilities," OECD Science, Technology and Industry Policy Papers, No. 182, OECD Publishing, Paris, https://doi.org/10.1787/4154cdbf-en.

inputs. They assemble and package devices, test their performance and reliability, and export finished or intermediate products to affiliated firms, manufacturers, logistics hubs, and final markets. This position creates both opportunity and exposure. ATP is a value-adding and quality-critical stage, but it depends on upstream suppliers and efficient logistics. A delayed component, spare part, or chemical may halt a production line, while a delayed export may affect customers several jurisdictions away. Customs performance therefore influences lead times, inventory requirements, and firms' assessments of whether Philippine operations can reliably serve global customers.

Commodity data and their limits

Commodity-level analysis using Harmonized System (HS) and ASEAN Harmonized Tariff Nomenclature (AHTN) data provides a starting point for mapping the semiconductor ecosystem. Beyond their traditional use in tariff classification, customs valuation, and trade statistics, HS-based trade data can provide strategic intelligence for customs risk management, supply chain analysis, compliance monitoring, and economic decision-making. Through such analysis, Customs and other government stakeholders can identify strategic commodities, evaluate trade flows, assess regulatory requirements, monitor supply chain dependencies, and develop evidence-based policies that strengthen trade facilitation, investment competitiveness, and border security.

For the Philippine semiconductor ecosystem, commodity-level analysis may focus primarily on semiconductor-related classifications under HS Chapter 85, which covers electrical machinery and equipment, integrated circuits, semiconductor devices, and related components. Supporting analysis may include relevant goods under HS Chapter 84, particularly machinery and mechanical equipment used in semiconductor manufacturing as well as precision instruments, specialty chemicals, and other inputs essential to production.

The strategic value of customs data extends beyond identifying the goods being traded. Through its modernization initiatives, the Philippine Bureau of Customs has increasingly used tariff classification data as a foundation for improving regulatory transparency, enhancing compliance predictability, and strengthening coordination among government agencies. Classification systems, however, serve different institutional mandates. My appreciation of the technical and institutional challenges involved in reconciling these systems began earlier in my career, when I served on a team of consultants supporting the development of the Philippine NSW. That experience demonstrated that building an interoperable digital trade platform requires more than connecting government information systems. **Agencies must also reconcile differences in terminology, data structures, regulatory procedures, and commodity classification frameworks.** Customs uses the HS and AHTN; statistical and industrial agencies may use activity- or product-based classifications; and strategic trade authorities rely on control lists that distinguish goods, software, and technology according to technical parameters and potential end uses. Effective interoperability therefore requires more than a shared code; it requires semantic mapping, common reference data, and rules for resolving differences without erasing each agency's legal mandate.

The limitations of commodity classification are particularly relevant to semiconductor supply chains. An HS or AHTN code primarily identifies the nature of a traded commodity for tariff and customs purposes. By itself, it does not fully explain the commodity's intended end use, its position within a production process, or whether it will be used for domestic consumption, intermediate manufacturing, further processing, or eventual re-exportation. Although customs declarations may contain additional information on the applicable customs procedure, importer, origin, value, and destination, HS-based trade data alone cannot fully represent the technical, commercial, and strategic relationships that characterize semiconductor value chains. This limitation cautions against interpreting a shipment's recorded destination as its final market. Hong Kong and Singapore, for example, perform important trading, distribution, and logistics functions. Goods may move through affiliated companies or regional hubs before further processing or final delivery. Customs should therefore complement bilateral trade statistics with information on routes, ownership, processing, and end use when evaluating dependencies and risks.

The Philippine experience demonstrates that interoperability requires more than technical connectivity. It also requires **semantic interoperability: the ability of participating**

institutions to interpret exchanged information consistently while preserving their respective legal mandates. Common data definitions, standardized reference tables, and reliable mapping mechanisms among customs classifications, industrial classifications, statistical categories, and strategic control lists are essential to ensuring that digital platforms accurately identify applicable regulatory requirements. Semantic interoperability is especially important in the semiconductor sector, where the same item may have commercial, customs, technical, and strategic applications, and where inaccurate classification or incomplete regulatory mapping may result in clearance delays, compliance risks, or inappropriate control decisions. Customs classification and declaration data should therefore be complemented by industry intelligence, investment data, company-level information, logistics records, licensing information, and internationally recognized analytical frameworks, including those developed by the OECD. Integrating these sources can provide a more comprehensive understanding of the movement, use, and transformation of semiconductor-related goods across the supply chain. It can also strengthen Customs' capacity to identify risks, facilitate legitimate trade, coordinate with relevant government agencies, and support the Philippines' secure, resilient, and competitive participation in global semiconductor ecosystems.

Import, export, and customs connectivity

The Philippines' principal semiconductor relationships connect complementary capabilities. The United States supplies design technologies, software, manufacturing equipment, intellectual property, and high-value components and is also a major market and source of investment. Taiwan is central to wafer fabrication; Japan supplies precision equipment, materials, and chemicals; South Korea contributes memory products and advanced materials; China remains important to regional electronics manufacturing; and Singapore and Malaysia support regional production, distribution, and logistics.

These connections have different customs implications. Imports of advanced or dual-use items may require accurate classification, recordkeeping, and compliance with applicable export or re-export conditions imposed by the originating jurisdiction. Related party transactions may raise valuation questions. Specialized equipment may benefit from advance rulings or temporary admission arrangements. Goods moving through regional hubs require better visibility into routing and end users.

Trade flow mapping should therefore inform customs diplomacy. Customs can prioritize cooperation with counterpart administrations in major production and export markets through AEO Mutual Recognition Arrangements (MRAs), advance electronic data exchange, coordinated risk management, joint capacity building, and lawful information sharing. Over time, these arrangements could support trusted semiconductor trade corridors in which compliant firms receive more consistent treatment across jurisdictions while Customs obtains better information to protect the supply chain.

3. Borders divide, customs connect philippine customs' modernization, reforms and evolving role

In the Philippines, customs modernization has been guided by initiatives to advance digitalization, strengthen risk management, enhance transparency, and promote coordinated border governance.
Republic Act No. 10863, or the Customs Modernization and Tariff Act (CMTA), directs the state to modernize customs and tariff administration, make procedures transparent, facilitate international trade, prevent customs fraud, and use information and communications technology. This mandate enables the Philippine Bureau of Customs to treat facilitation, compliance, and modernization as interconnected responsibilities. The strategic value of these initiatives, however, should not be assessed solely by the existence or number of specific customs programs. Their effectiveness should instead be evaluated according to the capabilities they create and their contribution to trusted supply chains.

For semiconductor firms, the relevant outcome is predictability across the shipment lifecycle. Electronic declarations, pre-arrival processing, digital payments, risk-based selectivity, automated inventory controls for bonded operations, and electronic release can reduce administrative time. Interoperability with licensing agencies can prevent permits from becoming separate manual checkpoints. System performance, business continuity arrangements, and accessible support channels are particularly important because even a short outage can disrupt time-sensitive production.

Philippine National Single Window and digital trade integration

The National Single Window (NSW) initiative provides an institutional bridge between Customs and other border agencies. Its value lies in coordinated decisions, shared reference data, and traders' ability to satisfy regulatory requirements without navigating disconnected processes. For semiconductor supply chains, an NSW can link customs declarations with permits covering chemicals, controlled goods, plant or animal products used in packaging, and other regulated inputs.

Interoperability can also strengthen compliance and supply chain security. Electronic exchanges among Customs, investment promotion agencies, and other regulators could support the verification of permits, authorized end users, commodity classifications, declared end use, and applicable strategic trade controls. The resulting data could improve customs risk assessment while facilitating shipments that have already satisfied the necessary regulatory requirements.

The Philippines has pursued this objective through three successive stages: PNSW Phase 1, TRADENET, and the new National Single Window–Integrated Trade Facilitation Platform (NSW-ITFP). The first major version, commonly referred to as PNSW Phase 1, was developed pursuant to Executive Order No. 482, series of 2005, which created the National Single Window Task Force for Cargo Clearance. Launched in 2010 and deployed beginning in 2011, PNSW Phase 1 sought to connect Customs electronically with trade regulatory government agencies and provide a platform for processing import and export permits, licenses, and clearances. It represented an important initial step toward replacing paper-based interagency transactions with electronic regulatory processing. However, PNSW Phase 1 faced limitations involving system capacity, agency integration, data exchange, and the uneven digital readiness of participating institutions.

In 2017, the government adopted TRADENET as the second major version of the Philippine NSW. It was intended to replace PNSW Phase 1, expand agency participation, harmonize import and export procedures, and support the Philippines' connection to the ASEAN Single Window (ASW). Despite agency onboarding activities and the development of several electronic processes, TRADENET did not achieve full government-wide operationalization. Challenges included differences in agency procedures and data requirements, varying levels of institutional and technological readiness, integration difficulties, governance and coordination concerns, and the need to align existing agency systems with a common platform.

Building on these lessons, the government launched the NSW-ITFP in June 2026. The platform is intended to serve as a unified digital gateway for import, export, and transit-related regulatory transactions and is being implemented through phased agency onboarding. [7] This progression reflects both the Philippines' continuing commitment to digital trade facilitation and the institutional challenges involved in establishing a fully functioning NSW.

The Philippine experience demonstrates that an NSW cannot be established through technology alone. Effective implementation requires enabling policies, clearly defined institutional responsibilities, harmonized and simplified procedures, common data standards, reliable infrastructure, sustained funding, cybersecurity safeguards, and the active participation of government agencies and private sector users. Digitalizing fragmented or duplicative procedures without first reviewing and harmonizing them risks transferring existing inefficiencies to a new platform.

ASEAN connectivity

The Philippine experience with the ASEAN Single Window (ASW) offers additional practical lessons. As of June 2025, all ASEAN Member States were exchanging both the electronic certificate of origin (e-CO) and the ASEAN Customs Declaration Document (ACDD). Indonesia, the Philippines, and Thailand were also exchanging electronic phytosanitary certificates. [8] These exchanges replace manual transmission with structured, authenticated data and

[7] Department of Finance, "DOF Welcomes Launch of National Single Window, Advances Digital Trade Reforms," June 23, 2026, https://www.dof.gov.ph/dof-welcomes-launch-of-national-single-window-advances-digital-trade-reforms/.

[8] Association of Southeast Asian Nations, "ASEAN Single Window," accessed September 2, 2026, https://asean.org/our-communities/economic-community/asean-single-window/. See also ASEAN Economic Ministers, "Joint Media Statement of the 56th

can improve speed, integrity, and cross-border verification.

The author directly participated in and helped spearhead Philippine implementation of these electronic documents. Coordination involved Customs offices, partner agencies, technical teams, traders, development partners, and ASEAN counterparts. The experience demonstrated that regional commitments become operational only after institutions resolve questions of legal authority, data definitions, process ownership, testing, user readiness, and cross-border recognition. In this process, five interdependent elements were applied: **Policy, People, Process, Platform, and Partnership.** Policy establishes authority for electronic transactions and data exchange. People provide leadership, technical expertise, and institutional ownership. Process simplification prevents inefficient paper procedures from being reproduced online. Platforms provide secure and reliable interoperability. Partnerships create the trust and cooperation required for domestic coordination and recognition across borders.

Implementation further demonstrated that digitalization extends beyond replacing paper documents with electronic equivalents. It transforms trade data into a strategic resource for government and the private sector. Every customs declaration, permit, certificate, cargo manifest, shipping instruction, and logistics transaction contributes to an expanding trade data ecosystem. When this information is accurate, standardized, interoperable, and securely exchanged among authorized supply chain participants, it gives Customs greater visibility into the movement of goods and supports more effective risk assessment, compliance monitoring, and operational decision-making. This visibility enables Customs to distinguish more precisely between legitimate, compliant trade and transactions requiring closer examination. It supports faster processing of lower-risk shipments while directing enforcement resources toward areas of greater concern. The experience of implementing the three ASEAN electronic exchanges therefore reinforces this study's central argument: digital customs transformation creates value not only through administrative efficiency but also by generating trusted data that strengthen supply chain visibility, risk intelligence, trusted trade, and, ultimately, the resilience of strategic industries such as semiconductors.

This framework applies directly to semiconductor trade. A digital permit has little value if a port cannot retrieve it, a firm must also submit a paper copy, or agencies interpret the underlying data differently. Conversely, a well-governed exchange can provide Customs with earlier information, reduce documentary fraud, support automated validation, and accelerate legitimate shipments.

Paperless trade and cross-border digital cooperation

The Philippines has demonstrated its commitment to paperless trade through its participation in the CPTA, a United Nations treaty developed under the auspices of the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP).[9] The Agreement provides an inclusive intergovernmental framework for enabling the electronic exchange and mutual recognition of trade-related data and documents and for promoting interoperability among NSWs and other paperless trade systems. The Philippines' accession reflects the recognition that domestic digitalization alone is insufficient; the full benefits of paperless trade are realized only when electronic documents and data can be legally recognized, securely exchanged, and reliably processed across national borders.

As one of the Philippines' national focal points for the Framework Agreement, the author has also observed that the next challenge extends beyond exchanging electronic replicas of documents. Governments must enable reusable structured data, mutual legal recognition, trusted digital identities, and secure interoperability beyond existing regional corridors.

The distinction between paperless trade and cross-border paperless trade is important. Paperless trade refers primarily to the electronic processing of trade requirements within a country, including online declarations, electronic permits, digital payments,

ASEAN Economic Ministers' Meeting," September 17, 2024, para. 16, https://asean.org/wp-content/uploads/2024/09/AEM-56-Joint-Media-Statement-adopted-1.pdf.

[9] United Nations Economic and Social Commission for Asia and the Pacific, "Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific," accessed September 2, 2026, https://www.unescap.org/projects/cpta.

and automated customs procedures. Cross-border paperless trade goes further by enabling trade data and documents generated in one economy to be transmitted electronically, recognized, verified, and reused by authorities and businesses in another. This requires interoperability not only among technologies, but also among legal frameworks, data standards, institutional arrangements, digital identity systems, and information security frameworks. At this point, paperless trade becomes supply chain infrastructure for strategic industries.

Risk-based clearance and integrated intelligence

Customs cannot physically inspect every shipment. The WTO TFA therefore calls for risk management that concentrates controls on high-risk consignments and expedites the release of low-risk consignments.[10] The Customs applies automated selectivity and varying levels of documentary review, non-intrusive inspection, and physical examination. The strategic objective is not a particular channel allocation but intervention that is proportionate to risk and supported by feedback.

For semiconductor trade, risk indicators may include unusual routing, inconsistent descriptions, questionable values, mismatches between goods and the declarant's stated business activity, unauthorized parties, abnormal volumes, or possible diversion of controlled technology. High value alone should not make a shipment high-risk. Established firms often move high-value components routinely and maintain strong internal controls. Customs should therefore combine transaction data with compliance history, AEO status, licensing information, intelligence, examination results, and post-clearance findings.

Integrated risk management requires Customs offices to share relevant information. Risk management, intelligence, enforcement, assessment, post-clearance audit, and collection districts should not maintain separate pictures of the same operator. A coordinated targeting capability can translate strategic profiles into pre-arrival decisions, capture examination results, and revise risk profiles accordingly. This approach also supports coordinated border management when another agency is responsible for the regulatory decision.

Post-clearance audit: facilitation with accountability

Post-clearance audit (PCA) allows Customs to release appropriate shipments and verify compliance later by examining business records, declarations, accounting information, and internal controls. Under the CMTA, Customs may conduct an audit within three years from the final payment of duties and taxes or customs clearance, as applicable, subject to statutory requirements.[11] Customs Administrative Order No. 1-2019 governs Philippine PCA and the Prior Disclosure Program.[12] PCA is particularly useful for semiconductor transactions whose complexity cannot always be resolved at the border. Auditors may review the classification and valuation of specialized equipment and components; related party transactions; assists, royalties, and license fees; exemptions and conditional privileges; inventory records; and the disposition of inputs used in bonded or economic zone operations. This shift does not weaken control. It relocates appropriate verification to a setting in which Customs can assess transactions over time instead of examining a single shipment under clearance pressure. Findings can identify systemic errors and inform future selectivity, guidance, and company outreach. The Prior Disclosure Program can further encourage companies to identify and correct errors, subject to applicable rules.

AEO and MRAs: compliance as competitiveness

The AEO Program creates a structured partnership between Customs and operators that demonstrate compliance with standards relating to recordkeeping, financial solvency, security, and internal controls. Article 7.7 of the TFA provides for additional facilitation measures for authorized operators, while the WCO SAFE Framework situates AEO programs within end-to-end supply chain security.[13]

During the author's work on AEO MRAs and consultations with stakeholders, a recurring question

[10] World Trade Organization, "Agreement on Trade Facilitation," art. 7.4.

[11] Republic Act No. 10863, secs. 1000-1006.

[12] Bureau of Customs, Customs Administrative Order No. 1-2019, "Post Clearance Audit and Prior Disclosure Program," Jan. 9, 2019, https://customs.gov.ph/wp-content/uploads/2019/01/CAO-01-2019_Post-Clearance-Audit-and-Prior-Disclosure-Program.pdf.

[13] World Trade Organization, "Agreement on Trade Facilitation," art. 7.7; World Customs Organization, *SAFE Framework of Standards*.

was, ***"What is in it for us, and why should we join?"*** The question reflects a common implementation challenge in voluntary trade facilitation programs. Accreditation requires a company to document procedures, improve controls, maintain records, invest in security, and undergo validation. Participation will remain limited if benefits are uncertain, inconsistently applied, or unrelated to commercial needs. The strongest answer extends beyond faster clearance. For a company seeking new customers, investment, or export markets, AEO accreditation can demonstrate institutional maturity through reliable compliance, cargo security, traceability, risk management, and governance. These capabilities may support supplier qualification and customer confidence, even when accreditation does not guarantee a contract. MRAs strengthen this value by allowing partner customs administrations to recognize compatible AEO programs and extend agreed benefits across borders. For semiconductor firms operating across several jurisdictions, mutual recognition can improve predictability and signal trusted status to foreign authorities and business partners.

Coordinated border governance and stakeholder partnership

Semiconductor shipments may involve Customs, economic zone authorities, strategic trade regulators, environmental or health agencies, port and airport authorities, and private logistics operators. No single institution holds all relevant information or authority. Coordinated border management should clarify which agency decides what, what data it requires, when the decision occurs, and how the result reaches the trader and Customs.

The Philippine Customs Industry Consultative and Advisory Council (CICAC) provides a foundation for sustained public-private dialogue. Its greater value lies not in resolving individual transactions but in identifying recurring bottlenecks, assigning institutional responsibility, and tracking reforms. Semiconductor-specific engagement is necessary because general consultations may not reach technical issues such as specialized classification, bonded production, controlled technology, time-critical spare parts, and end-use verification. Consultation should produce operational intelligence as well as stakeholder satisfaction. Industry can help Customs understand normal trade patterns, legitimate supply chain structures, product cycles, and disruption risks. Customs can explain requirements, emerging threats, and available facilitation programs. Appropriate safeguards must protect confidential business information and prevent consultation from becoming preferential treatment.

The Evolving Role of Customs Administration in Trusted Semiconductor Supply Chains

The author examined how customs administrations can evolve beyond traditional border control functions to become strategic partners in trusted semiconductor supply chains. The following matrices summarize this transition from cargo control to intelligence-led supply chain governance and illustrate Customs' expanding roles in balancing trade facilitation and security, managing trusted data, strengthening supply chain resilience, supporting national security, and enhancing economic competitiveness.

Dimension	Traditional Customs	Modern Customs
Primary orientation	Revenue collection and border control	Balanced facilitation, compliance, security, and competitiveness
Control method	Routine documentary and physical inspection	Risk-based, intelligence-led, and post-clearance controls
Information	Paper-based, fragmented, and transaction-specific	Digital, interoperable, and used for supply chain intelligence
Agency model	Customs-centered decisions at the border	Coordinated border management and interagency data exchange
Business relationship	Primarily regulator to trader	Customs-business partnership, including AEO programs
Performance focus	Revenue, seizures, and procedural compliance	Predictability, security, release efficiency, compliance, and resilience

Matrix 1. Traditional and Modern Customs

Matrix 1 illustrates the institutional shift from traditional Customs—primarily focused on revenue collection, border control, documentary review, and physical inspection—to modern Customs, which integrates trade facilitation, regulatory compliance, security, and economic competitiveness. This transition is characterized by digitalization, risk-based and intelligence-led controls, coordinated border management, customs-business partnerships, and broader performance measures emphasizing predictability, efficiency, resilience, and compliance.

Evolving role	**Institutional shift**	**Value for trusted semiconductor supply chains**
Trusted trade data steward	From collecting declarations to governing reliable, reusable trade data	Improves visibility, early risk assessment, automation, and informed decisions
Risk intelligence provider	From routine inspection to intelligence-led targeting	Focuses intervention on anomalies, diversion risks, and non-compliant trade
Trade facilitator	From procedural control to speed and predictability	Supports timely movement of equipment, inputs, components, and exports
Trade continuity and resilience partner	From border processing to coordinated disruption response	Helps prioritize critical movements, restore cargo flow, and protect production schedules
End-to-end supply chain security partner	From release stage control to lifecycle compliance and security	Combines advance targeting, non-intrusive inspection, PCA, and international cooperation
Economic competitiveness enabler	From administrative gatekeeper to strategic investment partner	Reduces uncertainty and strengthens confidence in the Philippines as a trusted manufacturing location

Matrix 2. Evolving Roles of Customs

Matrix 2 presents six complementary roles of customs administration: ***governing trusted trade data, generating risk intelligence, facilitating trade, supporting trade continuity and resilience, safeguarding end-to-end supply chain security, and strengthening economic competitiveness.*** Collectively, these roles demonstrate how modern customs administration can support trusted semiconductor supply chains by improving visibility, targeting risks more effectively, facilitating time-sensitive trade, responding to disruptions, safeguarding supply chain integrity, and strengthening investor confidence.

4. A practitioner's perspective: implementation before technology

The author's understanding of digital trade began before the three ASEAN electronic exchanges became operational. Earlier in her career, she worked with a consulting team supporting the Philippine NSW. That experience revealed a recurring implementation problem: agencies may agree on the objective of interoperability while using different languages to describe the same goods, actors, and regulatory decisions. Customs relied on the HS and the AHTN codes while other institutions organized information according to industrial, statistical, licensing, or control list classifications. Technical teams could connect systems, but an electronic message remained unreliable if the receiving agency interpreted its fields differently.

The practical response required detailed mapping, not merely a declaration that systems were interoperable. Agencies had to identify authoritative data sources, compare commodity descriptions, agree on common data fields, and establish rules for cases in which one classification could not be mapped neatly to another. These lessons became more concrete during the implementation of the e-CO, the ACDD, and the electronic phytosanitary certificate. Each exchange had a visible technical milestone, such as successful end-to-end testing or live transmission, but the less visible institutional work determined whether that milestone would endure. Policy teams had to confirm the legal basis for electronic issuance and acceptance. Operations offices had to revise procedures and assign responsibility for exceptions. Technical teams had to validate message structures and system responses. Users required training and support. Partner agencies and ASEAN counterparts needed confidence that transmitted data were authentic and would be interpreted consistently.

Implementation also revealed the importance of sequencing. Conversely, a narrowly defined exchange can create significant value when its legal basis, workflow, data, technology, and users are aligned. The three ASEAN exchanges therefore became more than individual digital projects; collectively, they demonstrated that cross-border reform succeeds through cumulative institutional trust. The author's role as a Philippine national focal point for the CPTA broadened this perspective. Regional cooperation requires economies with different laws, systems, and levels of readiness to identify a workable path toward mutual recognition. The Agreement provides an umbrella for technical assistance, legal harmonization, pilot exchanges, and capacity building, but national agencies must still translate regional commitments into funded work plans and clearly assigned operational responsibilities. For the Philippines, the Agreement can support exchanges beyond existing ASEAN documents, provided that the government first identifies high-value use cases and resolves domestic coordination issues.

Work on AEO MRAs presented a related challenge from the business perspective. As mentioned previously, during consultations, firms repeatedly asked what they would gain by joining a voluntary program. The question did not reflect resistance to compliance; it was a request for a credible business case. Customs therefore needed to explain how those investments could improve clearance predictability, reduce disruptions, support recognition abroad, and strengthen a company's reputation with customers. This experience reinforced a central lesson: ***a reform is not fully implemented when the government publishes a rule. It is implemented when the intended user understands its value, changes behavior, and consistently receives the promised treatment.***

Lessons from the 2026 U.S. study visit

The author's 2026 U.S. study visit connected these customs lessons to semiconductor industrial strategy. Engagements with the U.S. Department of State, technology and semiconductor companies, universities, policy institutions, and other ecosystem actors demonstrated that semiconductor competitiveness emerges from a network rather than from a single flagship investment. Design, fabrication, advanced packaging, equipment, materials, workforce development, research, infrastructure, logistics, investment promotion, and security policy must reinforce one another. Advanced packaging increases the strategic importance of ATP capabilities, but it also raises the requirements for precision equipment, protected intellectual property, skilled personnel, reliable utilities, and time-sensitive movement. The visit confirmed that Customs does not operate outside the semiconductor ecosystem. Border predictability influences whether equipment, prototypes, components, and spare parts reach production facilities when needed.

The discussions also demonstrated why *Protect and Promote* should not be treated as separate objectives. The *Protect* dimension includes export control compliance, end-use and end-user due diligence, technology security, intellectual property protection, cargo integrity, and measures against diversion. The *Promote* dimension includes predictable customs treatment, efficient logistics, trusted trader recognition, regulatory transparency, and investment confidence. Firms require both. A jurisdiction that moves goods quickly but cannot protect sensitive technology may not be trusted; a jurisdiction that applies strong controls through unpredictable or indiscriminate delays may not remain competitive.

A specific operational concern raised during the study visit illustrated the value of customs officers' participation in industry discussions. Customs administrations cannot prevent every disruption affecting global supply chains, because many factors influencing semiconductor production and logistics lie beyond the authority of border agencies. Modern Customs administrations can, however, reduce uncertainty, improve response capacity, and strengthen confidence among supply chain stakeholders. Through digital trade systems, risk-based processing, coordinated border management, and trusted data exchange, Customs enables businesses and government agencies to understand disruptions more clearly, prioritize critical movements, and restore trade operations more efficiently. This role is particularly important for the semiconductor industry, in which delays involving specialized materials, equipment, or components can significantly affect manufacturing continuity. Because semiconductor companies operate through highly synchronized global networks, visibility, predictability, and institutional responsiveness are essential elements of supply chain resilience.

The congestion affecting air cargo at Ninoy Aquino International Airport (NAIA) in 2026 illustrates this operational role. Following the closure of a private warehouse and the resulting reduction in customs-bonded warehousing capacity, cargo became concentrated in the remaining facilities. This created backlogs affecting time-sensitive imports, including shipments for semiconductor and electronics companies. The disruption primarily reflected insufficient cargo handling and warehousing capacity rather than customs clearance procedures alone. Nevertheless, it required a response from Customs management and the Port of NAIA because delays in the transfer, processing, and withdrawal of cargo threatened manufacturing schedules and export commitments. Both implemented immediate operational measures. Customs authorized temporary additional locations, including facilities as satellite processing area and additional staging facility for cargo awaiting processing. These measures expanded operational space, reduced pressure on the principal warehouse, and supported the continued processing and release of shipments. Customs also coordinated with warehouse operators, airlines, customs brokers, logistics providers, Philippine Economic Zone Authority (PEZA) locators, and other affected stakeholders to accelerate cargo withdrawal and identify practical adjustments to cargo handling arrangements. Beyond these immediate interventions, Customs constituted a Technical Working Group/Task Force that reported directly to the Office of the Commissioner. The body was tasked with developing coordinated measures to improve cargo clearance, address operational bottlenecks, and strengthen the return and monitoring of containers and unit load devices. It brought together Customs, the Departments of Finance and Transportation, airport and port authorities, PEZA, warehouse operators, logistics providers, trucking groups, customs brokers, and private sector users. Customs and PEZA also explored the direct release and transfer of qualified PEZA shipments to their respective economic zones, where customs facilities were available, to relieve pressure on airport warehouses. Longer-term measures included assessing total warehousing capacity around NAIA, encouraging additional qualified operators and facilities, and preparing for seasonal increases in air cargo volume.

The NAIA experience demonstrates that Customs' contribution to resilience extends beyond the approval of goods declarations. ***Customs acted as a coordinator, problem-solver, and continuity enabler; it inspected conditions firsthand, opened temporary processing and staging facilities, convened responsible agencies and private operators, and developed both immediate and longer-term solutions.*** Although Customs cannot eliminate every external disruption, it can reduce uncertainty, improve response capacity, restore cargo movement, and strengthen stakeholder confidence. For the semiconductor industry, such institutional responsiveness supports manufacturing continuity and reinforces the Philippines' credibility as a reliable and investment-ready participant in global technology supply chains. ***The evolving role of modern Customs is therefore not to eliminate all risk but to improve preparedness and visibility, respond proportionately to disruptions, and strengthen trust among governments, businesses, and international trading partners.***

The study visits ultimately changed the author's framing of Customs' role. Customs need not claim responsibility for building the semiconductor industry. It should instead become a reliable institutional partner within a broader ecosystem, protecting sensitive technology and lawful trade, providing predictable border services, generating trusted data, and helping government and industry resolve cross-border constraints. This distinction preserves institutional mandates while making Customs relevant to national strategy.

Practitioner learning and research limitations

The combination of operational work and fellowship research offers a distinct advantage, but it also requires discipline. Direct involvement gives the author insight into the institutional reasoning behind a reform, the coordination difficulties that formal reports may omit, and the concerns raised by actual users. It also creates a risk of evaluating programs according to effort and intent rather than measurable results. This paper therefore treats practitioner experience as evidence of implementation processes and lessons, not as proof that every initiative has achieved its intended outcome.

This distinction matters when assessing automation. An officer involved in launching an electronic exchange may understandably emphasize successful transmission, while a trader may judge the same initiative according to system availability, duplicate requirements, response times, and the handling of exceptions. Both perspectives are necessary. Future evaluations of Customs initiatives should combine administrative data, time release and dwell time measures, company experiences, audit findings, and independent review, where appropriate.

The fellowship also reinforced the value of customs officers' participation in policy research. Operational personnel observe how laws, systems, and supply chains interact at the transaction level. When organized through comparative analysis, those observations can reveal policy gaps that may not be visible from either government headquarters or industry alone. Practitioner research should not replace formal institutional decision-making, but it can help frame better questions, identify realistic reforms, and connect international commitments with port operations.

Accordingly, the recommendations in this paper are presented as a pilot agenda rather than as a claim of universal applicability. Semiconductor firms differ in their products, ownership structures, regulatory exposure, logistics models, and economic zone status. Customs should validate proposed measures with companies, ports, other agencies, and available data before national implementation. This iterative approach is consistent with the central lesson of the 5Ps: effective reform is built through aligned institutions and repeated operational feedback.

5. Operational and institutional gaps constraining a trusted semiconductor trade ecosystem

Fragmented data and incomplete interoperability

Philippine digitalization has produced multiple systems, but connectivity and semantic alignment remain uneven. Agencies may require the same data in different formats or maintain separate reference lists. Some processes still combine electronic submission with manual verification. This fragmentation increases compliance costs and prevents the government from developing an integrated view of a shipment or operator.

The next stage of modernization should prioritize data quality, interoperability, and reuse rather than the number of portals. Customs and its partner agencies need shared identifiers, standardized definitions, authoritative reference tables, application programming interfaces, and clear rules governing data access, correction, retention, confidentiality, and cybersecurity. Where legally permissible, systems should capture data once and make them available to authorized agencies for clearly defined regulatory purposes.

Regulatory uncertainty and inconsistent implementation

Complex classification and valuation questions, related party transactions, rules of origin, and conditional privileges can create uncertainty for semiconductor firms. National policies may also be interpreted or applied differently across ports or offices. Companies may respond by holding additional inventory, building time buffers into their operations, or escalating routine questions, all of which increase costs.

Advance rulings, published guidance, internal knowledge management, and clear escalation mechanisms can improve consistency. Customs should identify recurring sector-specific questions and issue guidance or encourage applications for formal rulings, where appropriate. Performance monitoring should measure not only average clearance times but also variability, repeat submissions, inconsistent decisions, and unresolved cases.

Skills, technology, and funding

Semiconductor trade involves specialized products, rapidly evolving technologies, complex business models, and strategic trade considerations. Customs officers cannot be expected to become engineers, but selected personnel need sufficient technical literacy to ask the right questions, interpret documentation, identify when specialist advice is required, and coordinate effectively with competent regulators.

Training should integrate classification, valuation, rules of origin, export control awareness, intellectual property protection, data analysis, and cybersecurity. Modernization also requires sustained funding for system maintenance, security, analytics, equipment, and workforce development. Project-based funding may launch a platform but may not sustain it. Investment decisions should therefore prioritize capabilities that reduce risk and uncertainty across multiple programs, including digital identity management, shared reference data, resilient infrastructure, secure interoperability, and institutional capacity to maintain and improve systems over time.

Weak translation from dialogue to action

Government-industry consultations often identify legitimate concerns but lack a common issue register, responsible institutional owners, implementation deadlines, and systematic feedback to participants. Repeated discussion without visible resolution can weaken trust and discourage continued engagement. A standing mechanism should distinguish case-specific concerns from systemic policy issues, protect confidential information, assign responsibility, monitor agreed actions, and report non-confidential progress to participating stakeholders.

Cross-cutting lessons for the Philippines

The gaps identified in this chapter are interdependent. Better technology will not resolve inconsistent policies, additional training will have limited value if officers cannot access reliable data, and consultation will not build trust unless institutions act on the issues raised. The central lesson for the Philippines is therefore that trusted semiconductor trade cannot be created through a single platform, program, or agency. It requires an operating model that aligns policy, people, processes, platforms, and partnerships around measurable sector outcomes. For Customs, those outcomes include predictable clearance, proportionate intervention, reliable regulatory decisions, secure data exchange, and timely resolution of disruptions affecting legitimate trade.

Reform should proceed through disciplined implementation: select high-value use cases, define responsible institutions, establish baselines and performance measures, test solutions with affected firms and ports, and scale only after results are demonstrated. A semiconductor-focused pilot can provide the necessary learning environment while recognizing differences among products, companies, logistics models, and economic zone arrangements. Within its legal mandate, Customs can convene relevant agencies and industry actors, translate operational evidence into risk intelligence, and connect facilitation with security. This approach would allow Customs to complement—not duplicate—the functions of industrial, investment promotion, science and technology, and strategic trade authorities while strengthening the Philippines' credibility as a trusted and competitive location for semiconductor manufacturing.

6. Strategic roadmap for strengthening customs as a strategic partner in trusted semiconductor supply chains

Building upon the research findings, the Strategic Roadmap translates the study's recommendations into a prioritized set of institutional reforms that will collectively enhance Customs' role as a strategic partner in trusted semiconductor supply chains.

It adopts a phased implementation approach:

a. Short-term reforms focus on strengthening organizational capacity, stakeholder engagement, and regulatory coordination.
b. Medium-term initiatives prioritize integrated digital customs systems, interoperable platforms, customs analytics, and international customs cooperation.
c. Long-term reforms seek to institutionalize customs modernization through a National Customs Strategy for Trusted Semiconductor Supply Chains aligned with the National Semiconductor Strategy, the Luzon Economic Corridor, and Pax Silica.

No.	Strategic Challenge	Strategic Recommendation	Lead Office / Key Partners	Timeline	Expected Strategic Outcome
1	**Limited technical expertise in semiconductor trade and emerging technologies**	**Strengthen international cooperation** through sustained research collaborations, fellowship programs, study visits, technical exchanges, and joint policy development with partner customs administrations, international organizations, academia, and industry. Promote collaborative research and knowledge-sharing to exchange best practices, pilot innovative approaches, and co-develop policies addressing emerging issues in trade facilitation, digital customs, semiconductor supply chains, and economic security.	Human Resource Management Division; Philippine Tariff Commission; PEZA; SEIPI; Academic Institutions	Ongoing	Continuous institutional learning, stronger international partnerships, evidence-based policymaking, accelerated customs modernization, and increased trust and confidence among stakeholders and international partners.
2	**Resource and funding constraints for customs modernization**	**Mobilize technical and financial assistance** from international development partners to support digital transformation, infrastructure development, technology acquisition, and capacity building.	DOF; BOC; WCO; World Bank; ADB; EU, JICA; UNDP	Ongoing	Sustainable financing for modernization projects and accelerated implementation of customs reforms.
3	**Limited awareness and participation in trade facilitation programs**	**Establish a Trade Facilitation Service/Unit within the Bureau of Customs** as a dedicated office for stakeholder engagement, client assistance, policy advocacy, and implementation of trade facilitation initiatives.	Office of the Commissioner (OCOM); Public Information and Assistance Division; Private Sector	Short-term (1–2 years)	Increased stakeholder engagement, improved awareness of customs programs, stronger public-private collaboration, and higher utilization of trade facilitation initiatives.
4	**Regulatory uncertainty affecting business confidence**	**Strengthen institutional coordination through the Philippine Trade Facilitation Committee (PTFC)** by promoting regular policy dialogue,	DOF; BOC; PTFC Member Agencies; Private Sector	Short-term (1–2 years)	More predictable regulatory environment, improved ease of doing business, and increased

No.	Strategic Challenge	Strategic Recommendation	Lead Office / Key Partners	Timeline	Expected Strategic Outcome
		regulatory harmonization, and structured stakeholder consultation.			investment confidence.
5	**Absence of a dedicated trusted trader program for the semiconductor industry**	**Develop a Trusted Semiconductor/Exporter Program** in partnership with DTI-attached agencies such as PEZA, the Export Marketing Bureau, and the Board of Investment. The program may build upon existing initiatives such as the AEO Program, Top Importers Program, and industry-specific green lane arrangements to provide differentiated treatment for highly compliant semiconductor companies.	OCOM; AOCG; PEZA; DTI; BOI; SEIPI	Short- to Medium-term (1–3 years)	Faster customs clearance, enhanced supply chain reliability, increased investor confidence, and stronger positioning of the Philippines as a trusted semiconductor hub.
6	**The evolving strategic role of customs in high-value industries yet to be fully institutionalized**	**Develop a National Customs Strategy for Trusted Semiconductor Supply Chains** that integrates digital customs, trade facilitation, economic security, risk management, and investment promotion into a unified long-term framework aligned with the National Semiconductor Strategy, the Luzon Economic Corridor and Pax Silica.	Bureau of Customs; Department of Finance; DTI; PEZA; National Economic and Development Authority; Semiconductor Industry; Development Partners	Short- to Medium-term (1–3 years)	A modern Bureau of Customs recognized as a Competitiveness Institution that enables trusted trade, strengthens economic security, supports investment, and positions the Philippines as a trusted partner in global semiconductor value chains.
7	**Limited customs-to-customs cooperation with major semiconductor trading partners**	**Expand bilateral and multilateral customs cooperation through Mutual Agreements, AEO MRAs,** advance electronic information exchange, and joint risk management initiatives with major semiconductor trading partners.	OCOM; International Affairs Office; WCO; Partner Customs Administrations	Medium-term (2–5 years)	Enhanced supply chain security, improved intelligence sharing, stronger trusted trade corridors, and increased resilience of semiconductor supply chains.
8	**Limited use of trade data for strategic**	**Strengthen customs analytics** by integrating HS trade data, risk intelligence,	MISTG; Risk Management	Medium-term	Better policy decisions, improved risk

No.	Strategic Challenge	Strategic Recommendation	Lead Office / Key Partners	Timeline	Expected Strategic Outcome
	decision-making	and supply chain mapping into evidence-based policymaking, investment promotion, and performance monitoring.	Office; Research Units	(2–4 years)	targeting, stronger investment support, and data-driven customs governance.
9	**Fragmented digital systems and limited interoperability**	**Procure and implement a next-generation integrated customs management system** with end-to-end digital processing and interoperability with the PNSW, PEZA, and other Trade Regulatory Government Agencies (TRGAs).	OCOM; MISTG; DOF; DICT	Medium-term (2–5 years)	Improved data sharing, reduced transaction costs, greater supply chain visibility, and seamless border processing.
10	**Institutional continuity challenges arising from leadership transitions**	**Institutionalize customs modernization initiatives** through legislation, strategic plans, administrative issuances, and performance frameworks. Sustain reform momentum through partnerships with international organizations and development partners.	OCOM; DOF; Congress; WCO; World Bank; ADB; Development Partners	Long-term (3–5 years)	Greater policy continuity, sustained modernization efforts, and reduced disruption from organizational leadership changes.

Conclusion

Trusted semiconductor supply chains depend on manufacturing capability, technology, infrastructure, skills, security, and reliable cross-border institutions. The Philippines' role in ATP makes Customs particularly relevant because production depends on the continuous importation of specialized inputs and the timely exportation or re-exportation of value-added products.

Customs' strategic contribution does not require an expansion into industrial policymaking. It requires Customs to organize its existing mandate around outcomes that matter to a strategic sector: predictable movement, reliable information, proportionate control, effective compliance, and rapid coordination when disruptions occur. Digital systems, risk management, post-clearance audit, AEO programs, the NSW, ASEAN connectivity, and stakeholder consultation become more valuable when they operate as components of an integrated compliance and facilitation architecture.

The Philippine experience also confirms that technology cannot substitute for institutions. Policy, people, processes, platforms, and partnerships must advance together. Interoperability requires shared meaning as well as technical connectivity, while consultation requires institutional ownership, deadlines, and measurable follow-through.

The author's practitioner experience with AEO implementation and mutual recognition arrangements further demonstrated that companies ask a practical question before joining a voluntary trusted trader program: ***"What is in it for us?"*** The answer must extend beyond limited procedural privileges. For companies seeking to compete globally, enter new markets, and strengthen relationships with international customers, trusted status can provide regulatory credibility, supply chain assurance, stronger internal compliance, and recognition as a reliable business partner. Trusted trader programs must therefore offer a clear value proposition that combines immediate customs benefits with longer-term commercial and reputational advantages.

A Customs for Exports platform, piloted with the semiconductor and electronics sector and structured around *Protect and Promote*, offers a practical means of closing these gaps. It can connect industry intelligence with risk management, translate dialogue into accountable action, align trusted-exporter support with AEO, and guide customs diplomacy with priority trading partners. Properly designed, the platform would facilitate compliant trade without weakening control and strengthen control without imposing indiscriminate delay.

The 2026 NAIA air-cargo congestion experience further illustrated that Customs' contribution extends beyond processing goods declarations. By inspecting operational conditions, authorizing temporary processing and staging facilities, convening government and private sector stakeholders, and developing immediate and longer-term responses, the BOC acted as a coordinator and trade continuity enabler. The experience confirmed that Customs may not control every source of disruption, but it can reduce uncertainty, support the movement of critical cargo, restore trade flows, and strengthen stakeholder confidence through timely and coordinated action.

Modern Customs should therefore be assessed not only by the revenue it collects or the violations it detects, but also by its capacity to create confidence in lawful trade. By converting trusted data into visibility, visibility into risk intelligence, and risk intelligence into predictable and proportionate treatment, Customs can help Philippine semiconductor firms compete as secure and reliable partners in global value chains. This is the practical meaning of moving beyond border control: Customs does not build the semiconductor industry itself, but it helps create the trusted trade environment in which that industry can grow, remain resilient, and compete.

ABOUT THE AUTHOR

RHOAN P. ESCARMOSA, LCB is a licensed customs broker with an Executive Diploma in Supply Chain Management from the Ateneo Graduate School of Business. She has built a diverse career across both the public and private sectors, specializing in customs, trade facilitation, and policy development. She previously served as a Policy Advocacy Officer at the Export Development Council and as a Single Window Consultant at the Department of Finance. Currently, she is a Customs Operations Officer III at the Bureau of Customs, assigned to the Office of the Commissioner and the Port of Manila. In this role, she actively supports the BOC's digital transformation initiatives, particularly on cross-border paperless trade. She is also involved in the Authorized Economic Operator Program, National Single Window-Technical Working Group, and the Philippine Trade Facilitation Committee, managing foreign-assisted trade facilitation projects with UN ESCAP, ARISE Plus, ITC, and USAID, and representing the BOC in national and international engagements.

Regulatory Credibility as Competitive Strategy: Export Controls, IP Protection, and the Philippines' Position in Security-Sensitive Semiconductor Value Chains'

By
Bernard Errol M. Advincula

Executive Summary

Bernard Errol M. Advincula

The Philippines plays a critical role in the global semiconductor supply chain, particularly in assembly, testing, and packaging, yet faces growing pressure to adapt its industrial and regulatory strategies amid shifting geoeconomic conditions. As global semiconductor governance becomes increasingly shaped by national security concerns, export controls, intellectual property protection, and allied coordination, regulatory credibility has emerged as a condition of participation in trusted supply chains.

This study examines how export control compliance and intellectual property protection shape the Philippines' position in security-sensitive semiconductor value chains. Drawing on policy analysis and consultations in the Philippines and the United States, it is organized through a multilevel framework distinguishing global market alignment, security partnership alignment, and domestic institutional alignment, ordered by the degree of sovereign control available to the Philippine government. Its logic is sequential: domestic institutional capacity produces partnership credibility, and partnership credibility unlocks the market opportunity available to trusted suppliers. The findings indicate that the Philippines' formal regulatory architecture is regarded by partners as regionally leading while institutional capacity remains the outstanding gap. Firms expect advanced packaging to be the next innovation cycle, which places the country's existing assembly and test base next to where value is moving. However, lead firms are keeping the capabilities that carry that value in-house rather than releasing them to third-party assembly and test providers. Domestically, the binding constraint is coordination. Domestic stakeholders do not raise export control compliance or intellectual property protection as active concerns, because neither currently blocks transactions or imposes visible costs. They function instead as differentiators among jurisdictions that have already cleared the ecosystem conditions.

The study argues that the country's comparative advantage lies not in immediate vertical upgrading but in positioning itself as a reliable, security-aligned manufacturing partner, where compliance capacity is not a cost of participation but a policy advantage the state can deliberately construct. It recommends provisioning designated packaging sites and their engineering pipelines ahead of demand, reorganizing promotion around the buyers whose sourcing decisions locate suppliers, and claiming currently unclaimed partner financing instruments. It further recommends publishing an annual record of regulatory performance drawn from data the agencies already hold and chartering a government corporation able to designate sites and bind agencies to commitments rather than convene them.

1. Introduction

This study presents a targeted gap assessment of the Philippine semiconductor ecosystem with a specific focus on two pillars critical to deepening US-Philippines cooperation in advanced and critical technologies: export control compliance and intellectual property protection. The study is produced under the Philippines Technology Policy (PTP) Fellowship, organized by the Pacific Forum with support from the US Department of State's Office of Export Controls and Border Security (EXBS).

1.1. Research Questions

The guiding question is how export control compliance and intellectual property protection shape the Philippines' position in security-sensitive semiconductor value chains. Four sub-questions structure the inquiry:

- **Industry Sentiment:** What regulatory gaps related to intellectual property protection and export controls do semiconductor industry actors perceive, and to what extent do these perceptions reflect the quality of industry-government alignment in the Philippine semiconductor sector?
- **Geoeconomic and Development Implications:** How does industry-government coordination on intellectual property and export control regulations affect the Philippines' competitiveness, supply chain security, and position in the global semiconductor value chain?
- **Government Policies and Coordination:** How do government actors interpret and implement regulations related to intellectual property protection and export/trade controls in the semiconductor sector, and how aligned are these actions with industry expectations? Where do gaps or overlaps in regulatory enforcement occur?
- **Policy Recommendations:** Which regulatory measures or enforcement mechanisms, particularly those related to intellectual property protection and export/trade control compliance, could strengthen industry-government alignment, enhance investment, and support the Philippines' role as a trusted partner in global semiconductor supply chains?

The question is consequential because semiconductor governance is increasingly shaped by national security considerations. Partner governments and multinational firms assess where security-sensitive production can be trusted, not only where it can be performed at lowest cost. For an economy with limited fiscal space and no frontier fabrication capacity, regulatory credibility is among the few competitive assets that remain within sovereign control.

The study argues that regulatory credibility functions as a constructible competitive asset under a specific condition. Ecosystem fundamentals gate entry into firms' consideration, and credibility differentiates among jurisdictions that have already qualified. The two are complements rather than substitutes, and credibility accumulates through administrative practice over time rather than being assembled when demand arrives.

Section 2 reviews the industry, its regulatory framework, and the bilateral relationship. Section 3 sets out the analytical framework. Section 4 presents the findings, Section 5 develops the conditional argument, Section 6 offers policy recommendations, and Section 7 concludes.

1.2. Methodology

This study combines documentary policy analysis with primary stakeholder research. Documentary analysis of Philippine legislation, implementing rules, agency issuances, and bilateral instruments establishes the regulatory architecture reviewed in Section 2, supplemented by published industry and trade data. Primary research comprises more than 20 semi-structured interviews and consultations conducted in the Philippines and the United States between January and July 2026. Philippine respondents include representatives from government agencies, industry associations, semiconductor firms, foreign chambers, and policy institutions. US respondents in Washington, D.C., California, and Arizona include employees of federal and subnational agencies, semiconductor firms, and academic institutions, as well as strategic advisors and Philippine diplomatic representatives. Findings follow a modified Chatham House convention: respondents, agencies, and firms are not identified, and government statements are treated as informal rather than official positions. Corroborated findings identify source types; single-source findings are noted.

This design carries three limitations. The sample favors multinational firms and organized industry, underrepresenting smaller domestic suppliers. US interviews also capture a single point in a rapidly changing investment cycle. Finally, the study assesses perceptions and reported practice rather than measured performance, reflecting limited public data on licensing, enforcement, and case disposition; this data gap is itself examined as a finding.

2. Background and Literature

This section provides context for the study by reviewing three interconnected areas. It begins with an overview of the Philippine semiconductor industry, covering economic indicators, industry composition, and the country's role in global value chains. It then examines the domestic legal and regulatory framework, focusing on export control compliance, intellectual property protection, and coordination mechanisms. Next, it considers US–Philippines bilateral relations and technology cooperation arrangements, highlighting trade, investment, and security-linked frameworks relevant to semiconductor supply chains. The section concludes by identifying gaps in the literature, which this study addresses through a multilevel framework integrating regulatory, geoeconomic, and industrial policy perspectives.

2.1. Overview of the Philippine Semiconductor Industry

The Philippine semiconductor industry has emerged as a strategically significant component of the global technology landscape. The country occupies a specialized downstream position in the global semiconductor value chain, concentrated in assembly, testing, and packaging (ATP) operations that link upstream wafer fabrication to downstream electronics manufacturing. Firms in the Philippines have limited participation in front-end fabrication and advanced chip design. This functional specialization is nonetheless substantial in scale; the Philippines accounts for approximately 10% of global ATP output, establishing it as a meaningful node in semiconductor production networks despite its narrow position within the value chain.[1]

The semiconductor/electronics sector is the single largest contributor to Philippine export earnings, underscoring its macroeconomic significance. Electronics exports reached a record high of approximately $49.5 billion in 2022, driven by post-pandemic demand recovery in global markets, before contracting to $41.9 billion in 2023 and $42.6 billion in 2024 as global semiconductor demand softened.[2] Despite this correction, electronics consistently accounted for approximately 57–62% of total Philippine merchandise exports over this period, with semiconductors comprising most of that share.[3] The OECD estimates semiconductors represent over 70% of electronic component exports, while SEIPI data for mid-2024 places that share at approximately 76.6%, indicating that semiconductors account for the large majority of the electronics basket.[4] Recovery indicators for 2025 point to a rebound, with year-to-date electronics exports rising 7.3% in the first seven months of the year relative to the same period in 2024, driven in part by growing demand for AI-related components.[5]

The Philippine semiconductor sector comprises more than 500 electronics and semiconductor firms, the majority of which are multinational corporations with export-oriented operations.[6] Prominent among these are Texas Instruments, Analog Devices, ON

[1] Rifki Weno, Heikal Suhartono, Tania Heryanto, Rio Kiantara, Cania Adinda, and Rahma Nur Annisa, "ASEAN's Emerging Semiconductor Giant: The Philippines' Rising Role in the Global Supply Chain," ASEAN Business Advisory Council, Nov. 7, 2025

[2] Dan Lachica, as quoted in Othel V. Ocampos, "Electronics Sector Expects 'Modest' Exports Growth," *Manila Standard*, Oct.2, 2025, https://manilastandard.net/business/314650422/electronics-sector-expects-modest-exports-growth.html.
Philippine Statistics Authority, "Highlights of the 2023 Annual International Merchandise Trade Statistics of the Philippines," PSA, 2024, https://psa.gov.ph/content/highlights-2023-annual-international-merchandise-trade-statistics-philippines.

[3] Weno et al., "ASEAN's Emerging Semiconductor Giant.

[4] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines* (Paris: OECD Publishing, Dec 9, 2024), https://doi.org/10.1787/01497fea-en.
Semiconductor and Electronics Industries in the Philippines Foundation, "Philippine Electronics Export Performance," SEIPI, July 2025, https://seipi.org.ph/philippine-electronics-export-performance-july-2025/.

[5] SEIPI, "Philippine Electronics Export Performance," July 2025.

[6] Weno et al., "ASEAN's Emerging Semiconductor Giant."

Semiconductor, STMicroelectronics, and NXP Semiconductors, whose sustained and expanding presence reflects confidence in the country's engineering capabilities and production reliability.[7] Production is geographically concentrated in zones administered by the Philippine Economic Zone Authority (PEZA)—principally in Laguna, Cavite, Batangas, Clark, and Cebu—which provide fiscal incentives, streamlined customs processing, and export-oriented logistics infrastructure suited to precision manufacturing operations.[8] Semiconductor and electronics companies have historically accounted for approximately 35% of all investment in Philippine special economic zones, underscoring the sector's dominant position within the country's export manufacturing base.[9] The industry employs an estimated 3.2 million workers in direct and indirect capacities, making it one of the largest sources of industrial employment in the Philippine economy.[10]

Philippine semiconductor production is concentrated in a defined range of backend product categories, including integrated circuits, sensors, power devices, and discrete semiconductors.[11] The industry's functional strengths lie in high-reliability testing and precision packaging for end-use applications in automotive systems, industrial equipment, and consumer electronics—segments that demand consistent quality and process discipline rather than cutting-edge fabrication capability.[12] Conversely, Philippine firms have minimal participation in advanced node fabrication and the country lacks a developed indigenous chip design ecosystem, with design activity remaining largely confined to the internal operations of multinational affiliates.[13] This production profile is best characterized as process-intensive rather than ground-breaking; the Philippines holds competitive strength in precision manufacturing operations but has not yet developed the innovation and design capabilities that define higher-value positions in the semiconductor value chain.[14]

The Philippines is deeply integrated into regional and global semiconductor production networks, with its ATP operations functioning as a critical link between upstream fabrication and downstream electronics assembly. Philippine-produced devices are distributed to major regional manufacturing hubs—principally Malaysia, Singapore, and Thailand, which serve as integration nodes within ASEAN's broader semiconductor value chain.[15] This regional division of labor is functionally differentiated: Singapore leads in chip design and research and development, Malaysia anchors advanced backend processing, Vietnam is scaling mass electronics assembly, and the Philippines specializes in ATP operations that ensure devices meet global quality and reliability standards prior to final integration.[16] This position reflects deep integration into networked production systems, but it also entails structural dependence on upstream producers for wafer supply and design inputs that Philippine firms do not generate domestically. The Philippines' comparative advantage is therefore embedded in regional production complementarities rather than self-contained capability, making its continued participation in these networks contingent on maintaining the reliability, compliance, and cost competitiveness that multinational partners require.[17]

A substantial technical workforce underpins the Philippines' comparative advantage in semiconductor manufacturing. The country produces more than 80,000 engineering and technical graduates annually, many of whom specialize in disciplines directly applicable to precision ATP operations, such as electronics, mechatronics, and

---

[7] Venice Isabelle Rañosa and Jaime Jimenez, "Strengthening the Philippine Semiconductor Ecosystem: Opportunities for Growth and Innovation," *SPARK* 18, no. 2 (June 2025), Stratbase ADR Institute, https://adrinstitute.org/wp-content/uploads/2025/06/stratbase-adr-institute-june-2025-spark-strengthening-the-philippine-semiconductor-ecosystem_opportunities-for-growth-and-innovation.pdf.

[8] Rañosa and Jimenez, "Strengthening the Philippine Semiconductor Ecosystem."

[9] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines*, December 2024, citing PEZA (2021).

[10] Semiconductor and Electronics Industries in the Philippines Foundation (SEIPI), cited in Weno et al., "ASEAN's Emerging Semiconductor Giant."

[11] Weno et al., "ASEAN's Emerging Semiconductor Giant."

[12] Weno et al., "ASEAN's Emerging Semiconductor Giant"; Rañosa and Jimenez, "Strengthening the Philippine Semiconductor Ecosystem."

[13] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines*, December 2024.

[14] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines*, December 2024.

[15] Weno et al., "ASEAN's Emerging Semiconductor Giant."

[16] Weno et al., "ASEAN's Emerging Semiconductor Giant."

[17] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines*, December 2024.

industrial automation.[18] Government and industry-led upskilling programs aim to train an additional 128,000 semiconductor engineers and technicians by 2028, reflecting recognition that sustained competitiveness will require continuous workforce development as production processes grow more complex.[19] The skills base is, however, skewed toward manufacturing operations rather than design and research functions. Depth in chip design, process engineering, and applied research remains limited, with advanced technical roles concentrated within the internal structures of multinational affiliates rather than distributed across a broader domestic innovation ecosystem.[20] This skills profile reinforces the country's current position as a precision manufacturing hub while also marking the primary human capital constraint on any transition toward higher-value functions in the semiconductor value chain.[21]

2.2. Domestic Legal and Regulatory Framework

The Philippine semiconductor sector operates within a multilayered legal and regulatory environment shaped by trade policy, national security considerations, and intellectual property governance. This environment is not incidental to the industry's development. It directly conditions the terms on which Philippine firms and their multinational partners participate in global value chains. The relevant legal frameworks perform dual roles: they establish the compliance requirements that govern the movement of strategic goods, technologies, and intellectual property across borders while simultaneously signaling the Philippines' credibility as a partner in security-sensitive production networks to foreign investors and allied governments. Export control compliance and intellectual property protection function not merely as legal obligations but as determinants of market access and supply chain trust. In a semiconductor industry increasingly shaped by national security considerations and geoeconomic competition, a state's regulatory capacity to implement, enforce, and sustain compliance standards operates as a competitive asset in its own right, distinct from and complementary to its industrial and technological capabilities.

2.2.1. Export Control Frameworks—Strategic Trade Management Act (STMA)

The primary legal instrument governing export control in the Philippines is Republic Act No. 10697, known as the Strategic Trade Management Act (STMA), enacted in 2015. The STMA establishes a comprehensive framework for managing trade in strategic goods, dual-use items, and related technologies, covering their export, import, transit, transshipment, and re-export.[22] Critically, the law's scope extends beyond the movement of physical goods to include intangible transfers such as the electronic transmission of software, technical data, and technology to persons outside the Philippines, a provision directly relevant to semiconductor production environments where technical knowledge transfer is routine.[23] The Act establishes a National Strategic Goods List comprising military goods, dual-use goods, and nationally controlled goods, and it requires firms engaged in strategic trade to obtain authorization, maintain documentation, and verify the identity and intended end-use of recipients.[24] These requirements align the Philippines with international export control and nonproliferation regimes, including the commitments set out in United Nations Security Council Resolution 1540, and provide the legal foundation for Philippine participation in security-sensitive supply chains where partner governments and multinational firms require demonstrated compliance as a condition of engagement.[25]

The STMA's regulatory scope extends beyond the physical movement of controlled goods to encompass flows of knowledge and technology that are directly relevant to semiconductor production environments. The law covers the transmission of software and technology by any means (electronic or otherwise) to destinations or persons outside the Philippines, including through face-to-face communication, personal demonstration, and the

[18] Weno et al., "ASEAN's Emerging Semiconductor Giant," citing CHED and OECD (2024).
[19] Weno et al., "ASEAN's Emerging Semiconductor Giant," citing BOI/DTI.
[20] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines*, December 2024.
[21] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines*, December 2024.
[22] Republic Act No. 10697, "Strategic Trade Management Act," 16th Congress, 3rd Regular Session (2015), Sections 1 and 3, https://lawphil.net/statutes/repacts/ra2015/ra_10697_2015.html.
[23] Republic Act No. 10697, Section 5(h).
[24] Republic Act No. 10697, Sections 4 and 5.
[25] Republic Act No. 10697, Section 2.

provision of technical assistance such as training, instruction, and the transfer of working knowledge or skills.[26] This breadth is significant; in semiconductor manufacturing, technical knowledge transfers between multinational affiliates and their local counterparts are routine, and these exchanges fall within the law's coverage regardless of whether they involve a physical export. The STMA additionally regulates brokering, financing, and intermediary activities related to the movement of strategic goods between foreign countries, extending compliance obligations beyond direct exporters to a wider range of commercial actors in the supply chain.[27] Taken together, these provisions establish that Philippine export controls regulate not only goods but also the flows of knowledge, technology, and services that underpin semiconductor operations, making compliance a firm-level operational matter and not merely a border management function.

Implementation of the STMA is distributed across multiple government agencies operating under a coordinated but decentralized architecture. The National Security Council (NSC)-Strategic Trade Management Committee serves as the central authority, chaired by the Executive Secretary, with the Secretary of Trade and Industry as Vice Chairperson and secretaries from the departments of Foreign Affairs, Justice, National Defense, Finance, and others as members. The Strategic Trade Management Office (STMO), lodged within the Department of Trade and Industry (DTI), functions as the executive and technical agency responsible for licensing, registration, database maintenance, and enforcement referrals.[28] The Bureau of Customs serves as the primary border enforcement body, operating under a memorandum of agreement with the STMO to coordinate the identification and clearance of strategic goods at ports of export.[29] Additional agencies with supporting roles include the Philippine Coast Guard, the Philippine National Police, and the National Bureau of Investigation, which may be engaged when violations fall outside customs jurisdiction.[30] This multi-agency structure means that effective implementation is coordination-dependent rather than centralized, with compliance outcomes contingent on sustained interagency alignment across trade, security, and border management institutions.

At the firm level, compliance with the STMA involves a defined set of procedural obligations. Firms engaged in the export of strategic goods are required to register with the STMO and obtain export authorization prior to shipment, with three types of licenses available depending on the nature and regularity of the transaction.[31] Documentation requirements include end-user certificates, records of transactions, and reporting of re-exports and reassignments.[32] For firms with recurring obligations, internal compliance programs provide a mechanism for systematizing these requirements across business operations. Compliance imposes administrative and technical burdens that are particularly significant for firms handling sensitive dual-use technologies, as is common in semiconductor manufacturing.

Implementation has matured considerably since the STMA took effect. A 2023 Bureau of Customs account documented a program of commodity identification training for frontline officers, an interagency agreement that improved technical reachback between Customs and the STMO, and plans to integrate the separate export declaration system used in economic zones with Customs' risk management system.[33] A subsequent consultation with an enforcement official indicated that these training programs and systems are now in place. The challenge that remains is inherent to the sector: many shipments requiring technical review originate from semiconductor manufacturers, and identifying controlled items among highly specialized goods

[26] Republic Act No. 10697, Sections 5(h) and 5(w).

[27] Republic Act No. 10697, Section 5(t).

[28] Republic Act No. 10697, Section 6; Department of Trade and Industry, "Strategic Trade Management Office," https://www.dti.gov.ph/dti-business-center/dti-strategic-trade.

[29] Bureau of Customs, "BOC and DTI-STMO Strengthen Strategic Trade Facilitation," Sept. 4, 2023, https://customs.gov.ph/boc-and-dti-stmo-strengthen-strategic-trade-facilitation/.

[30] Republic Act No. 10697, Section 6.

[31] Department of Trade and Industry, "DTI-STMO's Authorization for Exporting Strategic Goods Begins," July 2020, http://bdblaw.com.ph/index.php/newsroom/articles/tax-law-for-business/652-dti-stmo-s-authorization-for-exporting-strategic-goods-begins.

[32] Republic Act No. 10697, Sections 5(g) and 14.

[33] Clarence Dizon, "Strengthening Inter-Agency Cooperation and Coordination in the Implementation of the Strategic Trade Management Act with a View to Enhancing Trade Facilitation: A Philippine Customs Perspective," *World Customs Journal* 17, no. 1 (March 2023), https://www.worldcustomsjournal.org/article/73210.

demands technical familiarity that must keep pace with rapidly evolving technologies. Awareness of compliance requirements also remains uneven across the industry, with smaller domestic firms and non-multinational exporters less likely to have the institutional capacity to navigate the licensing and documentation processes that larger multinational affiliates manage as a matter of routine. The complexity of these processes, combined with the phased and still-incomplete rollout of the STMA's full implementation scope, creates conditions in which regulatory intent is not uniformly translated into firm-level practice. These constraints are examined in greater depth in the analysis section.

2.2.2. Intellectual Property Protection

Intellectual property protection constitutes a second pillar of the regulatory environment shaping Philippine semiconductor sector participation in global value chains. Semiconductor production is among the most IP-intensive activities in the global economy: the design, architecture, and process technologies embedded in semiconductor devices represent substantial proprietary investments by multinational firms, and the terms on which these firms locate operations in a given country are directly conditioned by the strength and reliability of that country's IP protection regime. For the Philippines, where multinational affiliates account for the dominant share of semiconductor output, the credibility of domestic IP governance functions as a prerequisite for sustaining foreign direct investment and maintaining access to technology transfer arrangements that support production upgrading.

The primary legal instrument governing intellectual property in the Philippines is Republic Act No. 8293, known as the Intellectual Property Code of the Philippines (IP Code), enacted in 1997 and subsequently amended by Republic Acts No. 9150, No. 9502, and No. 10372. The IP Code establishes a comprehensive framework covering patents, trademarks, copyrights, industrial designs, trade secrets and, notably, the layout designs of integrated circuits—a provision with direct relevance to semiconductor manufacturing.[34] The law created the Intellectual Property Office of the Philippines (IPOPHL) as the central regulatory body responsible for registration, adjudication, and enforcement of intellectual property rights, operating as an attached agency of the Department of Trade and Industry.[35] Amendments introduced under Republic Act No. 10372 expanded the IPOPHL's enforcement powers and broadened the scope of copyright protection to address digital infringement.[36]

The IP Code was designed explicitly to align Philippine intellectual property law with international standards, and the Philippines is a signatory to the principal multilateral IP agreements, including the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), the Paris Convention for the Protection of Industrial Property, the Berne Convention for the Protection of Literary and Artistic Works, and several World Intellectual Property Organization (WIPO) treaties.[37] This alignment is significant for the semiconductor sector; multinational firms and their government partners treat TRIPS compliance and participation in international IP conventions as baseline indicators of a host country's suitability for technology-intensive investment. The Philippines' formal alignment with these standards thus provides a legal foundation for investor confidence, even where practical enforcement capacity requires further development.

IP enforcement in the Philippines operates across three institutional layers. At the administrative level, IPOPHL's Bureau of Legal Affairs has original jurisdiction to hear and decide IP infringement cases, issue cease and desist orders, impose fines, and confiscate infringing goods.[38] At the judicial level, IP rights holders may pursue civil or criminal litigation in Philippine courts, with decisions appealable to the Court of Appeals and ultimately to the Supreme

[34] Republic Act No. 8293, "Intellectual Property Code of the Philippines," Section 2 and Part VI (Layout Designs of Integrated Circuits), https://lawphil.net/statutes/repacts/ra1997/ra_8293_1997.html.

[35] Intellectual Property Office of the Philippines, "Intellectual Property Code and Implementing Rules and Regulations," https://www.ipophil.gov.ph/intellectual-property-code-implementing-rules-and-regulations/.

[36] Republic Act No. 10372, amending Republic Act No. 8293 (2013).

[37] Republic Act No. 8293, Section 3; ASEAN Intellectual Property Portal, "Philippines," https://www.aseanip.org/resources/asean-ip-offices-details/philippines.

[38] Sampang Law Offices, "Intellectual Property Law in the Philippines," https://sampanglawoffices.ph/legal-updates/intellectual-property-law-in-the-philippines/.

Court.[39] At the border, the Bureau of Customs serves as the primary enforcement body for the seizure of counterfeit and infringing goods, supported by the Philippine National Police and the National Bureau of Investigation for cases requiring criminal investigation.[40]

Recent enforcement indicators reflect measurable improvements. Authorities seized P40.98 billion worth of counterfeit and pirated goods in 2024, a 63% increase from the previous year and the highest on record, with the Bureau of Customs accounting for the largest share through border operations.[41] The Philippines has remained off the USTR's Special 301 Watch List for 12 consecutive years, and the Department of Justice achieved a 98% disposition rate in IP-related cases in 2024.[42] Public-private cooperation has expanded through IPOPHL's E-Commerce Memorandum of Understanding framework, which now counts 108 platform signatories and has produced measurable reductions in repeat infringement across major digital marketplaces.[43] These developments indicate a strengthening enforcement trajectory.

The IP Code operates alongside two supporting statutes that extend IP governance into digital environments and publicly funded research. Republic Act No. 10175, the Cybercrime Prevention Act of 2012, provides criminal enforcement mechanisms applicable to digital IP violations and the theft of proprietary data transmitted through electronic means, closing a gap in the IP Code's coverage that is directly relevant to semiconductor production environments, where process data, design files, and technical specifications are routinely stored and transferred digitally.[44] Republic Act No. 10055, the Philippine Technology Transfer Act of 2009, governs the ownership, management, and commercialization of intellectual property generated from government-funded research and development, establishing licensing mechanisms, revenue-sharing arrangements, and pathways for spin-off formation.[45] Together, these instruments situate IP protection within a broader innovation and technology governance ecosystem that encompasses both enforcement and commercialization functions, signaling to foreign partners that the Philippines' approach to IP governance extends beyond compliance into the active management of technology-intensive economic activity.

The formal architecture of Philippine IP governance is comprehensive and internationally aligned, and recent enforcement indicators point to measurable progress. Nevertheless, practical constraints remain. Case resolution backlogs within both IPOPHL's administrative dockets and the regular court system continue to lengthen the timeline for IP dispute resolution, creating uncertainty for rights holders pursuing infringement claims. Furthermore, enforcement capacity outside Metro Manila remains uneven, with regional offices and local authorities less consistently equipped to identify and act on IP violations.[46] Informal market activity, particularly in physical and online retail channels, also continues to generate recurring compliance concerns despite improvements in border seizure performance. These conditions do not negate the legal framework's credibility as a signal to foreign investors, but they indicate that the gap between formal alignment and operational effectiveness remains an active governance challenge, the implications of which are examined in the analysis section of this study.

2.2.3. Industrial Policy and Investment Regulation Linkages

Export control compliance and intellectual property protection do not operate in isolation but alongside a parallel set of industrial policy instruments designed to attract investment and promote industrial upgrading. The two most significant are the Corporate Recovery and Tax Incentives for

[39] Republic Act No. 8293, Section 7.

[40] Republic Act No. 10372, Section 1, amending Section 7 of Republic Act No. 8293.

[41] Intellectual Property Office of the Philippines, "Philippines Cites Record Enforcement Gains, Strong Public-Private Partnerships in USTR Review," Oct. 22, 2025, https://www.ipophil.gov.ph/news/philippines-cites-record-enforcement-gains-strong-public-private-partnerships-in-ustr-review/.

[42] Intellectual Property Office of the Philippines, "Philippines Cites Record Enforcement Gains."

[43] Intellectual Property Office of the Philippines, "Philippines Cites Record Enforcement Gains."

[44] Republic Act No. 10175, "Cybercrime Prevention Act of 2012," Section 4, https://lawphil.net/statutes/repacts/ra2012/ra_10175_2012.html.

[45] Republic Act No. 10055, "Philippine Technology Transfer Act of 2009," Sections 2 and 3, https://lawphil.net/statutes/repacts/ra2010/ra_10055_2010.html.

[46] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines*, December 2024.

Enterprises Act (CREATE Act), Republic Act No. 11534, enacted in 2021, and its 2024 amendment, the CREATE to Maximize Opportunities for Reinvigorating the Economy (CREATE MORE) Act, Republic Act No. 12066. The CREATE Act reformed the corporate income tax and incentives system, introducing income tax holidays of four to seven years for registered enterprises, a preferential special corporate income tax rate of 5% on gross income in lieu of all national and local taxes, and duty-free importation of capital equipment, with incentives calibrated according to investment priority tiers defined under a Strategic Investment Priority Plan.[47] The CREATE MORE Act expanded these provisions, broadened VAT and duty exemptions, and streamlined business registration processes, with the stated objective of maximizing the inflow of high-impact domestic and foreign investments.[48] For the semiconductor sector, these incentives directly shape the investment calculus of multinational firms evaluating the Philippines as a production location.

The analytical significance of these instruments for this study lies in what they do not address as much as what they do. Investment promotion frameworks and regulatory compliance regimes—export controls, IP protection, and strategic trade management—are governed by separate institutional actors operating under distinct mandates and timelines. Investment promotion is administered primarily through the Board of Investments (BOI), PEZA, and the Fiscal Incentives Review Board (FIRB), while export control compliance falls under the STMO and the NSC-Strategic Trade Management Committee and IP governance falls under IPOPHL. These systems are not always operationally integrated, and the absence of formal coordination mechanisms between investment facilitation and regulatory compliance functions creates conditions in which firms may receive investment incentives without corresponding guidance on the compliance obligations that participation in security-sensitive supply chains entails.[49]

<u>2.3. US-Philippines Bilateral Relations and Technology Cooperation</u>

Bilateral relations and technology cooperation with the United States provide a critical external context for the Philippines' semiconductor industry. The US-Philippines alliance has expanded well beyond its traditional defense foundations into economic and technological domains, and the Philippines has actively positioned this relationship as an instrument for advancing its industrial development objectives, including in semiconductors. The analytical relevance of the alliance for this study is not merely historical but instrumental; it shapes the regulatory standards, investment flows, and supply chain expectations within which the Philippine semiconductor sector operates.

The 1951 Mutual Defense Treaty remains the foundational element of the alliance, establishing the security architecture that underpins broader bilateral cooperation.[50] The Enhanced Defense Cooperation Agreement (EDCA), signed in 2014 and expanded in 2023 to nine agreed locations, extends this architecture into infrastructure and logistics domains, several of which are proximate to major semiconductor production clusters in Luzon.[51] These agreements establish the strategic trust that makes deeper cooperation in non-military domains, including technology and supply chains, politically viable and practically operational.

The United States is among the Philippines' most significant trade and investment partners. Electrical machinery and equipment, including semiconductors, constitute the largest category of US imports from the Philippines, valued at $6.28 billion as of 2024.[52] The bilateral Trade and Investment Framework Agreement (TIFA), signed in 1989, provides a standing platform for dialogue on trade, investment, intellectual property, and supply chain issues, with the two governments meeting under it

[47] Republic Act No. 11534, "Corporate Recovery and Tax Incentives for Enterprises Act," Section 294, https://lawphil.net/statutes/repacts/ra2021/ra_11534_2021.html.

[48] Republic Act No. 12066, "Corporate Recovery and Tax Incentives for Enterprises to Maximize Opportunities for Reinvigorating the Economy Act," Nov. 11, 2024.

[49] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines*, December 2024.

[50] US Department of State, "US Security Cooperation with the Philippines," https://www.state.gov/u-s-security-cooperation-with-the-philippines/.

[51] US Department of State, "US Relations with the Philippines," https://www.state.gov/u-s-relations-with-the-philippines/.

[52] US Import Data, "US-Philippines Trade Relations: Top Traded Products and Bilateral Trade Data 2024-25," November 2025, https://www.usimportdata.com/blogs/us-philippines-trade-relations-top-products-2025.

most recently in July 2024.[53] These commercial ties create the foundation for deeper technology sector cooperation and reinforce the Philippines' function as a US-linked production base within global semiconductor value chains.

The US CHIPS and Science Act of 2022, while primarily focused on domestic semiconductor manufacturing, establishes a broader allied supply chain strategy that shapes the terms of engagement for partner economies, including the Philippines. The Act's provisions for international cooperation make regulatory alignment and supply chain trustworthiness conditions of participation in US-anchored semiconductor networks.[54] The Philippines is not a primary recipient of CHIPS Act subsidies, but it is relevant as a backend manufacturing partner whose inclusion in trusted supply chains depends on demonstrating compliance credibility.

In March 2024, US Secretary of Commerce Raimondo announced more than $1 billion in combined US investments in the Philippine technology sector, aiming to double the number of semiconductor factories in the country.[55] The two governments also announced the Luzon Economic Corridor, coordinated with Japan, committing to accelerated investments in infrastructure, clean energy, and semiconductor supply chains connecting Subic Bay, Clark, Manila, and Batangas.[56] These developments reflect the Philippines' active pursuit of this partnership as part of a broader industrial strategy, not merely a response to US-led initiatives.

The Philippines also participates in the Indo-Pacific Economic Framework for Prosperity (IPEF), which includes pillars on supply chain resilience, regulatory alignment, and cooperation in critical sectors including semiconductors.[57] The US Department of State's Export Control and Border Security (EXBS) program has provided technical assistance to Philippine agencies on export control implementation, training, and enforcement capacity.[58] These engagements function as mechanisms for aligning Philippine regulatory practice with the compliance standards that participation in security-sensitive supply chains requires, and they represent a tangible operational dimension of the bilateral relationship.

Furthermore, major US semiconductor companies—including Texas Instruments, Analog Devices, and ON Semiconductor—anchor the Philippine industry, accounting for a substantial share of its export output and employment base. These firms operate within US-origin technology and compliance systems, and their Philippine affiliates are subject to US export control regulations, including those governing the transfer of controlled technology and the use of US-origin equipment. In this respect, US firms function as transmission channels for regulatory standards within the domestic ecosystem, embedding compliance expectations at the firm level independent of government-to-government arrangements.[59]

Intensifying US-China technological competition has elevated the strategic salience of the Philippines' position in semiconductor supply chains. The US has progressively tightened export controls on advanced semiconductors and manufacturing equipment, applied investment screening mechanisms, and pursued allied supply chain strategies explicitly designed to reduce dependence on geopolitically exposed production nodes.[60] The Philippines, as such, operates within a network governance system

[53] Office of the United States Trade Representative, "Readout of the US-Philippines Trade and Investment Framework Agreement (TIFA) Meeting," July 2024, https://ustr.gov/about-us/policy-offices/press-office/press-releases/2024/july/readout-us-philippines-trade-and-investment-framework-agreement-tifa-meeting.

[54] H.R. 4346, "CHIPS and Science Act of 2022," 117th Congress (2022), https://www.congress.gov/bill/117th-congress/house-bill/4346.

[55] Matthew P. Goodman and others, "US Investment in the Philippines: More Than Meets the Eye," Center for Strategic and International Studies, Dec. 6, 2024, https://www.csis.org/analysis/us-investment-philippines-more-meets-eye.

[56] White House, "Fact Sheet: Celebrating the Strength of the US-Philippines Alliance," April 11, 2024, https://bidenwhitehouse.archives.gov/briefing-room/statements-releases/2024/04/11/fact-sheet-celebrating-the-strength-of-the-u-s-philippines-alliance/.

[57] US Department of Commerce, "Indo-Pacific Economic Framework for Prosperity," https://www.commerce.gov/ipef.

[58] US Department of State, "Export Control and Border Security (EXBS)," https://www.state.gov/export-control-and-border-security-exbs/.

[59] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines*, December 2024.

[60] US Government Accountability Office, "Export Controls: Commerce Implemented Advanced Semiconductor Rules and Took Steps to Address Compliance Challenges," GAO-25-107386, Dec. 2, 2024, https://www.gao.gov/products/gao-25-107386.

increasingly structured by these pressures. The February 2026 joint statement from the US-Philippines Bilateral Strategic Dialogue commits both governments to catalyze private sector development in semiconductors and to hold the first Luzon Economic Corridor Investment Forum in 2026, reinforcing the bilateral semiconductor agenda at the highest diplomatic level. [61] The Philippines' positioning within this system reflects a deliberate choice to align with US-led supply chain standards as a strategy for securing investment and market access while managing the attendant compliance demands that this alignment entails.

The bilateral relationship creates meaningful opportunities but does not guarantee industrial upgrading. The Philippines is not a primary recipient of large-scale CHIPS Act subsidies, its domestic capability in upstream semiconductor segments remains limited, and its position in the value chain remains dependent on external partners for design inputs and advanced fabrication. The benefits of the alliance are therefore conditional on the Philippines' capacity to meet the regulatory, institutional, and compliance standards that trusted supply chain participation requires—a condition that places the burden of action squarely on domestic institutional performance.[62]

2.4. Literature Gap and Study Contribution

Notably absent from the existing literature is a scholarly analysis of three dimensions that are central to this study. First, while global value chain scholarship has extensively theorized upgrading pathways for late-industrializing economies, it has not adequately addressed regulatory alignment as a competitive variable in its own right. Existing global value chain (GVC) frameworks presume commercially driven governance structures and focus on technological and process upgrading as the primary mechanisms for value chain advancement. No dedicated study examines how middle-income assembly, testing, and packaging economies can leverage regulatory credibility rather than technological leapfrogging as a distinct pathway to competitive repositioning within security-sensitive production networks.

Second, the literature on export control compliance and geoeconomic statecraft focuses primarily on advanced industrialized partners such as South Korea, Japan, Taiwan, and the Netherlands, whose institutional capacities and alliance relationships are treated as the baseline for trusted supply chain participation. Middle-income economies with established but non-frontier manufacturing capabilities remain largely unexamined, leaving a significant gap in understanding how such economies navigate the demands of security-sensitive value chain integration.

Third, while developmental state literature offers foundational frameworks for understanding institutional capacity in industrializing economies, its application to the Philippines has remained largely sector-agnostic. Despite extensive documentation of industry-government coordination mechanisms through policy reports and official publications, the dynamics of industry-government alignment in the Philippine semiconductor sector, particularly as they pertain to export control compliance and intellectual property protection, have not been subjected to rigorous empirical analysis.

This study addresses these gaps through a multilevel analytical framework that integrates GVC theory, geoeconomic analysis, and industrial policy scholarship to assess the regulatory and institutional conditions shaping the Philippines' position in security-sensitive semiconductor value chains.

3. Framework—Multilevel Regulatory Alignment for Security-Sensitive Value Chains

This study employs a multilevel analytical framework, termed Multilevel Regulatory Alignment for Security-Sensitive Value Chains, to organize the competitive and governance demands facing the Philippines' semiconductor industry. The framework identifies three distinct but interdependent levels of alignment, each grounded in a corresponding body of theoretical literature and distinguished by the degree of sovereign control available to the Philippine government. The framework's central proposition is that alignment failures at any one level constrain the country's ability to sustain and upgrade its position in global semiconductor value chains. The

[61] US Department of State, "Joint Statement on the Philippines-United States Bilateral Strategic Dialogue," February 2026, https://www.state.gov/releases/office-of-the-spokesperson/2026/02/joint-statement-on-the-philippines-united-states-bilateral-strategic-dialogue.

[62] OECD, *Promoting the Growth of the Semiconductor Ecosystem in the Philippines*, December 2024.

levels are analytically separable but operationally linked: domestic institutional capacity underpins security partnership credibility, and security partnership credibility is a prerequisite for accessing the terms of global market participation available to trusted suppliers.

3.1. Global Market Alignment (*Low control—exogenous)*

The first level examines the conditions under which semiconductor-producing economies participate in, and potentially upgrade within, internationally fragmented production systems. This level draws primarily on GVC theory to assess the governance conditions that determine the Philippines' current chain position and the structural requirements for improving it. Gereffi, Humphrey, and Sturgeon construct a theoretical framework for explaining governance patterns in GVCs by identifying three determinant variables: the complexity of transactions, the ability to codify transaction specifications, and the capabilities of the supply base.[63] From these variables they derive five governance types—market, modular, relational, captive, and hierarchy—which range from low to high levels of explicit coordination and power asymmetry between lead firms and suppliers. Their framework is explicitly oriented toward the development problem. They argue that GVC research must examine not only the organization of global industry but also "the possibilities for firms in developing countries to enhance their position in global markets" and that the evolution of global industrial organization shapes "not only the fortunes of firms and the structure of industries, but also how and why countries advance or fail to advance in the global economy."[64] Especially relevant to this paper is the captive governance type, which emerges when transaction complexity is high and specifications are codifiable but supplier capabilities remain limited. Under captive governance, lead firms exert significant control over suppliers; captive suppliers are "frequently confined to a narrow range of tasks, for example, mainly engaged in simple assembly, and are dependent on the lead firm for complementary activities such as design, logistics, component purchasing, and process technology upgrading."[65] This paper uses the GVC governance framework to situate the Philippines' ATP role within the broader semiconductor chain and to assess the regulatory and institutional conditions under which the country's position within that chain can be maintained or potentially improved. In the context of the semiconductor industry, where product specifications are highly complex and technology transfer is tightly controlled, the compliance requirements imposed by lead firms on suppliers, including intellectual property protection protocols and export control practices, function as governance instruments that shape supplier market access.

Kaplinsky and Morris extend this analysis by demonstrating that entry into global markets does not automatically generate economic gains. They argue that "there is a need to manage the mode of insertion into the global economy, to ensure that incomes are not reduced or further polarized."[66] Their treatment of barriers to entry and rent distribution provides a complementary lens for understanding where value is captured within the semiconductor chain and what institutional conditions would be necessary for Philippine firms and the state to appropriate a greater share of it. Kaplinsky and Morris distinguish between different forms of rent, including those that arise from policy and regulatory conditions, and argue that governance over these conditions is a determinant of a country's competitive position within the chain.[67] This paper applies this framework to argue that regulatory compliance capacity, including effective intellectual property protection and export control administration, constitutes a form of policy advantage that the Philippines can cultivate as a strategic asset rather than simply a cost of market participation.

Goldberg, Juhász, Lane, Lo Forte, and Thurk provide the empirical and sectoral grounding for this level. Their analysis of government support in the semiconductor industry across all major economies documents that state intervention has been critical to the industry's development in every major producing country, from its initial phases in the United States and Japan to contemporary efforts by India, the US,

[63] Gary Gereffi, John Humphrey, and Timothy Sturgeon, "The Governance of Global Value Chains," *Review of International Political Economy* 12, no. 1 (2005): 78.
[64] Gereffi, Humphrey, and Sturgeon, "Governance of Global Value Chains," 79.
[65] Gereffi, Humphrey, and Sturgeon, "Governance of Global Value Chains," 87.
[66] Raphael Kaplinsky and Mike Morris, *A Handbook for Value Chain Research* (Ottawa: IDRC, 2001), 26.
[67] Kaplinsky and Morris, *Handbook for Value Chain Research*, 30.

and China.[68] Crucially, they identify that cross-border externalities are inherent to the semiconductor industry, that industrial policies in one country generate spillover effects across the entire supply chain, and that this structural characteristic makes semiconductors strategically distinct from other manufacturing sectors.[69] This sectoral specificity reinforces the paper's argument that the Philippines' regulatory environment carries market consequences that extend beyond the compliance posture of individual firms and the state has both an interest and an obligation to manage these conditions actively.

<u>3.2. Security Partnership Alignment (Partial control—negotiated)</u>

The second level addresses the demands that allied export control regimes, technology cooperation frameworks, and security governance requirements place on the Philippines as a participant in US-oriented supply chain networks. This level draws on geoeconomic theory and on structural accounts of interdependence to examine the strategic logic that animates these demands and the consequences of non-alignment with them.

Blackwill and Harris define geoeconomics as "the systematic use of economic instruments to accomplish geopolitical objectives."[70] Their analysis documents the extent to which the United States and other major powers have deployed trade policy, investment restrictions, and technology controls as tools of grand strategy, and they argue that the failure to treat these instruments with the same deliberateness applied to military and diplomatic tools has imposed growing strategic costs on the United States and its partners. Of particular relevance to this paper is their argument that Washington has not sufficiently focused on building defenses to help allies resist economic pressure from rival states, leaving allied economies exposed to coercive instruments without adequate policy architecture.[71] Applied to the semiconductor sector, this framework situates export control compliance and intellectual property protection not as administrative formalities but as elements of an allied geoeconomic strategy in which the Philippines has both obligations and potential gains. The US-Philippines alliance creates a basis for the Philippines to leverage its security partnership to attract investment, access technology transfer arrangements, and secure preferential treatment within trusted supply chain networks, contingent on its demonstrated regulatory alignment. This paper examines the conditions under which that contingency can be credibly met.

Farrell and Newman provide the structural explanation for why alignment with allied network norms carries systemic consequences for states in dependent network positions. They develop a theory of weaponized interdependence that shows how "states with political authority over the central nodes in the international networked structures through which money, goods, and information travel are uniquely positioned to impose costs on others."[72] They identify two mechanisms through which hub-controlling states exert this power. First, the panopticon effect allows states with jurisdiction over network hubs to extract informational advantages from flows passing through those hubs, making it effectively impossible for peripheral actors to operate within the network without exposing their activities to hub-state scrutiny.[73] Second, the chokepoint effect allows hub-controlling states to deny peripheral actors access to network flows—a form of coercion that carries substantial economic consequences for states that lack substitutes for the hub's services.[74] In the semiconductor supply chain, export control enforcement, technology licensing regimes, and trusted supply chain designations operate through precisely these mechanisms; they allow hub-controlling states to condition peripheral actors' access to technology networks on demonstrated regulatory compliance. Farrell and Newman further argue that the ability to exploit or resist weaponized interdependence depends critically on domestic institutional configurations: "states' variable ability to

[68] Pinelopi K. Goldberg, Réka Juhász, Nathan J. Lane, Giulia Lo Forte, and Jeff Thurk, "Industrial Policy in the Global Semiconductor Sector," NBER Working Paper No. 32651, revised February 2026, 5.

[69] Goldberg et al., "Industrial Policy in the Global Semiconductor Sector," 10.

[70] Robert D. Blackwill and Jennifer M. Harris, *War by Other Means: Geoeconomics and Statecraft* (Cambridge: Harvard University Press, 2016), 20.

[71] Blackwill and Harris, *War by Other Means*, 45.

[72] Henry Farrell and Abraham Newman, "Weaponized Interdependence: How Global Economic Networks Shape State Coercion," *International Security* 44, no. 1 (2019): 45.

[73] Farrell and Newman, "Weaponized Interdependence," 55.

[74] Farrell and Newman, "Weaponized Interdependence," 56.

employ these forms of coercion will depend on the combination of the structure of the underlying network and the domestic institutions of the states attempting to use them."[75] Their observation that only the United States and a small number of other states enjoy the network position necessary to weaponize interdependence has a direct corollary for peripheral states. The Philippines cannot alter the topography of the semiconductor network, but it can manage its exposure within it by building the domestic institutional capacity that credible alignment requires. This paper applies this framework to assess the extent to which the Philippines' current export control and intellectual property institutions meet the compliance threshold that security partnership alignment demands.

3.3. Domestic Institutional Alignment (High control— sovereign)

The third and final level addresses the state's capacity to build, implement, and coordinate the regulatory architecture that both global market participation and security partnership require. This level draws on industrial policy theory and on sectoral evidence to argue that regulatory governance capacity is itself a form of industrial policy and that the absence of interagency coordination and effective enforcement constitutes a structural constraint on the Philippines' competitive positioning in the semiconductor sector.

Juhász, Lane, and Rodrik define industrial policies as "those government policies that explicitly target the transformation of the structure of economic activity in pursuit of some public goal," noting that the goal may include not only economic growth and productivity but also strategic objectives such as import substitution, export promotion, and national security.[76] Their framework identifies national security externalities as a legitimate and analytically grounded rationale for state intervention; specifically, they assert that "reducing dependence on a foreign source of supply, such as rare earth or semiconductor inputs, makes a country as a whole more secure," and that this constitutes "a social benefit that is not fully internalized in the input sourcing decisions of individual firms."[77] This rationale applies directly to export control compliance and intellectual property protection, where the state's interest in maintaining the integrity of technology flows exceeds the compliance incentives of any individual firm. Their framework also emphasizes the practical obstacles that distinguish the theoretical case for industrial policy from its effective implementation. Informational shortcomings and the risk of political capture are identified as the two primary reasons why governments fail to convert legitimate industrial policy rationales into effective interventions.[78] Juhász, Lane, and Rodrik's review of the empirical literature, drawing in part from Peter Evans's concept of embedded autonomy, further argues that the difference between successful and unsuccessful industrial policy cases lies less in the formal design of policy instruments than in the quality of cooperative relationships between state agencies and private actors and in the government's ability to acquire and use operational information about the industries it seeks to govern.[79] This paper applies this framework to assess whether the Philippine government's arrangements for semiconductor governance across the agencies responsible for export control implementation, intellectual property enforcement, and investment facilitation meet the institutional conditions that effective industrial policy requires.

Goldberg et al. further demonstrate the sectoral relevance of this level. Their cross-country analysis of semiconductor industrial policy shows that government support has been decisive in shaping which countries occupy meaningful positions in the value chain, and this support has operated through mechanisms that include direct subsidies, public R&D investment, and regulatory coordination between the state and the private sector.[80] For countries at early stages of industrial development, such as the Philippines, the state's role in establishing and sustaining the institutional environment for semiconductor production is not optional; it reflects a structural condition of the industry in which private actors alone cannot build the coordination infrastructure, signal credible commitment to global partners, or internalize the national security externalities that semiconductor supply chain participation entails. This paper uses the Goldberg et

[75] Farrell and Newman, "Weaponized Interdependence," 58.
[76] Réka Juhász, Nathan Lane, and Dani Rodrik, "The New Economics of Industrial Policy," *Annual Review of Economics* 16 (2024): 216.
[77] Juhász, Lane, and Rodrik, "New Economics of Industrial Policy," 218.
[78] Juhász, Lane, and Rodrik, "New Economics of Industrial Policy," 219.
[79] Juhász, Lane, and Rodrik, "New Economics of Industrial Policy," 236.
[80] Goldberg et al., "Industrial Policy in the Global Semiconductor Sector," 5–6.

al. sectoral evidence to argue that the Philippines' regulatory governance posture, including the coherence of its export control and intellectual property frameworks, is not separable from its industrial policy, and the absence of a consolidated regulatory strategy represents an unrealized industrial policy instrument.

The three levels are analytically distinct but sequentially dependent: the quality of domestic institutional alignment determines the credibility of the Philippines' security partnership commitments, and that credibility determines the terms on which the country can access the supply chain relationships and technology flows available to trusted suppliers.

Table 1. Conceptual Framework for the Study

Multilevel Regulatory Alignment for Security-Sensitive Value Chains				
Research Question	**Level & Control Gradient**	**Purpose**	**Variables**	**Theoretical Framework**
R1. What regulatory gaps related to intellectual property protection and export controls do semiconductor industry actors perceive, and to what extent do these perceptions reflect the quality of industry-government alignment in the Philippine semiconductor sector?	Global Market Alignment *Low control (exogenous)*	Meeting the technical, regulatory, and competitive demands of global industry value chains to sustain market participation and supply chain relevance.	Supplier capabilities, compliance codifiability, and value chain positioning.	• Gereffi, Humphrey, and Sturgeon (2005). The governance of global value chains. • Kaplinsky and Morris (2001). A Handbook for Value Chain Research. • Goldberg et al. (2026) Industrial Policy in the Global Semiconductor Sector.
R2. How does industry-government coordination on intellectual property and export control regulations affect the Philippines' competitiveness, supply chain security, and position in the global semiconductor value chain?	Security Partnership Alignment *Partial control (negotiated)*	Fulfilling allied export control regimes, technology cooperation frameworks, and security governance requirements to access and sustain trusted supply chain partnerships.	Export control alignment, intellectual property protection, strategic trust.	• Blackwill and Harris (2016). War by other means. • Farrell and Newman (2019). Weaponized Interdependence.

R3. How do government actors interpret and implement regulations related to intellectual property protection and export/trade controls in the semiconductor sector, and how aligned are these actions with industry expectations? Where do gaps or overlaps in regulatory enforcement occur?	Domestic Institutional Alignment *High control (sovereign)*	Building governance capacity to advance national development goals, fulfill sovereign industrial priorities, and credibly deliver on market and alliance demands.	Regulatory capacity, inter-agency coordination, industry-government alignment.	• Juhász, Lane, and Rodrik (2024). The New Economics of Industrial Policy. • Goldberg et al. (2026) Industrial Policy in the Global Semiconductor Sector.

4. Findings and Analysis

Evidence is organized around the three levels of the framework developed in Section 3, with fieldwork presented alongside its interpretation.

4.1 Global Market Alignment

Industry actors across the value chain expect advanced packaging to constitute the next major semiconductor innovation cycle. This expectation was reported independently by respondents in design, lithography and equipment, foundry, assembly and test, and industry associations. As transistor scaling becomes more difficult and expensive, competitive advantage is shifting toward packaging, integration, and system-level performance. Three consequences were consistently identified. First, chiplet architectures make packaging decisions integral to system performance. Second, high-value packaging processes are increasingly retained in-house at the leading edge and co-located with design rather than treated as commodity outsourcing. Third, packaging technologies are differentiating rapidly, with silicon interposers, high-bandwidth memory integration, organic interposers, large-format panel processing, and vertical stacking described as distinct capability sets.

The Philippines' current position corresponds closely to the captive governance type in the Gereffi, Humphrey, and Sturgeon typology: operations concentrated in a narrow range of tasks and dependent on lead firms for design inputs, process technology, and upgrading pathways.[81] The evidence complicates but does not overturn this reading. If packaging and integration drive the next innovation cycle, four decades of Philippine capability sit adjacent to a newly forming rent pool rather than at the chain's low-value floor. Adjacency is therefore the operative term. The country does not currently hold the capabilities to which value is migrating. Conventional packaging remains largely contracted out, and contract providers still perform most packaging work by volume, including overflow capacity for firms running their own lines. At the leading edge, however, firms are building these capabilities in facilities they own and operate, sited close to their design and fabrication activities. That pattern may ease as the cycle matures and processes become standardized enough to contract out, but it is the near-term trend. Upgrading into the segment is therefore possible but time-bound. As processes stabilize and capacity is committed, whether to those captive facilities or to competing jurisdictions, the entry points available to a new location close.

Advanced packaging and wafer fabrication also differ by approximately an order of magnitude in capital intensity. A firm developing foundry capacity

[81] Gereffi, Humphrey, and Sturgeon, "Governance of Global Value Chains," 85–86.

characterized packaging as requiring roughly one-tenth the capital of fabrication, with revenue growth in the two activities converging and packaging remaining substantially more labor intensive. An integrated device manufacturer independently confirmed a large investment gap without specifying a ratio. Both described the asymmetry as structural rather than specific to the current investment cycle.

This is where policy instruments become decisive. For an economy with constrained fiscal space and an abundant technical workforce, packaging's cost structure is more compatible with available resources than wafer-scale fabrication. Kaplinsky and Morris distinguish policy and regulatory rents as a form of rent over which governments exercise direct governance.[82] Where the capital barrier is an order of magnitude lower, the relative importance of policy advantage in determining who captures the segment rises. Regulatory capacity, including intellectual property protection and export control administration, can therefore become a source of competitive differentiation at a fraction of the cost of frontier fabrication. That differentiation is registered by lead firms and partner governments beyond the initial site-screening stage, as Level 2 develops.

Firms evaluate ecosystems rather than individual advantages, with incentives functioning as tiebreakers among qualified sites rather than entry points into consideration. This finding appeared across integrated device manufacturing, equipment, assembly and test, subnational economic development, and local industry respondents. Four conditions were repeatedly identified as prerequisites: reliable water, reliable and affordable electricity, regulatory certainty, and technical talent. Secondary considerations included operating costs, seismic and physical risk, logistics, and overall business predictability. Incentives at national, subnational, and local levels are assessed together but do not substitute for ecosystem conditions. One firm explicitly stated that its location decision was not induced by incentives; prior investment in workforce pipelines, supplier networks, and utility reliability was the decisive factor.

Investment decisions operate on an approximately two-year horizon and involve actors beyond the investing firm. Firm-side accounts across segments and geographies described roughly two years from investment decision to operation, with one case taking two and a half years from land acquisition to operation and involving approximately 250 equipment installations and a peak on-site workforce of 14,000. Evaluation is based on conditions prevailing when the assessment is made, meaning announced commitments, pending legislation, and programs still in design do not enter the comparison. Equipment and material suppliers separately reported locating themselves where their clients were situated; in one completed selection, customers named their preferred jurisdiction. Siting decisions, therefore, propagate through the chain rather than resting with the investing firm alone.

This extends the captive governance analysis. If suppliers in captive relationships follow buyers' location logic, investment promotion directed only at firms already present in the Philippines addresses an incomplete decision structure. Promotion must reach the lead firms and customers that shape downstream siting decisions.

A firm-side account described an assessment of 15 to 15 countries conducted approximately four years before the consultation; the Philippines did not appear on the selection list. The jurisdiction selected combined operating cost, existing supply-chain presence, local technical schools, and customer preference. Three of these four criteria are ecosystem conditions, and none are regulatory. The account is single-source and dated, but the Philippines' exclusion from the shortlist directly illustrates that ecosystem conditions gate entry into consideration.

The terms of the next competition are also shifting. The same account reported that Southeast Asian labor cost differentials are compressing as wages rise in earlier relocation destinations, while firms increasingly identify semiconductor and materials science engineers as the binding constraint after cost. This workforce constraint has a distinct domestic and institutional dimension. First, supply must be geographically accessible, since firms assess not only the number of engineers a jurisdiction produces nationally but also the talent available around a prospective site. A site in a province whose universities graduate few engineers in relevant disciplines may therefore face recruitment and retention costs that weaken its position even where national graduate numbers are high. Second, supply

[82] Kaplinsky and Morris, *Handbook for Value Chain Research*, 12, 65.

must be sustained, requiring retraining as process technologies change rather than relying on a single cohort assembled at start-up. Third, workforce capacity depends on linkages between universities and resident firms, through which curricula, placements, and applied research can adapt to production requirements. The relevant competitive asset is therefore not simply a large graduate pool, but a local ecosystem capable of continuously producing and upgrading specialized technical talent.

This distinction creates an important difference in lead times. Facilities can become operational within roughly two years of a siting decision, whereas the engineers necessary to staff, operate, and upgrade them require education, industry experience, and continuing training over a much longer horizon. As firms divert capacity from China, Southeast Asian jurisdictions therefore continue to compete for investment even as their cost positions converge, increasing the importance of capabilities that governments must build rather than cost advantages they may temporarily inherit. The same logic extends beyond workforce capacity to the completeness of supply chains. A separate single-source account identified substrate capacity as a gap in the US buildout, with production established in China on cost grounds and partially relocated within Southeast Asia. Relocation can therefore redistribute individual stages of production without necessarily producing a complete allied supply chain. For governments seeking to attract higher-value semiconductor activity, the competitive question is consequently not only whether a jurisdiction can host a facility, but whether it possesses or can develop the surrounding capabilities required to sustain that facility within a resilient production ecosystem.

Goldberg et al. provide the final element at this level: semiconductor industrial policies generate spillovers across the supply chain, implying that a country's regulatory environment affects more than individual firms' compliance.[83] Managing that environment is therefore both a competitive act and an administrative function, with responsibility resting ultimately with the state.

4.2 Security Partnership Alignment

External partners characterize the Philippines as regionally advanced in formal regulatory architecture but constrained in operational capacity. Consultations with officials from a bilateral export control assistance program and a technical agency engaged in strategic trade cooperation consistently described the Philippines as having one of ASEAN's more sophisticated frameworks for export controls and intellectual property protection and as a trusted participant in security-sensitive technology ecosystems. The remaining gap was operational: the preparedness, coordination, and responsiveness required to act when strategic opportunities or security contingencies arise. These assessments were informal but consistent with the regime adherence documented in Section 2.

These perspectives reflect the distinction between formal and credible alignment at the center of this study. In Farrell and Newman's account, states controlling central network nodes condition access on demonstrated compliance.[84] Statutes signal intent; operational capacity signals reliability. Trusted supply chain participation therefore depends on demonstrated performance, not regulatory coverage alone.[85]

Export-controlled work already reaches Philippine facilities without significant regulatory friction. One firm operating in the country reported that controlled workloads are routinely allocated to Philippine sites through internal compliance programs and end-user arrangements. Operational capacity is therefore demonstrated where facilities already exist but remains less tested where new activities would require greater regulatory engagement. Existing firms can absorb jurisdictional risk through their own compliance systems; new investment requires the state to demonstrate that capacity directly. The Philippines has therefore achieved the level of alignment currently demanded by existing operations, but it has not yet demonstrated the capacity required for deeper integration.

For a peripheral state, this also creates an opportunity. The same network structures that allow hub states to exclude unreliable nodes create incentives to grant

[83] Goldberg et al., "Industrial Policy in the Global Semiconductor Sector," 8, 52.

[84] Farrell and Newman, "Weaponized Interdependence," 45–46, 56.

[85] Farrell and Newman, "Weaponized Interdependence," 56–57, 75.

privileged access to reliable ones. Credibility can therefore become a condition of inclusion rather than merely a defense against exclusion.

Allied technology policy combines protective and promotional functions. Consultations with multiple bureaus of a partner foreign ministry and a technical agency described two parallel tracks: a protect track covering export controls, intellectual property, investment screening, research security, restrictions, and interdiction; and a promote track covering manufacturing capacity, technology diplomacy, partner readiness, and programs that reduce transaction friction for allied adoption. Trusted supply chain participation is an objective of the promote track, which means partner capability-building is pursued for what it enables rather than as an extension of the protect track's restrictions on technology flows. Under this approach, partners that enable speed acquire greater value. Regulatory systems that clear licenses, verify end uses, and protect proprietary technology efficiently help sustain allied production. Compliance capacity can therefore function as an instrument of allied acceleration and a commercial asset, not merely a defensive obligation.

Partner assistance is organized around functions rather than institutional models. Consultations indicated that assistance is intended to strengthen capabilities within the partner's existing administrative structure rather than transplant foreign institutions. Relevant functions include a legal basis, licensing, industry compliance and end-user due diligence, enforcement, and interagency coordination. The objective is therefore functional capacity, not institutional replication.

Partner financing instruments available to the Philippines likewise provide potential but remain largely unconnected to semiconductors. Documentary analysis of two partner institutions identified upstream support for feasibility studies, technical assistance, engineering, and transaction advisory services and downstream financing through debt, equity, guarantees, political risk insurance, and project participation. Both are active in the Philippines, but their identified portfolios focus on transport, energy, digital infrastructure, and critical minerals rather than semiconductors. The instruments therefore exist, but alliance standing has not yet been converted into sector-specific capital.

Credible alignment is also a continuing performance obligation. Export control credibility is tested through licensing turnaround, end-use verification, intangible technology transfer controls, coordination between the STMO and Bureau of Customs, and risk management in free zones. The constraints documented in Section 2.2.1—including the technical difficulty of identifying controlled items among highly specialized goods and the phased implementation of the STMA—are therefore not residual administrative issues. They can reduce the credibility premium observed by partner governments and multinational firms. Similar constraints in intellectual property governance, including case backlogs, uneven enforcement outside Metro Manila, and persistent informal markets, affect the same calculation; what partners value is consistent enforcement over time, not statutory coverage alone.

The difficulty of detecting illicit intangible technology transfer reinforces this requirement. Credibility cannot rest on enforcement outcomes or a single case but accumulates through licensing practice, end-use verification, and the competence of officials administering them. Such credibility is built gradually and cannot be assembled when needed. Level 2 alignment is therefore maintained rather than achieved, with the capacity to maintain it built at Level 3.

4.3 Domestic Institutional Alignment

Neither government nor industry stakeholders identified export controls or intellectual property protection as binding constraints on semiconductor development. Early consultations spanned industry and government, including the agencies responsible for strategic trade management and intellectual property governance. Industry respondents were asked openly about their priorities and concerns without prompting on specific regimes, and neither issue surfaced among the constraints they identified. When raised, no participant contested their relevance, but none had offered them unprompted. Across these consultations, the strategic implications of both regimes for sector positioning had not been prioritized in domestic policy discussion. This constitutes the study's central empirical finding; its significance is developed in Section 5.

The sector's own planning instrument frames competitiveness as an ecosystem problem. The 2026–

2030 Semiconductor and Electronics Industry Roadmap identifies upgrading the established export base as the central challenge, with talent, electricity, water, logistics, infrastructure, and the business environment among the principal constraints.[86] This closely matches the criteria firms reported at Level 1.

The domestic deficit is therefore not diagnosis but execution. Juhász, Lane, and Rodrik locate industrial policy failures less in the absence of rationale than in weak state–industry relationships.[87] The Philippines exhibits this problem in its approach to capability upgrading.

Government policy remains concentrated on the existing ATP segment while industry stakeholders argue that exclusive focus on current activities constrains movement up the value chain. Organized industry has advocated for a wafer lab: a smaller, innovation-oriented facility for research, prototyping, testing, and design validation, operating below commercial scale as a potential pathway toward foundry capability. The proposal was not pursued, reportedly reflecting fiscal constraints, existing incentive structures, competing priorities, and uncertainty over commercial viability. Industry regarded this as a missed opportunity, and no alternative instrument serving the same purposes has been adopted.

The episode illustrates an informational failure. The government conditioned support on demonstrated commercial viability, but demonstrating viability required the proof of concept investment that was declined. Both positions were internally coherent, but no institutional mechanism existed to resolve the circularity—no forum for jointly assessing strategic value, sequencing investment, or supplying the operational information required for an informed decision. What is missing is the embedded autonomy—the institutionalized information exchange between state and industry—associated with effective industrial policy.

Comparator jurisdictions address similar objectives through three institutional forms: a subnational public-private coordination model, a consortium foundry, and a university-hosted shared fabrication model. The coordination model acts as a single orchestrator across infrastructure, energy, water, logistics, talent, education, research, supplier development, and investment promotion. The consortium model depends on private-industry leadership, sustained legislative sponsorship, consortium financing, demonstrated customer demand, and equipment supplier participation. The university model provides shared fabrication and prototyping capacity within a research institution, with university–industry linkages also supporting workforce formation and intellectual property enforcement.

These comparators narrow the significance of the wafer lab debate. Prototyping, design validation, and workforce formation can be pursued through lower-cost shared facilities and institutions where regulatory and research functions are already embedded. The longer-term ambition also depends on preconditions the domestic debate did not address. The choice was treated as a binary between a state-funded facility and nothing, when the available institutional option set was broader.

The Luzon Economic Corridor initiative presents a related coordination problem. Its strategic framing emphasizes trusted supply chains and advanced manufacturing, but its documented portfolio centers on rail, aviation, ports, bridges, logistics, power, telecommunications, digital government, and industrial zones. International partners are engaged mainly in project preparation and technical assistance. The portfolio therefore provides stronger evidence of enabling infrastructure than direct semiconductor investment. Still, it addresses many of the ecosystem prerequisites firms identified at Level 1. The divergence is consequently one of coordination and framing rather than substantive incompatibility: strategic positioning and project selection have not been reconciled.

Unfamiliarity with the regulatory dimension, policy attention without a framework for adjacent opportunities, an upgrading dispute without a resolution mechanism, and an unreconciled infrastructure portfolio are not separate deficiencies but manifestations of a common constraint: coordination capacity. This is the binding domestic constraint.

[86] Department of Trade and Industry, *Semiconductor and Electronics Industry Roadmap 2026–2030* (Manila: Department of Trade and Industry, 2026), 21–31.

[87] Juhász, Lane, and Rodrik, "New Economics of Industrial Policy," 216-218, 235-236.

The comparator evidence also shows that coordination need not be addressed by convening another interagency council. The model that most directly addresses coordination is a public-private corporation with authority to execute rather than advise, an institutional form distinct from both the interagency bodies and the line agencies through which such functions are usually assigned. Its design is developed in Section 6.

5. The Conditional Argument

The evidence supports a conditional rather than unconditional claim, and the distinction determines what follows. Regulatory credibility operates at two margins, where the Philippines currently occupies different positions. At the workload allocation margin, where firms decide what work to place in existing facilities, credibility is already productive: controlled work reaches Philippine sites without friction. At the siting margin, where firms decide whether to establish facilities, credibility has not been tested because the Philippines has not consistently entered the relevant consideration sets. Ecosystem conditions determine entry. Only after a jurisdiction qualifies are regulatory and security-related factors able to differentiate it. The credibility asset is therefore real but only partially realized.

The study's central empirical finding follows from this sequencing. Government and industry stakeholders do not identify export control compliance or intellectual property protection as binding constraints because neither currently prevents transactions or imposes visible costs. Their non-salience therefore supports, rather than weakens, the sequencing argument. It also reveals that future credibility cannot rest on export control administration alone. As value moves toward advanced packaging, intellectual property protection will become increasingly important alongside strategic trade controls.

Three time horizons make the issue more pressing. Firms make siting decisions on an approximately two-year horizon and assess conditions as they exist at the time of evaluation. Regional labor cost advantages are also narrowing, shifting competition toward capabilities states can build. Meanwhile, advanced packaging is moving toward technologies more likely to attract security and control requirements. From an export control perspective, the traditional node-centric regulatory logic is failing to capture system-level performance gains, prompting policy analysts to call for a systematic extension of security controls to back-end materials and technologies.[88] Ramping up domestic advanced packaging capabilities is now viewed as an essential step to secure supply chains against offshore hardware vulnerabilities.[89] However, there is a risk that projecting US export controls on these technologies will drive international partners and adversaries to design domestic inputs to avoid restrictions altogether.[90] Firms move faster than jurisdictions. Credibility built only when these changes become binding will be assessed against what exists at that point.

The argument is therefore sequential. Energy, water, land, zone terms, workforce, and permitting determine whether a jurisdiction enters the consideration set; they are threshold conditions that regulatory credibility cannot replace. Among qualified jurisdictions, regulatory credibility can differentiate the Philippines in security-sensitive activities. The two are complements: credible regulation cannot compensate for weak infrastructure or talent, while ecosystem investment without regulatory credibility leaves potential strategic value unrealized. The sequence runs upward from domestic capacity; institutional capability builds partnership credibility, which can then convert existing market participation into greater market access.

6. Policy Recommendations

As regional cost advantages compress and value shifts toward advanced packaging, the capabilities determining investment are changing. The Philippines must build them before the next evaluation cycle.

---

[88] I-Yin Chung, Jin-Chian Seer, and Peter Tozzi, The Great Breakout: Advanced Packaging and China's Race for AI Compute Parity (DSET Policy Report, June 2026), 6, 40–41

[89] Rouhan Noor et al., "US Microelectronics Packaging Ecosystem: Challenges and Opportunities," arXiv preprint arXiv:2310.11651 (2023), 1, 6

[90] William Alan Reinsch, "Designing Out US Technology," Center for Strategic and International Studies (Oct. 15, 2024), https://www.csis.org/analysis/designing-out-us-technology

Provision packaging-ready sites ahead of global demand

Sites should be designated for advanced packaging and provisioned ahead of demand, each carrying a published and contractible standard for power reliability and delivered cost, water volume and quality, and quick turnaround. The Department of Energy (DOE), DTI, PEZA, and host local governments should issue the designation jointly within the current budget cycle, with PEZA accountable for performance against the standard at each site. This addresses the qualification margin at which the Philippines is currently lost.

Build the engineering depth the segment requires

Packaging and materials engineering capability should be developed at institutions serving designated sites through undergraduate and graduate programs, faculty capacity, and placement arrangements with resident firms. The Commission on Higher Education (CHED), the Technical Education and Skills Development Authority (TESDA), and the Department of Science and Technology (DOST) should scope programs against segment requirements rather than aggregate enrollment targets, with partner training and exchange filling gaps the domestic system cannot yet supply. Enrollment, curriculum, and placement data should be published alongside site standards.

The constraint firms identify after cost is not graduate volume but semiconductor and materials engineering depth. Concentrating this capability around designated sites would strengthen both workforce supply and university–industry research linkages.

Promote through the buyers, not only the investors

Investment promotion should be organized around firms whose sourcing decisions locate suppliers, treating resident lead firms as buyers whose supplier requirements can be met domestically rather than solely as prospective expanders. DTI and BOI should build target lists from those requirements, prioritizing segments where allied supply is incomplete and extending engagement to equipment and materials suppliers that follow their clients.

Siting decisions propagate through supply chains rather than being made by the investing firm alone. Where customers influence jurisdiction selection, promotion that reaches only the target investor addresses the wrong decisionmaker. Resident lead firms already operating in the country provide an existing channel.

Claim the partner financing already available

Advanced semiconductor projects should be submitted into the upstream layer of partner financing this programming cycle, framed against priorities those portfolios already support rather than as a request for a new sector line. DTI, along with the Department of Finance (DOF) and the Department of Foreign Affairs (DFA), should prepare submissions beginning with power and water capacity for designated packaging sites and substrate capacity—an adjacent segment where allied supply remains incomplete.

These instruments provide feasibility, engineering, and transaction advisory intended to make strategically significant projects commercially viable, with preparation conducted by partner country firms. The idea is therefore to apply an existing financing channel to a Philippine proposal rather than create a new one. The submission would also establish whether the gap reflects an absent Philippine proposal or a partner judgment about the sector.

Reconcile the corridor's strategic framing with its project portfolio

The Luzon Economic Corridor's semiconductor objectives should be matched to specific projects within its existing portfolio, identifying which power, water, logistics, and zone investments serve designated packaging sites and on what timeline. DTI, the Department of Economy, Planning and Development (DEPDev), and the agencies implementing corridor projects should publish this mapping alongside the site standards, and route new project selection through it.

The corridor's strategic framing emphasizes trusted supply chains and advanced manufacturing while its documented portfolio centers on enabling infrastructure. The two are compatible, since that infrastructure addresses the ecosystem conditions firms assess. What is missing is the mapping that connects them, which requires no new appropriation.

Measure capacity against the functions partners actually assess

Export-control capacity should be assessed against the five functions partner governments use when evaluating a jurisdiction: adequate legal basis, licensing capability, industry compliance knowledge and end-user due diligence, enforcement capacity, and interagency coordination. The NSC-Strategic Trade Management Committee should commission the assessment at fixed intervals and direct technical assistance toward the weakest functions, with results incorporated into the published regulatory performance record.

Partner assistance is organized around these functions rather than imported institutional models. Existing evidence points particularly to industry compliance knowledge and interagency coordination as the functions requiring attention. A formal assessment would establish the size of those gaps and create a baseline against which improvement can be measured.

Charter a Philippine Semiconductor Development Authority

A chartered corporation should be established to execute the national semiconductor program, modeled on the Bases Conversion and Development Authority and compliant with the Government-Owned and Controlled Corporation (GOCC) Governance Act. Its mandate should cover the sector, with advanced packaging and adjacent segments as the initial priorities. It should designate priority sites, bind participating agencies to commitments attached to designation, develop or contribute to site infrastructure, participate in consortium and shared-facility instruments, contract with partner financing institutions, and require agency reporting against targets. Its board should be chaired at cabinet level, include the relevant trade, energy, science, higher education, and zone administration agencies, and reserve fixed-term seats for private and academic members.

Coordination is the binding domestic constraint identified across the study, reflected in unfamiliarity with semiconductor governance, limited frameworks for adjacent segments, unresolved upgrading disputes, and fragmented strategic initiatives. Comparator jurisdictions address similar problems through a single accountable public–private lead rather than line-agency coordination.

Corporate form is necessary because an advisory council cannot perform these functions while its mandate can be revoked by a succeeding administration.

Publish the regulatory performance record

An annual regulatory performance report covering the semiconductor and electronics sector should be published jointly by STMO and IPOPHL, issued by department order and drawn from data the agencies already hold. It should report licensing turnaround as a distribution rather than an average, including the tail alongside authorization volumes, end-use verification activity, IP case disposition by type, and enforcement actions and outcomes. Where a metric is not yet collected, the report should state this and provide a collection date.

Credibility accumulates as an administrative record, but performance that is not published cannot be assessed by firms or partners. The Philippines already has a favorable baseline; publication would convert that performance into observable evidence and could begin within one budget cycle.

Fund shared prototyping through a university-hosted facility

A shared prototyping and packaging-characterization facility should be established at a designated research university, focused on packaging and integration rather than wafer-scale fabrication, with industry participating in funding and governance. DOST and CHED should establish it as a dedicated program with its own appropriation and a consortium agreement, with IP arrangements governed by the Technology Transfer Act.

Comparator jurisdictions provide prototyping, design validation, and workforce formation through shared facilities at a substantially lower cost than dedicated public fabrication facilities. Industry co-funding would also provide evidence of demand rather than assuming it, while locating the facility in a university would strengthen university–industry research linkages.

Sequencing

The recommendations are presented by level of alignment but should be executed in reverse order. Once more, domestic institutional action produces partnership credibility; partnership credibility converts market position into market access.

Several measures require neither legislation nor new appropriation: namely, publishing the regulatory performance record, assessing export control capacity against partner functions, submitting projects to partner financing, reorganizing promotion around buyers, and reconciling the corridor's strategic framing with its project portfolio. These can proceed immediately and independently, converting existing capabilities into forms firms and partners can observe.

Site readiness, the engineering programs attached to designated sites, and the shared prototyping facility require appropriation and should proceed within the current budget cycle. Site readiness is the precondition for entering evaluations the Philippines currently misses.

Chartering the Philippine Semiconductor Development Authority is the only recommendation whose full value lies beyond the immediate cycle. It is retained because coordination is the binding constraint identified by the study and because institutional capability cannot be assembled once demand arrives.

7. Conclusion

The Philippines' position in security-sensitive semiconductor value chains is shaped not only by its technological capabilities but by its regulatory credibility. Among the pathways available to the country, deliberately constructing compliance capacity stands out as one that is within reach, largely within sovereign control, and undervalued in current policy discussions.

The Philippines' established share of global ATP output is a strategic asset whose value depends on trusted supply chain access, while the anticipated shift toward advanced packaging could increase its importance. Access is governed by networks that price demonstrated capacity, not formal architecture. That capacity is produced domestically, where the binding constraint is coordination: domestic institutional capacity produces partnership credibility, and partnership credibility sustains and expands market opportunity.

This pathway does not foreclose longer-term upgrading into design and fabrication. The incremental capability-building recommended here is intended to strengthen the country's position while keeping those pathways open. But for middle-income economies in security-sensitive value chains, compliance capacity is a distinct asset in its own right. It is not a cost of market participation, but a policy advantage that can be deliberately constructed, is difficult to replicate, and is increasingly priced by the networks that govern access.

The Philippines begins with an established industrial base and a position in a segment that trusted supply chains continue to value. What remains is the institutional work of converting those advantages into demonstrated performance.

ABOUT THE AUTHOR

BERNARD ERROL M. ADVINCULA is a policy consultant in Manila working on industry-government relations across manufacturing, defense, artificial intelligence, and semiconductors. He is a non-resident fellow with the Philippines Technology Policy program at Pacific Forum, where his research covers semiconductor governance, export controls, intellectual property protection, and trusted supply chains in Southeast Asia, and an affiliate of Safe AI Philippines. He has served as policy officer at the Lead-Acid Battery Recycling Initiative, leading its regulatory engagement with Philippine environmental agencies, and as advocacy research associate at the European Chamber of Commerce of the Philippines, covering defense, intellectual property, and emerging technology. He holds a degree in diplomacy and international relations from Ateneo de Manila University.

Pax Silica for Pax Filipina?

Closing the Gaps in the Philippine Semiconductor Sector

By
Florence Principe Gamboa

Executive Summary

Florence Principe Gamboa

The Philippines enters 2026 with a rare convergence of opportunity. It is now recognized as an emerging semiconductor giant in Southeast Asia, has formally entered the US-led Pax Silica Initiative, and is building a 4,000-acre Economic Security Zone within the Luzon Economic Corridor (LEC). This paper examines whether the country's policy architecture is ready to convert that opening into durable industrial capacity rather than repeating a familiar pattern of hosting foreign investment without building lasting capabilities of its own.

The Global Tech Race

Washington and Beijing are each racing to secure technological primacy, though from different positions. The United States (US) is defending an innovation lead that is showing signs of erosion, whereas China is working to escape dependencies. Neither strategy can fully succeed alone, since no single country can internalize the entire semiconductor supply chain. This is the logic behind allied scaling and friendshoring: distributing chipmaking capacity across trusted partners instead of concentrating or reshoring it. This concept solidifies the rationale of the Philippines' entry into Pax Silica.

Sound Legal Foundation, Uneven Implementation Record

The Strategic Trade Management Act (STMA) and Memorandum Circular 25-20 give the Philippines a legally credible export control regime. It is on par with global, Western standards. Over the course of researching for this paper, it was revealed that the country's persistent challenges are operational rather than legislative: high power costs, lacking infrastructure, a widening skills gap, and uneven private sector compliance. Left unaddressed, these risk producing a "zombie industry"—one that hosts foreign capacity without ever building its own. That risk is reinforced by a remittance-driven "Dutch disease" that has historically let the country skip a foundational phase of industrialization. This finding is corroborated independently by sources from the industry itself; trade and export control management is not among the leading obstacles firms weigh—a convergence that shifts the burden of proof onto implementation rather than legislation.

Underexamined Risks

Beyond funding and compliance gaps, this paper surfaces risks that have so far received little policy attention: energy constraints as Malampaya depletes, food security impacts from converting agricultural land for economic zone development, water resource limits, and indigenous peoples' ancestral domain rights. Left unaddressed, each carries the same consequence: legal challenges, project delays, and community (and wider public) opposition capable of stalling the very investment Pax Silica is meant to attract.

Lessons from Other Players

Malaysia and Vietnam are the Philippines' closest peers in development stage, and both offer instructive comparisons. Malaysia shows that even a mature semiconductor exporter still needs greater diversification and stronger academia-government-industry linkages. Vietnam shows the value of sequencing trade law, industrial strategy, and coordinating infrastructure together rather than treating export control reform as a standalone measure. Singapore's Economic Development Board (EDB) highlights the power of a single statutory body that invests strategically, while Japan's Rapidus model illustrates that moving into upstream capacity requires state funding and support.

Recommendations

To translate this opening into durable capacity, this paper outlines a clear, multi-stakeholder roadmap:

For the Philippine Government:

1. Empowered Leadership: Appoint a single, empowered LEC Economic Czar with statutory authority over PEZA, BCDA, and BOI within the corridor to streamline approvals under a single desk. This office must oversee the success of LEC through the next action points.
2. Energy Planning: Directly confront high power costs and coordinate baseload grid additions.
3. Pax Silica Terms: Require tech transfer, local supplier integration, and high-value ATP and R&D over energy-draining data centers, targeting commercial wafer fabs long-term (post-2027).
4. Export Controls: Firm up STMO compliance authority and eliminate ambiguous IRR language.
5. Infrastructure and Workforce Sequencing: Invest in inter-port logistics and workforce pipelines ahead of announcements.
6. Indigenous Rights: Mandate FPIC consultations and LGU Sanggunian approvals from project inception and before sites have been finalized.
7. Environmental Safeguards: Enforce strict water assurances, closed-loop recycling, and effluent reporting.
8. Bespoke Investment Courtship: Shift from generic incentives to targeted, high-value, intelligence-driven investor recruitment.
9. State-Catalyzing Capital: As a long-term goal, emulate Japan's Rapidus model with direct bridge-financing for R&D labs.
10. Multilateral Hedging: Deepen ASEAN (AFISS) ties to derisk against foreign political pivots.

For the US Government and Pax Silica partners:

1. Anchor Pax Silica in durable statutory instruments rather than temporary executive funds.
2. Foreign government funders (for instance, the US DFC and Japan) must explicitly condition financing disbursements on demonstrated procurement transparency, process audit standards, and strict anti-corruption safeguards to support domestic reformers.
3. US and partners should also support extending energy grid and nuclear feasibility to power the LEC.

For the Private Sector & Civil Society:

1. Private investors must play a bigger role in addressing public mistrust toward top-down government projects. They can lead direct community engagement, publish independently audited environmental metrics, and establish genuine, transparent CSR programs.
2. Citizens and civil society must maintain constructive watchdog scrutiny while guarding against bad-faith influence operations.

Opportunity, Not Guarantee

Pax Silica may provide favorable security and economic conditions for industrialization, but favorable conditions alone do not translate into capacity. The Philippines benefits only if the initiative is implemented well, which is not something Washington can do on the Philippines' behalf. The Philippine government must take the lead, working alongside affected communities and the private sector already on the ground. The US can and should provide real support, but support is not a substitute for ownership; the heavy lifting has to be done by Manila. The Philippines has a chance to build its own version of Taiwan’s “silicon shield” or become a part of the “silicon testudo”: a leverage gained by making itself indispensable to allied supply chains rather than dependent on any single power. Whether that chance becomes durable industrial capacity depends on whether the country’s security-economic policy matures as quickly as its diplomatic standing already has.

Introduction: The Global Tech Race

The COVID-19 pandemic shifted how the world views national security and geopolitical primacy beyond its traditional sense. No longer confined to military assets and capacities of power projection, security now entails unhampered access to the global supply chain. With the pandemic prompting an unprecedented scale of lockdowns and disruptions, many vulnerabilities in the supply chain were exposed. [1] As great power competition unsurprisingly bleeds into technology, a state's primacy necessitates the protection of its semiconductor and silicon supply chain.

This issue is all the more important given the situation in the Indo-Pacific that threatens the world's supply of semiconductors. The region itself is a critical node for the supply chain and it is besieged due to Chinese activities.[2] Early in the pandemic, the US State Department released an overview of what China has been doing in the region.[3] Most notable of these are its occupation in the South China Sea and its encroachment on Taiwan.

From a security perspective, sustainability of the supply chain requires protection, because while all aspects of the supply chain are dominated by the US and its allies, they are threatened by China's rapid push to catch up and expand its own markets. [4] China's race to become self-sufficient in semiconductors has been met with several obstacles.[5] The country faced active opposition by the US, global decoupling efforts and backlash against its activities in the Indo-Pacific, and internal contradictions in its vision. China is still heavily reliant on global markets despite its mutual desire to decouple and become a dominant player in the industry. Its struggle between concentrating on security vs. development is an example of what other states will have to contend with.[6]

Taiwan, which plays a key role in global shipping, is also home to the Taiwan Semiconductor Manufacturing Company (TSMC), the dominant company in contract chipmaking. [7] Taiwan is the source of 65% of the world's semiconductors and almost 90% of the advanced chips.[8] The importance of the industry to the world has established a "silicon shield" for Taiwan, providing the world ample reason to protect Taiwan.[9] Yet Taiwan remains the primary subject of China's actions in the region. Recent years have seen Taiwan in the middle of a struggle between the US and China, particularly as the latter desires to "unify" with Taiwan by its centennial year in 2049. [10] The loss of TSMC to a Chinese invasion of Taiwan would result in a loss of $1.6 trillion USD for the US economy alone and $1 trillion USD from the global economy annually.[11] The US and Taiwan recently reached a deal that resulted in $250 billion USD investment into the US to increase production of semiconductors, with the ultimate goal of putting 40% of Taiwan's entire supply chain under US protection, internally and externally.[12]

Neither Washington's innovation-race posture nor Beijing's self-sufficiency drive can fully succeed on its own, because as previously stated, the semiconductor supply chain cannot be monopolized by a single state. No single country can internalize the

[1] Moosavi, Javid, et al. "Supply chain disruption during the COVID-19 pandemic: Recognizing potential disruption management strategies." International Journal of Disaster Risk Reduction, Vol. 75, 2022.
[2] Thadani, Akhil and Gregory C. Allen. "Mapping the Semiconductor Supply Chain: The Critical Role of the Indo-Pacific Region." CSIS Briefs, Center for Strategic & International Studies, May 2023.
[3] United States Department of State. "China's Military Aggression in the Indo-Pacific Region."
[4] Khan, Saif, et al. "The Semiconductor Supply Chain: Assessing National Competitiveness." Issue Brief, Center for Security and Emerging Technology, January 2021.
[5] Jiang, Yang. "China's response to the US tech war." DIIS Policy Brief, Danish Institute for International Studies, July 3, 2023.
[6] Hai, Jiawei Steven. "What's happening in China's semiconductor industry?" Economics Observatory, May 28, 2025.
[7] "Crossroads of Commerce: How the Taiwan Strait Propels the Global Economy." Council on Foreign Relations, Oct. 10, 2024.
[8] Dasgupta, Saibal. "Race for Semiconductors Influences Taiwan Conflict." Voice of America, Aug. 10, 2022.
[9] "Taiwan's dominance of the chip industry makes it more important." The Economist, March 6, 2023.
[10] Sacks, David. "Why China Would Struggle to Invade Taiwan." Council on Foreign Relations, Aug. 22, 2023.
[11] Project 2049 Institute and US-Taiwan Business Council. "United States, Taiwan, and Semiconductors: A Critical Supply Chain Partnership." June 21, 2023.
[12] Hunnicutt, Trevor. "US and Taiwan reach trade deal, with semiconductor chips and China in focus." Reuters, Jan. 16, 2026.

entire chip-making process.[13] Raw materials come from China and Ukraine, design software and intellectual property come from the US, South Korea, and Europe, lithography machines come from the Netherlands and Japan, and specialty chemicals and photoresists come from Japan. All of these inputs converge at foundries like TSMC, but the foundry cannot function without the upstream nodes that feed it. Components of a single chip can cross more than 70 international borders during its production cycle—from raw material to finished device—a concrete illustration of just how distributed this process already is.[14]

This structure is described as a "silicon testudo" rather than a single "silicon shield." Like the interlocking shields of a Roman infantry formation, no individual chokepoint (not TSMC, not ASML's lithography monopoly, not America's dominance in electronic design automation software, not Japan's specialty chemical supply) is independently sufficient to deter conflict or sustain the industry, but together they form a collective structure that is far harder to dismantle or replicate than any one link alone.[15] Hence, while Taiwan is a vital piece of the "testudo" it is not the only country worth shielding in the whole supply chain.

This highlights the value of friendshoring over reshoring. Analysts argue that attempting to fully internalize the semiconductor supply chain within a single country's borders rather than distributing it across trusted allies actually unravels the very interdependence that constrains aggressive action, since it removes the mutual stakes that make disruption costly for everyone involved. Diversifying production across allied and partner states, by contrast, preserves that web of mutual dependency while still reducing any single point of failure.

Allied scaling calls for the US to pool the markets, industrial capacity, and technological innovation of its allies rather than compete with a dominant rival alone.[16] The Philippines, a vital ally of the US in the Indo-Pacific, is globally recognized as an "emerging semiconductor giant" in Southeast Asia, owing to expertise in Assembly, Testing, and Packing (ATP) and other related engineering services.[17] However, tensions in the South China Sea have slowly escalated since the onset of the pandemic and have particularly affected the national security interests of the Philippines.[18] As such, the effect of Chinese aggression now goes beyond the US-Philippines Mutual Defense Treaty, as the Philippines exports a significant share of its semiconductors and electronic products to the US.

Pax Silica and the LEC are allied scaling in practice. Instead of the US building semiconductor capacity by itself, the initiative distributes that capacity across partner states, including the Philippines. In this perspective, the Philippines, while not meant to replace any single node in the chain, becomes a significant interlocking piece, diversifying where the world's chipmaking capacity sits without severing the ties that keep great-power competition from tipping into conflict.[19] It is therefore in the interest of the allies to ensure that the Philippine semiconductor and technological supply chain remains robust.

The Philippines: Where We Are and Why We Need to Develop

The Philippines has a long and reputable history of aligning its national policies with international standards. It shares in the desire for a secure and resilient supply chain. A key piece of legislation toward that end is Republic Act No. 10697, also known as the Strategic Trade Management Act (STMA), which was passed in November 2015.[20] Under this law, the Philippines will "manage the trade of strategic goods and provision of related services" for the purposes of safeguarding national security interests and public safety. It was primarily

[13] Pham, Phuong and Melle Scholten. "The Chain of Peace: Do Supply Chain Chokepoints Deter War?" War on the Rocks, June 11, 2026.
[14] Bean, Jeffrey and Andreas Kuehn. "Building Resilient Supply Chains: The Case of Semiconductors". ORF America. Background Paper No. 26.
[15] Bean, Jeffrey and Andreas Kuehn. "Building Resilient Supply Chains: The Case of Semiconductors". ORF America. Background Paper No. 26.
[16] Ramesh, Akhil and Florence Principe Gamboa. "Pax Silica for Pax Filipina: Allied-Scale in Action." The Pilot #34, Pacific Forum, May 21, 2026.
[17] Weno, Rifki, et al. "ASEAN's Emerging Semiconductor Giant: The Philippines' Rising Role in the Global Supply Chain." ASEAN Business Advisory Council, Nov. 7, 2025.
[18] Maalouf, Khaled Robert. "China in the Indo-Pacific: October 2025." Council on Foreign Relations, Nov. 24, 2025.
[19] Pham, Phuong and Melle Scholten. "The Chain of Peace: Do Supply Chain Chokepoints Deter War?" War on the Rocks, June 11, 2026.
[20] Republic of the Philippines, Congress. Strategic Trade Management Act (STMA). 2015. Official Gazette of the Republic of the Philippines.

centered on preventing the proliferation of Weapons of Mass Destruction (WMDs) by imposing export controls on essential goods such as semiconductors and electronics.

The law classifies strategic goods into three categories: 1) Military Goods, 2) Dual Use Goods, and 3) Nationally Controlled Goods under the National Strategic Goods List.[21, 22, 23] Per the Implementing Rules and Regulations (IRR), these management systems will be established and maintained by the Strategic Trade Management Office (STMO) under the Department of Trade and Industry (DTI).[24] Semiconductors are mentioned multiple times in the Dual Use Goods list in various contexts involving microprocessors and transistors. Section 3B001 is dedicated to the equipment for the manufacturing of semiconductor devices or materials. At the start of 2023, STMO sent a circular to the Philippine Economic Zone Authority (PEZA) mandating that all export strategic goods listed under the Dual Use Goods list strictly required duly signed authorization from the STMO.[25]

The DTI issued Memorandum Circular 25-20 on December 18, 2025 to "strengthen regulatory oversight on the export, re-export, and reassignment of strategic goods."[26] The STMO includes provisions for re-export or reassignment as specific conditions in issued export authorizations. A "re-export" is the shipment of strategic goods to another foreign country after having originally been imported into or exported from the Philippines, while "reassignment" is the transfer of strategic goods within a foreign country from one entity to another. The circular also emphasized that the strategic goods must be shipped to the approved destination countries and end users and must be used solely for the authorized declared purpose.

The export of strategic goods (specifically, the dual-use goods of semiconductors) is a lucrative business for the Philippine economy. In 2021, profits on strategic goods exports reached $4.5 billion USD.[27] Per STMO, this figure was a massive increase from the $3.6 million USD from 2020. The top destinations of these exports were the US (60%), Japan (21%), Singapore (5%), South Korea (4%) and China (3%). According to the Semiconductor Industry Association (SIA), as of 2023, the Philippines became a "critical player in the global semiconductor industry and a major hub for semiconductor assembly and test manufacturing".[28] This view was bolstered the following year at a dialogue with the Philippine Board of Investments (BOI) when Jose Fernandez, the then-US Undersecretary of Economic Growth, Energy, and the Environment, acknowledged the Philippines' significant growth in semiconductors and critical minerals industries.[29] The BOI stated in July 2025 that the Philippine government is committed to advancing the Filipino semiconductor industry through "strategic policies, workforce development initiatives, and targeted incentives to attract further high-value investments and foster innovation."[30] The STMA was enacted to propagate this advancement, bolstered by other government pronouncements and policies. A recent example was in March 2025 when the Philippine government, through Administrative Order 31, created the Semiconductor and Electronics Industry (SEI) Advisory Council, tasked with providing strategic guidance and industry insights to

---

[21] Republic of the Philippines, Congress. Philippine National Strategic Goods List Annex 1: List of Military Goods. Official Gazette, April 22, 2019.

[22] Republic of the Philippines, Congress. Philippine National Strategic Goods List Annex 2: List of Dual Use Strategic Goods. Official Gazette, Feb. 1, 2019.

[23] Republic of the Philippines, Congress. Philippine National Strategic Goods List Annex 3: List of Nationally Controlled Goods. Official Gazette, Aug. 24, 2020.

[24] Republic of the Philippines, National Security Council, Strategic Trade Management Committee. Implementing Rules and Regulations of Republic Act No. 10697. Official Gazette, Aug. 31, 2017.

[25] Republic of the Philippines, Philippine Economic Zone Authority. Memorandum Circular No. 2022-075. Dec. 27, 2022.

[26] The Philippine Business and News. "PH tightens rules on re-export of strategic goods." THEPHILBIZNEWS, Jan. 5, 2026.

[27] Desiderio, Louella. "Strategic goods exports surge to $4.5 billion in 2021." The Philippine Star, Feb. 22, 2022.

[28] " Global semiconductor players remain confident in Philippine investment prospects, visit the Philippines to explore cooperation and business opportunities." Philippine Board of Investments, Jan. 17, 2023.

[29] "PH, US forge strategic collaboration in semiconductors and critical metals." Philippine Board of Investments, Feb. 5, 2024.

[30] "PH Semiconductor Industry Gains Momentum with New Manufacturing Lines Supporting Global Automotive, EV Market." Philippine Board of Investments, July 1, 2025.

implement the Philippine Semiconductor and Electronics Industry (PSEI) Roadmap.[31]

The semiconductor industry in the Philippines has been praised the world over. In 2024, the value of the industry was at $42.74 billion USD,[32] accounting for 70% of the country's total exports, with a potential of reaching $50 billion in electronics exports in 2026.[33] Aside from being the top exporter of semiconductors in ASEAN, the Philippines is the source of 5% of the global semiconductor market.[34] The importance of the Philippines to the supply chain is recognized by the US, as it was excluded from a series of tariffs briefly enacted in 2025,[35] before they were nullified and pending appeal in early 2026.[36] Dr. Danilo C. Lachica, President of Semiconductor and Electronics Industries in the Philippines Foundation, Inc. (SEIPI), stated in late 2024 that it was time for the Philippines to become a semiconductor superpower.[37]

SIA has found a correlation between robust export control frameworks and increased foreign direct investment, since predictable compliance regimes build the corporate trust firms need before committing capital.[38] However, while the Philippines demonstrates strong export control policies, some challenges persist. The BOI, together with the OECD, released a report that discusses these hurdles – namely, the high cost of electricity (especially given an unstable power grid infrastructure), a widening skill gap (with a notable shortage of specialized professionals), limited services in ATP and design (preventing the industry from expanding), and regional competition (states like Vietnam have a more developed ecosystem).[39] Some recommendations provided by the OECD directly address the aforementioned hurdles to developing the semiconductor industry. The report finds that Philippines needs to 1) improve its business environment with stable policies, 2) improve key infrastructures like airports and power grids, 3) invest in public and private initiatives to develop the ecosystem, and 4) establish an adaptive education and training system for human capital.[40]

In terms of human capital, industry consultations done for this paper describe the gap as compounding rather than static. Technicians and engineers trained in the Philippines leave shortly after training for higher-paying roles in Singapore or South Korea, which means the country is subsidizing training costs for regional competitors as much as it is building its own workforce.

Notably, these persistent challenges are largely operational and infrastructural rather than legal. In a discussion conducted for this paper, it was revealed that, from a purely legal standpoint, the Philippines already has a strong export control framework in place. That assessment suggests the STMA and its implementing regulations are not, by themselves, the country's binding constraint. The harder work lies in translating a sound legal architecture into consistent enforcement and investment-ready implementation.

This assessment is echoed by Dr. Lachica. According to him, trade and export control management are "not the biggest" obstacle firms weigh when considering the Philippines, ranking well below power costs, logistics, cooling water, labor unrest, and incentive instability. He pointed to PEZA's strict, GPS-tracked monitoring of goods movement through the ecozones as evidence that technical smuggling is not a live concern for an industry that is almost entirely export-oriented, unlike sectors such as cigarettes or garments. Another independent source, an export control official, arrived at the same conclusion: the STMA's adequacy is not seriously in question. What remains in question is everything downstream of it.

---

[31] Republic of the Philippines, Office of the President. Administrative Order No. 31. Malacañang Records Office, March 28, 2025.

[32] Desiderio, Louella. "Chipmakers see modest export growth in 2025." The Philippine Star, May 4, 2025.

[33] Zapanta, Logan Kal-El M. "Electronics exports poised for 12% growth." Inquirer, Dec. 29, 2025.

[34] "PH Semiconductor Industry Moves to Boost Competitiveness Amid Global Trade Risks." GoodElectronics, July 17, 2025.

[35] Cordero, Ted. "PH top export semiconductors, electronics spared from Trump's 20% tariff — Go." GMA News, July 10, 2025.

[36] Hawkins, Ari. "Trade court rules Trump's replacement tariffs illegal." Politico, May 7, 2026.

[37] Lachica, Dr. Danilo C. "Is PH the next semiconductor superpower?" Inquirer, Oct. 10, 2024.

[38] "Export Control and National Security Policy." Semiconductors.Org, Accessed Aug. 1, 2026

[39] Santos, Roger. "Philippine Semiconductor Industry 2025 Outlook." John Clements, Sept. 27, 2025.

[40] OECD. "Promoting the Growth of the Semiconductor Ecosystem in the Philippines." OECD Publishing, 2024.

Pax Silica: The Vehicle for Development

Domestic policies were meant to align with the umbrella of US-led initiatives. During the Biden administration (2021-2024), the chief push was the International Technology Security and Innovation Fund (ITSI),[41] a product of the CHIPS and Science Act enacted in August 2022.[42] At the time, the law was seen as proof of the US-led push to secure the global supply chain and fortify it from future shocks. In terms of semiconductors specifically, the ITSI was meant to support certain efforts such as securing earth materials for production, strengthening international policy coordination, and protecting national security. Of paramount importance to the Philippines, though, was the "Expanding and Diversifying Downstream Capacity in the Indo-Pacific and the Americas" effort, which was meant for the US to support partners like the Philippines in addressing gaps and safeguarding the supply chain. The CHIPS Act was designed to bring the semiconductor industry to the forefront of US investment and development while simultaneously prohibiting any expansion by China,[43] but its attempt to achieve the latter goal hampered investment and cooperation from both the private sector and from allied states.[44] The fund itself was split into two tracks: a "Protect" half focused on export control capacity building and a "Promote" half to help expand downstream capacities in key partner countries (including the Philippines) that would in turn diversify the global semiconductor supply chain and workforce development. The "Promote" half was paused for review before recently receiving approval to restart, and this distinction matters for how the funding gap described in the recommendations is read. The ITSI fund was left hanging—not because of a clean termination but rather a partial, uneven, and confusing pause.[45]

The situation remains the same for the US under the current Trump administration. The US is prioritizing the growth of its own semiconductor industry with the possibility of leveraging tariffs on international partners if the domestic sector is threatened.[46] Yet, the US has also backtracked on applying tariffs, as evidenced by the Philippines' semiconductor industry being exempt.

Taking a page from the Biden-era ITSI and CHIPS Act, the current administration held the inaugural Pax Silica Summit in December 2025. The Summit is a gathering of states in the semiconductor supply chain with the core goals of deepening cooperation and fortifying the economy.[47] Pax Silica is meant to deepen economic and security cooperation between the US and its partner countries through the "transformative force" of AI.[48] The Philippines officially joined the initiative on 16 April 2026 as the 13th signatory with the announcement of a 4,000-acre industrial hub dubbed an Economic Security Zone within the LEC.[49] The site itself will be established in New Clark City in Tarlac and jointly governed, described by US Undersecretary of State for Economic Affairs Jacob Helberg as a "new model" for "AI-native investment acceleration hubs" among Pax Silica partner states.[50]

The LEC began as a 2024 trilateral between the Philippines, the US, and Japan. It stretches from Manila in the National Capital Region south to Batangas and north to Clark and Subic, encompassing an area that generates about 62% of the Philippine GDP.[51] Among the many objectives of the LEC is to transform and strengthen the Luzon region

---

[41] United States Department of State. "The US Department of State International Technology Security and Innovation Fund."
[42] United States, Congress. Public Law 117-167, CHIPS and Science Act. govinfo.gov, 2022.
[43] "The CHIPS Act: What it means for the semiconductor ecosystem." PwC.
[44] Shivakumar, Sujai, et al. "'Guardrails' on CHIPS Act Funding to Restrict Investments in China May Restrict Participation in CHIPS Act Incentives." Center for Strategic & International Studies, Nov. 7, 2023.
[45] US Department of State, "Securing Semiconductors: How to Scale Up Global Semiconductor Production and Protect US National Security at the Same Time." May 15, 2023
[46] United States, President of the United States of America. Adjusting Imports of Semiconductors, Semiconductor Manufacturing Equipment, and Their Derivative Products into the United States. Jan. 14, 2026. The White House.
[47] Office of the Spokesperson. "Pax Silica Summit: Fact Sheet." United States Department of State, Dec. 11, 2025.
[48] US Mission to ASEAN. "Pax Silica Initiative." Accessed June 1, 2026.
[49] US Embassy Manila. "The United States and The Philippines Launch Plans for 4,000-Acre Economic Security Zone to Shore Up Supply Chains: First AI-Native Industrial Acceleration Hub Under Pax Silica." April 16, 2026.
[50] Philippine Daily Inquirer. "Pax Silica: What's in it for PH." April 22, 2026.
[51] International Trade Administration. "Philippines Luzon Economic Corridor." July 8, 2024.

as "a key node in regional supply chains, particularly semiconductors" and to "strengthen supply chain resilience for critical technologies."[52] In early May 2026, the LEC added Australia, Canada, Denmark, France, Italy, South Korea, Sweden, and the United Kingdom (UK) to its list of partners.[53] Some notable stated contributions from the onset include Italy's public financial support to attract Italian companies in various sectors, such as semiconductors, and South Korea's P1.5 billion PHP grant to enhance digital connectivity and establish the National Cyber Security Center.[54]

In a recent joint statement, the initial trilateral remarked on the LEC's role in digital connectivity and advanced infrastructure, calling it a "a critical node in trusted, global technology supply chains, complementing the Pax Silica initiative".[55] The Philippines has received further reaffirmation from both Japan and the US. President Ferdinand R. Marcos Jr. and Japanese Prime Minister Sanae Takaichi pledged to develop the LEC into a "world-class economic hub" for the purpose of safeguarding global supply chains.[56] US Secretary of State Marco Rubio made a similar pledge to President Marcos over the phone.[57]

Already, this has proven to be a boon to the Philippines. The country has been identified as a potential supplier of key mineral resources and is currently working on a memorandum of understanding with other states.[58] The Bases Conversion and Development Authority (BCDA), a government-owned and controlled corporation under the Office of the President of the Philippines that is overseeing the zone, stated that more than 50 companies are "keen" to invest in the Pax Silica initiative in New Clark City.[59] The inclusion of the other states into the LEC has also brought in a surge of investments and development pledges to address issues in infrastructure and energy. Advanced Semiconductor Engineering, a Taiwanese-based firm, announced plans to expand its operations at a PEZA-registered site with the construction of a 26,000-square-meter facility.[60] BCDA has since laid out a concrete timeline: contract negotiations are underway in 2026, with a framework agreement expected to be signed in November, formal planning to follow in 2027, and groundbreaking on construction targeted for early 2028.[61]

The LEC's staying power owes something to its own history. Because it originated as a 2024 US-Japan-Philippines trilateral before Pax Silica existed, the LEC does not depend entirely on the current initiative for its institutional survival, partially addressing a chronic weakness of American industrial policy in which the priorities of one administration are not always carried forward by the next.[62] Timing has also worked in the Philippines' favor. As ASEAN Chair for 2026, the Philippines hosted US Undersecretary Helberg at the inaugural US-ASEAN AI Ministerial in Singapore on May 20, 2026 held on the margins of Asia Tech x Singapore, giving Manila a platform to press its advantage while it holds the chairmanship.[63] Investment interest has followed accordingly, extending beyond the original Pax Silica signatories to include the United Arab Emirates.[64]

This momentum has translated into concrete interest from both the private sector and the US government itself. The Lowy Institute has called Pax Silica[65] "the

[52] US Embassy Manila. "Fact Sheet: Luzon Economic Corridor." May 12, 2026.
[53] US Embassy Manila. "Luzon Economic Corridor Expands Partnership to Accelerate Investment and Regional Prosperity." May 12, 2026.
[54] US Embassy Manila. "Luzon Economic Corridor Expands Partnership to Accelerate Investment and Regional Prosperity." May 12, 2026.
[55] US Embassy Manila. "Joint Statement from the United States, Japan, and the Philippines on the Luzon Economic Corridor Steering Committee." May 12, 2026.
[56] Gita-Carlos, Ruth Abbey. "PH, Japan vow to develop 'world-class' Luzon Economic Corridor." Philippine News Agency, May 29, 2026.
[57] Cabalza, Dexter. "Marcos, Rubio discuss WPS, Luzon corridor in 'productive' call." Philippine Daily Inquirer, June 1, 2026.
[58] Dela Cruz, Raymond Carl. "Israel eyes PH as Pax Silica partner for AI, semiconductor push." Philippine News Agency, May 27, 2026.
[59] Domingo, Rommel. "50 firms keen on PH 'Pax Silica' hub." Philippine Daily Inquirer, June 17, 2026.
[60] Zapanta, Logan. "Taiwan's ASE expands Philippine chip manufacturing hub." Philippine Daily Inquirer, Feb. 5, 2026.
[61] "Planned Pax Silica Project Heeds National, International Laws: BCDA." Philippine News Agency, July 24, 2026.
[62] Ramesh and Gamboa, "Pax Silica for Pax Filipina."
[63] Ibid.
[64] Ramesh and Gamboa, "Pax Silica for Pax Filipina."
[65] Camba, Alvin. "The Philippines has a golden chance to get Pax Silica right." Lowy Institute, June 12, 2026.

best opening the Philippines has had in decades to escape the low end of regional manufacturing." The planned AI hub will, according to Ferdinand Ferrer, president of the Philippine Chamber of Commerce and Industry (PCCI), create "opportunities for domestic suppliers to participate in the production of AI-related hardware and data center equipment."[66]

The Philippines would do well to ensure American interest is sustained. The US International Development Finance Corporation (DFC), which is already aligned with developing the Pax Silica economic zone, stated that it was interested in "financing major American-backed projects in the Philippines."[67] The DFC has an investment capacity of $205 billion and can disburse this through "loans, equity investments, political risk insurance and other financing tools for private sector projects."

The US House Committee on Appropriations recently published a report noting that the government was assessing the feasibility of a joint ammunition manufacturing and storage facility at Subic Bay, reflecting the possibility of a dual economic-security character of Pax Silica cooperation beyond semiconductors alone. [68] The newly appointed US Ambassador to the Philippines, Lee Lipton, is reported to have stated US interest in accelerating "the artificial intelligence-focused industrial enclave" planned in the LEC.[69] Philippine Finance Secretary Frederick Go, also the country's investment czar, said that the LEC was "generational" and estimated to create hundreds of thousands of new jobs.[70]

BCDA's own economic projections, unveiled in a July 2026 Palace briefing, put the site's initial investment target at $10 billion, rising to $40-70 billion at full development, with an estimated addition of 130,000 to 190,000 direct jobs and 500,000 to 800,000 indirect or induced jobs, alongside $200 billion in projected exports and roughly ₱75 billion in annual tax revenue.[71] The site itself has been precisely defined at 1,620 hectares within the larger 9,450-hectare New Clark City property, and it may offer investors land leases of up to 99 years.[72]

Why the Philippines Needs to Develop Now

Overseas Filipino Worker (OFW) remittances have long cushioned the Philippine economy, but economists have also linked that same remittance inflow to a form of "Dutch disease" wherein the influx of foreign currency resulted in national exports stagnating or deindustrializing, making the country skip a foundational phase of industrialization altogether. [73] Semiconductors already account for 58.81% of the country's total electronic exports, yet the industry's expertise remains concentrated in ATP, which makes up 73% of Philippine semiconductor manufacturing services.[74] As a result, the Philippine economy is flimsy. Pax Silica is a chance to address the missed industrial phase, but only if investment moves beyond ATP into the upstream, higher-value segments of the chip value chain: design, research, and advanced manufacturing.

This urgency is also sharpened by regional competition, for without a deliberate push of its own, the Philippines will fall further behind its peers in Southeast Asia. Across the region, other states are proactively executing targeted industrial strategies to funding infrastructure and building smoother logistics and transportation systems to capture foreign investments. Vietnam has established itself as an electronics assembly powerhouse, securing major supply chain investments from Samsung, Apple, and other global semiconductor packaging firms. Malaysia has solidified its role as a premier center for semiconductor testing and packaging, leveraging dedicated industrial hubs in Penang to attract billions in advanced microelectronics capital. Singapore is leading in the more advanced end of the value chain: IC design and R&D. Indonesia has transformed its domestic mining sector by placing a strict ban on unrefined nickel exports, successfully forcing foreign

[66] Zapanta, Logan Kal-El. "Apple contractor to 'level up' chip sector." Philippine Daily Inquirer, July 14, 2026.
[67] Zapanta, Logan Kal-El. "US investment arm keen on Pax Silica, Luzon Economic Corridor." Philippine Daily Inquirer, July 9, 2026.
[68] Mendoza, John Eric. "US House panel's push for Subic ammo plant 'not surprising'—envoy." Philippine Daily Inquirer, July 3, 2026.
[69] Zapanta, Logan Kal-El. "Go: US keen on fast-tracking 'top priority' Pax Silica." Philippine Daily Inquirer, July 11, 2026
[70] Ibid.
[71] "BCDA Pegs Pax Silica Investment at Up to $70B." BusinessWorld, July 24, 2026.
[72] "Pax Silica Investors May Lease New Clark Land for 99 Years – BCDA." Philstar.com, July 24, 2026.
[73] Ramesh and Gamboa, "Pax Silica for Pax Filipina."
[74] Ibid.

firms to build multi-billion-dollar domestic smelting and battery-processing infrastructure rather than ship the raw ore abroad. None of these positions happened passively. Each reflects a strategy aimed at securing a state's place in the value chain by creating the necessary business environment, infrastructure, and incentives.

Risks and Challenges

The LEC connects the major economic hubs of Subic Bay, Clark, Metro Manila, and Batangas. These hubs are home to several LGUs, each facing their own unique local challenges and receiving uneven support and attention by the national government.

a. Domestic Risks: Corruption, Land, and Community

A major problem when it comes to investments in the Philippines is corruption. The issue is all the more highlighted given the recent flood control scandals.[75] It is a longstanding issue in Philippine affairs, and a root of public mistrust in Pax Silica. A survey by Pulse Asia published at the start of 2026 saw that 96% of people in the National Capital Region (Metro Manila) believe corruption is widespread in the government – a sentiment shared by the rest of the country and notably 93% of people in Luzon.[76] Corruption in Manila caused it to slide in the Smart City Index of Switzerland-based Institute for Management Development's World Competitiveness Center, and it is viewed by 71% of the index's respondents as an urgent priority to address.[77] The surge of investments and development aid from international partners and private sector entities means that the Philippines and investors need to ensure transparency measures are in place. The "zombie industry" that the Philippines suffers from could be worsened by the funds intended for the LEC being lost to corruption.

The absence of trust in the government stemming from decades of corruption and mismanagement is mirrored and exacerbated by the various criticisms about Pax Silica. Farmer and peasant groups such as the *Kilusang Magbubukid ng Pilipinas* warned that the project could intensify conversion of agricultural land used for rice, coconut, and other food production into industrial and mining corridors, raising food security concerns even as the government promotes the initiative as a generational economic opportunity.[78] The group has also pointed to unresolved environmental contamination linked to former US military installations in Subic and Clark as a reason for caution around further military-adjacent industrial development in the same corridor.[79]

Indigenous peoples' advocates and human rights groups have also raised distinct concerns. Civil society groups opposing Pax Silica claim that a large share of existing mining permit applications in the Philippines, estimated at roughly 72-75%, already fall within the ancestral domains of indigenous communities, and they warn that the increased mineral demand accompanying Pax Silica could put indigenous communities at further risk of displacement.[80] Petitions filed against the initiative have specifically cited the displacement of indigenous and farming communities, alongside environmental degradation, as reasons for concern.[81] These concerns are not merely political; they are backed by legal and institutional mandates of the country. Under the Indigenous Peoples' Rights Act of 1997, Indigenous Cultural Communities and Indigenous Peoples hold a legally enforceable right to Free, Prior, and Informed Consent (FPIC) before any project affecting their ancestral domains may proceed, administered through the National Commission on Indigenous Peoples.[82] No government agency or corporation may issue a new concession, license, lease, or production-sharing agreement affecting an ancestral domain without that consent.

[75] Latoza, Guinevere. "Marcos freed up P214B in unprogrammed funds for 'priority' infra. Many of these projects prioritized graft over the public good." Philippine Center for Investigative Journalism, Nov. 6, 2025.

[76] Abarca, Charie. "Pulse Asia: 94% of Filipinos say corruption in PH gov't is widespread." Philippine Daily Inquirer, Jan. 9, 2026.

[77] Desiderio, Louella. "Corruption pulls down Manila in Smart Cities." Philippine Star, April 1, 2026.

[78] "Group slams Pax Silica as 'massive sellout' of country." Philippine Daily Inquirer, April 20, 2026.

[79] Ibid.

[80] "Sci-tech coalition opposes Pax Silica over 'resource plunder,' env't harms." Rappler, April 29, 2026.

[81] "Explainer: Why is the Philippines offering the US-led Pax Silica 4,000 acres of land?" Sustina, July 7, 2026.

[82] Republic of the Philippines, Congress. Republic Act No. 8371 (Indigenous Peoples' Rights Act of 1997). Official Gazette of the Republic of the Philippines, Oct. 29, 1997.

BCDA has released statements to address these concerns. The agency stated that the designated site is public land titled to BCDA under its own 1992 charter, not covering ancestral domain, and that more than 15,000 hectares within the broader Clark Special Economic Zone remain separately allocated for indigenous peoples' use in Bamban, Porac, and Floridablanca. It has designated a 50-hectare agricultural zone and a 10-hectare Aeta Ethnobotanical Center to support roughly 300 Aeta farmers, alongside relocation areas for affected households, and describes Pax Silica as a purely commercial initiative that will not host defense-related activities or on-site mining. [83] However, Agham has reported that BCDA has issued an initial list of persons to be displaced by the project, confirming the necessity and utmost importance of FPIC and resource-sharing safeguards, not just as a precaution against a distant risk but to ensure sustainable growth of a process already underway.[84] Given how urgently the Philippines needs this opportunity, the government cannot afford to treat these concerns as an afterthought; doing so risks legal challenges, project delays, and the kind of community opposition that will slow potential industrialization in the country.

b. Energy and Resource Constraints

As the country attempts to move higher up the value chain through wafer fabrication and AI data centers, concerns have also been raised about the immense power and water resources needed for these to operate. The scale of the Pax Silica corridor's energy and water demand is among the biggest concerns of civil society groups. With the site projected to require approximately 130 million liters of water a day and 3 gigawatts of electricity, the strain would translate to 16% of Luzon's entire current grid capacity and is comparable to the water consumption of 600,000 households, or the output of three coal plants or one nuclear facility. [85] This problem cannot be simply solved by pricing and taxation when the composition of the Philippines' own power supply is questionable. Malampaya, the offshore Palawan gas field that has supplied roughly a fifth of the country's electricity needs, feeds four major power plants directly in Batangas province, including one of the LEC's own growth centers, and is expected to be commercially depleted by 2027. [86] A new discovery nearby, Malampaya East-1, offers some relief, but even accounts of the find acknowledge it is not positioned to replace Malampaya's role, and analysts have cautioned that leaning further into gas risks deepening dependence on imported LNG rather than accelerating the renewable transition to which the country has already committed.[87]

With the promise of more investments, the Philippines is better positioned to diversify. It remains the world's third-largest geothermal power producer, having recently ceded second place to Indonesia, and the Department of Energy has set an explicit target of reclaiming that position by expanding installed capacity to 3,000 megawatts by 2030. [88] Geothermal offers a genuine comparative advantage rooted in the country's own volcanic geography; unlike solar, it runs as a reliable baseload power, and unlike a wafer fab drawing from a shared reservoir, it does not compete with agricultural or residential users for the same water.[89] Solar and other renewables are also moving quickly: a $406 million, 422-megawatt floating solar deal announced in June 2026 was notably designed to sit above active fishponds in Pampanga and Negros Occidental without displacing the aquaculture beneath it — precisely the kind of resource-sharing design that should become standard practice, not the exception.[90]

A more contested option sits geographically closer to the LEC itself. The Bataan Nuclear Power Plant (BNPP) sits on the Bataan peninsula adjacent to the Subic Bay growth center that anchors the LEC's western end. Pax Silica co-signatory South Korea has a state-run nuclear energy corporation – KHNP. The entity is currently conducting a feasibility study on

[83] "BCDA Offers Farms, Jobs to Farmers Affected by Pax Silica Project." Manila Bulletin, Aug. 3, 2026.
[84] "Scientists' group debunks claims on Pax Silica project" Philippine Daily Inquirer, July 27, 2026.
[85] Mendoza, Teodoro."Pax Silica brings promise – but at what cost?" Philippine Daily Inquirer, July 30, 2026.
[86] "New gas find to power 5.7M households a year." Philippine Daily Inquirer, Jan. 20, 2026.
[87] "Natural gas in the Philippines: A test case for Southeast Asia's energy transition." Reccessary, 2026.
[88] "Global Top 10 Geothermal Power Countries at Year-End 2025." ThinkGeoEnergy, Jan. 13, 2026.
[89] "Philippines strives to regain position as 2nd largest geothermal power producer." ThinkGeoEnergy, March 15, 2026.
[90] "Floating Solar Hits 422 MW in Philippines: Pile-Supported Design Preserves Fish Below." Tech Times, June 29, 2026.

BNPP's revival, and in March 2026 it signed a memorandum of understanding with Meralco and Korea's Export-Import Bank covering technology transfer, workforce development, and financing.[91] The Philippine government targets an addition of 1,200 megawatts of nuclear capacity by 2035, though revival cost estimates for Bataan alone range from roughly $1 billion to $4 billion,[92] and the plant's proximity to Mount Natib and nearby fault lines has drawn renewed opposition from science advocacy groups who argue the seismic and waste-storage risks remain unresolved.[93]

c. Structural and Institutional Risks

The Philippines faces a myriad of challenges internally and externally. Domestically, the Philippines needs to foster and sustain an environment friendly to investors and businesses. The OECD has flagged the absence of a national strategy, complications in power infrastructure, a lack of local funding and investment, an undermanned capacity, weak physical infrastructure (such as roads), and high electricity utility costs as significant factors weighing on the investment potential of the Philippine semiconductor industry.[94] In response, it emphasizes "a cohesive blueprint" of streamlining regulations, improving infrastructure, investing in R&D, developing human capital, and embracing global partnerships as a means of the country cementing "its status as a reliable global semiconductor hub."[95]

Across stakeholder discussions, physical infrastructure remains a persistent weak point. Beyond the OECD's general warning about road quality, the industry's own assessment is more specific, identifying logistics—especially the difficulty of moving goods efficiently between the country's own internal ports—as one of the Philippines' core weaknesses, standing alongside high energy costs and workforce attrition as reasons investors hesitate.[96] This is a reason why big investors choose Vietnam over the Philippines. In ATP, components and finished goods need to move quickly, seamlessly, and predictably between facilities and ports. This concern is consistent with the broader tenor of the industry consultations conducted in Silicon Valley for this paper, where operational costs repeatedly surfaced as a quiet deterrent to investment.

These issues need to be addressed quickly. Otherwise, the Philippine semiconductor industry risks devolving into a "zombie industry" as other states, driven by sustained government investment, upgrade their capacities for the latest generation technologies. Businesses want stability, and ease of doing business is very important for investors.[97] Without addressing these, the Philippines risks repeating previous industrialization efforts by only hosting foreign entities under Pax Silica rather than investing in and nurturing its own domestic industry.[98]

Harmonization of tax and business incentives is also vital. In a discussion with SEIPI, Lachica recounted a case in which a US multinational corporation had earmarked $1.6 billion in investment and 10,000 jobs for the Philippines, only to redirect it to Vietnam after the CREATE Law retroactively altered the tax incentive terms the company had budgeted around. SEIPI raised the issue directly with the government, arguing that operating costs like power and logistics needed to be leveled before incentives were. Once that capital left for Vietnam as brick-and-mortar investment, it could not be recovered. The government has since taken some corrective steps. Lachica credited the "Create More Roadshow" under Secretary Go with restoring PEZA's autonomy to approve investment decisions, presenting the CREATE Law's disruptions as having been fixed, though he noted this progress was later interrupted by other developments.[99]

[91] "Nuclear Power in the Philippines." World Nuclear Association. Accessed July 2026.

[92] "Bataan nuclear plant's future hinges on new independent regulator." Asian Journal, Nov. 18, 2025.

[93] Mangaluz, Jean. "Science advocates renew call against Bataan nuclear power plant revival." Inquirer.NET. July 22, 2022

[94] OECD. "Promoting the Growth of the Semiconductor Ecosystem in the Philippines." OECD Publishing, 2024.

[95] Attrey, Angela, et al. "7 strategies to strengthen the semiconductor ecosystem in the Philippines." OECD, Jan. 16, 2025.

[96] Chatham House Rule Discussion from Semiconductor Industry Representatives to Pacific Forum Philippine Technology Policy Fellows. Feb. 12, 2026

[97] Zapanta, Logan. "Taiwan's ASE expands Philippine chip manufacturing hub." Philippine Daily Inquirer, Feb. 5, 2026.

[98] Manila Bulletin. "Philippines must do more than host AI, chip investments under Pax Silica—UPSE paper." June 4, 2026.

[99] Lachica, Danilo. Remarks to Pacific Forum Philippine Technology Policy Fellows. May 29, 2026.

This resistance to moving beyond ATP is not merely structural; Lachica describes it as institutional. In a SEIPI commissioned study, the report recommended pursuing a wafer fabrication capability alongside advanced ATP and IC design, but that recommendation was sandwiched in with other data instead of being highlighted, resulting in a stagnation of investments in traditional ATP. The private sector initiated efforts to pursue a small-scale, prototyping "wafer lab" hosted at Malayan College, intended not to compete commercially but to train talent and build a proof of concept that could eventually attract a multinational to install a commercial fab in the country. The proposal has stalled repeatedly: an initial DOST-housed version was judged financially unsustainable, and the privately-based follow-up has struggled to secure enough equipment donors, pushing its timeline from 2026 into 2027. This demonstrates that without a deliberate institutional push, the Philippines' comfort with ATP becomes self-reinforcing rather than a stepping stone.[100]

The CONVERGE Report of Pacific Forum states that the Philippines needs to empower its agencies (specifically the STMO) to properly engage with the multifaceted issues surrounding strategic goods such as semiconductors.[101] In an interview, Manantan remarked that the Philippines is a viable location for developing advanced chips due to its strict alignment with US export controls, but he warned that industry and policy must go hand-in-hand. The government must work closely with the private sector in this endeavor so that the Philippines can readily cooperate with its neighbors and partner states. Manantan, too, stressed that "no country can truly dominate one single technology given the intricacy of supply-chains."[102]

Fortunately, the government is aware of these issues. Executive Secretary Ralph Recto reaffirmed the administration's support for the industry at a meeting with the Semiconductor and Electronics Industry Advisory Council.[103] In an interview, an official at the STMO noted that the agency is meant to ensure secure trade of high-value dual-use items in compliance with international standards and commitments and to improve both Philippine defense and economy. They spoke of the STMO's processes and policies, including the Control List that classifies the items and guidelines meant for dual-use tech. One specific guideline worth evaluating was the Internal Compliance Program, which held a provision for the Technology Control Plan, where applicable. This is because the private sector varies in their degree of compliance. The IRR allows for leeway, as certain policies allow companies to comply "as applicable" or "as needed."[104]

A senior official at the BOI explained that the Philippines has used its status as a longstanding ally of the US to platform itself as an alternative base of operations for manufacturing critical technology. At the time of the interview, the official noted that all activities related to the ITSI fund were at a standstill since the funding ceased. The fund was meant to increase Philippine capacity for ATP and to show how complementary the country was to US interests. Some projects of the BOI in 2026 were meant to be funded by the ITSI, and as such, they were not included in the government's annual budget.[105]

None of these issues can be holistically addressed without sound and clear policy as the foundation. The Philippines needs to codify the changes necessary to secure its own industry and its place in the global supply chain. Furthermore, the Philippines needs as much support from its allies and partners to enhance and sustain its role in the global supply chain.

The long history of being allies with the US is what helped bring the Philippines into the Pax Silica Initiative, and The Philippines' record as a steadfast, longstanding partner of the US is what helped bring it into the Pax Silica Initiative and what keeps it in the current administration's favor. Secretary of War/Defense Pete Hegseth praised the Philippines as a prime example of "burden-sharing."[106] In that same

[100] Lachica, Remarks to Pacific Forum Philippine Technology Policy Fellows.

[101] Manantan, Mark Bryan, et al. "CONVERGE: Indo-Pacific Critical Tech Cooperation." Pacific Forum International, November 2025.

[102] Manantan, Mark. Interview. March 3, 2026.

[103] Gita-Carlos, Ruth Abby. "Palace vows to boost growth of semiconductor, electronics sector." Philippine News Agency, March 24, 2026.

[104] Interview with Senior Official, Strategic Trade Management Office. March 5, 2026.

[105] Interview with Senior Official, Board of Investments. March 16, 2026.

[106] Philippine Star. "Pentagon chief cites Manila as defense burden-sharing example." May 31, 2026.

address, Hegseth pressed NATO and European allies to raise their own defense spending or risk losing US support,[107] underscoring that Washington's patience with allies that do not pull their weight is limited, even as it continues to deepen ties with partners like the Philippines that consistently deliver. These statements, coupled with the recent further investment in the LEC under Pax Silica, shows the favorable position that the Philippines has in its relationship with the US. That reliability is precisely why the US cannot afford to let the Philippine economy drift into China's orbit.

Lessons from Other Industry Players

The challenges that the Philippines is facing in industrializing and developing its semiconductor industry are not new. Semiconductor manufacturing technology, from chip design to advanced fabrication processes, has been happening globally for decades, and the country is merely catching up in a race that started long ago. Viewing this delay in a positive light, the country now has an opportunity to learn from other players in the industry and imbibe frameworks that have been beneficial to them..

a. Community

Taiwan's repeated droughts in 2021 and 2023 caused a clash between rice farmers and chipmakers—a tension that persisted even after TSMC invested heavily in water recycling and conservation. [108] Taiwan had to prioritize among these groups' competing interests. It provided compensation and subsidies to farmers and landowners and implemented other water-saving measures, including turning off the tap for residents and businesses in three cities and counties two days a week. High-volume industrial users, including semiconductor manufacturers, have been asked to reduce water usage by 13%, while non-industrial users, such as hair salons and car wash businesses, must reduce their usage by 20%. [109] This kind of scenario is exactly what the Philippines should seek to avoid.

Rapidus, a Japanese semiconductor manufacturer, owns a site in Hokkaido that offers a more positive working example. The company joined the city's Nature Coexistence Site Promotion Council specifically to help protect water sources critical to the surrounding community [110] and cited environmental harmony with the site's surroundings as a factor in its site-selection decision, not a concession extracted after the fact.[111]

The US state of Arizona also offers both lessons and cautionary tales. Arizona requires developments to demonstrate an assured water supply verified for at least 100 years before approval – something that the Philippines' site-selection and planning process should also mandate. TSMC has cited that standard explicitly as a reason it chose Phoenix[112] and has since invested in its own water reclamation plant to push its recycling rate above 90% and reduce net municipal draw.[113] However, water policy analysts caution that even a 100-year assurance is not a guarantee; it depends on evolving drought conditions, Colorado River allocations shared among multiple states, and demand growth from the very industries it was designed to accommodate. TSMC's expansion alone is projected to make it Phoenix's largest water customer.[114]

The lesson for the Philippines cuts both ways. A formal, legally binding water assurance standard, rather than an ad hoc case-by-case review, is worth adopting outright. However, given how quickly even Arizona's assurance has been tested by expansion, Philippine standards should be set with more conservative headroom than the American benchmark, planning for demand beyond the current generation of investment rather than just the horizon of a deal being signed today.

[107] Philippine Daily Inquirer. "US Defense Sec. Hegseth to NATO, Europe: Raise defense spending or else."
[108] Kuhn, Anthony. "Epic drought in Taiwan pits farmers against high-tech factories for water." NPR, April 19, 2023.
[109] "Taiwan is experiencing its worst drought in nearly 60 years." Earth.Org, April 23, 2021.
[110] "Rapidus Joins Chitose City Nature Coexistence Site Promotion Council." Rapidus Corporation, July 31, 2026.
[111] "Rapidus Selects Chitose City in Hokkaido for its New State-of-the-Art Semiconductor Plant." Rapidus Corporation.
[112] "TSMC Arizona Expansion Could Make It Phoenix's Largest Water Customer." AZFamily, July 23, 2026.
[113] "TSMC Breaks Ground on Water Reclamation Project in Phoenix, Arizona." Data Center Dynamics, June 18, 2026.
[114] "TSMC Arizona Fabs vs AI Data Centers: Water, Jobs and Power Trade-Offs." Windows Forum, 2026.

b. Policy

The Philippines is not alone in pursuing its place in the semiconductor supply chain. ASEAN's own Framework for Integrated Semiconductor Supply Chain (AFISS) aims to transform the region into a "vertically integrated semiconductor production base." [115] Malaysia and Vietnam, the Philippines' closest peers in development stage, illustrate two different paths toward that goal and two different sets of lessons for the bottlenecks discussed here.

Malaysia offers the clearest structural parallel. Its Strategic Trade Act of 2010 (STA) curbs WMD proliferation through a dual-use goods framework similar to the STMA, implemented by the Ministry of Investment, Trade and Industry and supported by the Malaysia Strategic Trade Control Community (MYSTCC). [116] The STA has allowed Malaysia to manage the US-China rivalry over semiconductor chips, along with Malaysia's pivot away from Chinese investments into its semiconductor industry. [117] Semiconductors already account for roughly 40% of Malaysia's total exports, and $12.8 billion in foreign direct investment poured into Penang, the country's semiconductor hub, in 2023 alone.[118] As of 2026, it has been a little over two years since Malaysia enacted its National Semiconductor Strategy under Prime Minister Anwar Ibrahim, wherein the government established a roadmap "to develop 60,000 highly skilled professionals and support 110 domestic corporate champions" as Malaysia transitions from ATP to advanced innovation.[119] Malaysia also has a history, however, of having "high-quality" plans only to lose momentum during implementation. [120] Its own analysts argue the country still needs greater diversification, a deliberate hedging strategy between major partners, and stronger linkages among academia, government, and industry—the same gaps this paper identifies for the Philippines.[121]

Vietnam offers a faster-moving comparison. Its 2025 Decree on Strategic Trade Control[122] and Law on the Digital Technology Industry[123] were passed as part of a single, coordinated legislative push under Prime Minister Pham Minh Chinh aimed at moving the country from an ATP player into a full semiconductor player within five to ten years. [124] Vietnam's semiconductor industry, valued at $10.16 billion in 2025, is projected to nearly triple to $31.28 billion by 2027, and the country has already put up a National Multi-Project Wafer Coordination Center to support that transition.[125]

Vietnam's goals and achievements have attracted the attention of the US, which announced in early 2026 it would remove Vietnam from its export control list and grant it access to technologies needed to make advanced chips. [126] The Lowy Institute notes that Vietnam is succeeding due to: 1) building the basics in becoming a reliable ATP sector; 2) creating a local supplier base to make it indispensable in the supply chain; 3) developing comprehensive legislation and policy direction; and 4) leveraging its local strength in the sciences talent and low labor cost in the ATP to attract investors and tech companies.[127] Aside from this, Vietnam has strategically-placed ports, airports and transportation systems that support its industrial

[115] "ASEAN Framework for Integrated Semiconductor Supply Chain (AFISS)." Economic Research Institute for ASEAN and East Asia, 2025.

[116] Malaysia, Parliament. Act 708: Strategic Trade Act 2010. 2010. Federal Official Gazette.

[117] Lee, Cassey and Francis E. Hutchinson. "Malaysia's Semiconductor Industry: Performance, Pitfall and Potential." ISEAS – Yusof Ishak Institute, April 16, 2026.

[118] "Malaysia is emerging as a new semiconductor powerhouse." World Economic Forum. Accessed Jan. 23, 2026.

[119] Gomes, Vanessa. "Global semiconductor industry heats up, Malaysia confident in moving up the value chain." The Edge Malaysia, July 15, 2026.

[120] Lee, Cassey and Francis E. Hutchinson. "Malaysia's Semiconductor Industry: Performance, Pitfall and Potential." ISEAS – Yusof Ishak Institute, April 16, 2026.

[121] Singh, Jaideep, et al. "Supply chains and geopolitical crisis: The semiconductor industry and case of Malaysia." Institute of Strategic & International Studies (ISIS) Malaysia, December 2025.

[122] Socialist Republic of Vietnam, National Assembly. Decree No. 259/2025/ND-CP: On Strategic Trade Control. 2025. Vietnam Official Gazette.

[123] Socialist Republic of Vietnam, National Assembly. Law No. 71/2025/QH15. 2025. Vietnam Official Gazette.

[124] "PM calls for nationwide synergy to propel Vietnam's semiconductor industry." People's Army Newspaper, Aug. 4, 2025.

[125] Singh, Sudhanshu. "Vietnam's Semiconductor Industry: Progress and Outlook Beyond 2025." Vietnam Briefing, March 3, 2025.

[126] Vijayakumar, Anupama. "Vietnam's chip bet – and America is all in." Lowy Institute, May 15, 2026.

[127] Ibid.

zones. A number of tech companies have already signed investments onto Vietnam's plans to grow from 2026 to 2030.[128]

The lesson for the Philippines is less about the specific legal instruments than the sequencing: Vietnam moved on passing its trade law, creating an industrial strategy, and coordinating infrastructure in concert to achieve its aims. This is in stark contrast to what appears to be the Philippine legal position of treating export control reform as a standalone measure.

c. Institutional Models

Based on official announcements, the LEC is governed by a Steering Committee sharing top-level oversight with senior diplomats and advisors from the US and Japan. In practice, however, execution is distributed across a fragmented matrix of independent departments, with NEDA, DTI, DOF, BCDA, and autonomous zone authorities like SBMA and CDC at the forefront. Without a single agency empowered to overrule institutional red tape, private investors face a multi-headed bureaucracy, competing priorities, and separate regulatory approvals across dozens of national agencies and local government units. Furthermore, because the Steering Committee relies heavily on political alignment at the executive level, any shift in political priorities—an unavoidable outcome of election cycles—risks plunging this multi-agency model into siloed paralysis.

To overcome this, the Philippines could draw lessons from Singapore's Economic Development Board (EDB). Established in 1961 as a single statutory board under one ministry, the EDB runs Singapore's industrial strategy end to end[129]: it courts specific firms directly rather than issuing generic incentive packages, and it invests strategically—building specialized, long-term infrastructure for semiconductor fabs before companies even commit.[130] While the Philippines' BOI serves as a primary promotion and tax-incentive body, it lacks the legal mandate, land ownership, and capital deployment powers of the EDB. It cannot master-plan land, override autonomous ecozone charters across Subic and Clark, or pre-build physical infrastructure. Bridging the gap between the LEC's strategic ambition and ground-level execution will require an empowered, unified coordinating body with actual institutional authority. This coordinating board can provide institutional continuity which can further be strengthened if there is a single accountable leader that drives development and makes the board move.

Singapore also backs that institutional model with a governance record that gives investors confidence: it ranks third least corrupt in the world and cleanest in ASEAN on Transparency International's Corruption Perceptions Index, something that the Philippine government should strive to achieve.[131] Singapore is also committing $37 billion to research and development broadly, with S$800 million earmarked specifically for semiconductor advanced packaging and photonics through EDB and A*STAR – putting money where its mouth is. This kind of commitment represents the exact mentality that Philippine leaders should have to be able to shift to an upstream capacity.[132]

Lessons from community, policy and institutional stakeholders show that the Philippines' peers succeeded not by having more resources but by treating implementation with strategic thinking. Taiwan, Rapidus, and Arizona show the importance of taking environmental and community stewardship seriously, and the need to prepare before conflict or disaster happens, not after. Malaysia and Vietnam show that a comprehensive approach and direction, not any single legal instrument, is what separates a country that moves up the value chain from one that stalls partway through. Singapore's EDB shows that sound institutional design, and particularly, a single empowered body with real authority, is what turns ambition into infrastructure and investment, even across election cyles. . These are certainly concepts that the Philippines can strive to emulate and build upon.

---

[128] Hồng Vinh. "Vietnam's semiconductor market set to grow by $2.22bln by 2030 amid investment surge." VnEconomy, July 22, 2026.

[129] Pek, Sara. "Economic Development Board." National Library Online. Accessed July 24, 2026.

[130] "The Future of Silicon: Semiconductors in Singapore" Singlife, May 16, 2025.

[131]"2025 TI CPI: Singapore Maintains Global Third Spot and Top Position in Asia Pacific." Corrupt Practices Investigation Bureau (CPIB), Singapore, 2026.

[132] "EDB Year 2024 in Review." Singapore Economic Development Board (EDB), 2025.

The Semiconductor Industry Association identifies five requirements companies weigh when considering new jurisdictions: investment and operational costs, infrastructure, regulatory and trade environment, workforce, and the depth of the surrounding supplier ecosystem.[133] Every example discussed above (Taiwan, Rapidus, Arizona, Malaysia, Vietnam, and Singapore) maps onto one of those five—a confirmation that what worked for them was never coincidental.

Risk-Benefit Matrix and Policy Recommendations

The semiconductor supply chain has become one of the clearest arenas in which post-pandemic notions of security, resilience, sustainability, and unhampered market access are being tested. For the Philippines, that test has arrived at a moment of genuine opportunity. The country is positioned to achieve three objectives simultaneously: (1) entrenching itself as a semiconductor hub, (2) fortifying its credibility as a reliable economic and security partner, and (3) attracting the investment needed to build self-reliant capacity rather than remaining dependent on foreign markets and economies. The alignment of the STMA and MC 25-20 with international standards, paired with the Philippines' favorable standing within both ASEAN and the Pax Silica framework, gives the country a genuine foundation to build from, but a foundation is not yet an outcome.

Taiwan's "silicon shield" gave one small state outsized protection by making itself indispensable to the world's chip supply. Integrating into Pax Silica's allied semiconductor network gives the Philippines a chance to build a version of that same shield for itself, hedging between the major powers rather than depending on either one alone.[134]

The challenges for the Philippines are clear and many, but the investment case is strong: the LEC has drawn dozens of interested firms, the DFC has signaled deep financing capacity, and successive US officials, from Hegseth with his "burden-sharing" praise to Rubio with his direct pledge to Marcos, have reaffirmed the relationship at the highest levels. These gains sit alongside unresolved vulnerabilities: volatile commitments based on leadership, uneven strategic trade compliance (ICP) enforcement, the risk of hosting foreign capacity without building domestic industry, infrastructure gaps in power, logistics and transport, domestic concerns on water and land use, and workforce shortage threaten to undercut progress in the semiconductor industry (especially the LEC), regardless of how much investment interest they attract. The Philippines should view these opportunities as a challenge to develop policies that mitigate risks and cover vulnerabilities, which is what is attempted below:

a. **Risk-Benefit Matrix**

Dimension	Benefit / Opportunity	Risk / Vulnerability	Policy Recommendation	Timeline Horizon
Investment & Capital	The Luzon Economic Corridor (LEC) has drawn dozens of interested firms; the US Development Finance Corporation's (DFC) $205B capacity signals durable financial backing beyond symbolic diplomacy.	The abrupt cessation of the ITSI Fund froze 2026 Board of Investments (BOI) projects, highlighting a funding cliff; relying on bilateral/private goodwill leads to stalled projects.	The Philippine government needs a domestic bridge-financing mechanism so momentum does not stall on foreign funding cycles; it should emulate state-backed models like Japan's Rapidus to provide direct public capital for domestic R&D facilities.	Immediate to Short-Term (2026–2027)

[133] https://www.semiconductors.org/new-sia-report-offers-policy-blueprint-for-facilitating-global-semiconductor-investment/

[134] Ramesh and Gamboa, "Pax Silica for Pax Filipina."

Industrial Development	The LEC aims to move the Philippines beyond low-end ATP work toward higher-value, upstream processes of the chip value chain.	The risk of devolving into a "zombie industry" that hosts foreign capacity without ever building lasting domestic capabilities, capturing value, or moving beyond traditional ATP.	Incentive structures must move away from generic packages toward targeted, bespoke courtship of specific firms while requiring technology transfer, local supplier integration, and R&D co-investments as conditions of participation.	Short to Medium-Term (2026–2028)
Governance & Public Trust	Widespread public and international scrutiny following major domestic corruption scandals creates tangible political momentum for institutional reform and transparency.	There is deeply ingrained corruption, red tape, and public mistrust risk stalling development or misallocating corridor funds.	The Philippine government should hold continuous consultations and release transparency documents about the LEC. Foreign government funders and partner nations (e.g., US DFC) must explicitly condition financing disbursements on demonstrated procurement transparency, process audit standards, and strict anti-corruption safeguards. Private firms must also play a role in actively bridging the institutional trust gap by leading direct community engagement, publishing independently audited environmental metrics, and co-creating transparent CSR programs.	Immediate & Continuous (2026 onwards)
Regional Positioning & Hedging	The Philippines can serve as a trusted, indispensable node in allied supply chains while modeling a viable balancing framework for hesitant ASEAN neighbors.	Over-reliance on bilateral goodwill exposes the country to transaction-heavy shifts in US trade policy across administration transitions.	The Philippines shoulf simultaneously deepen its ties through the ASEAN Framework for Integrated Semiconductor Supply Chains (AFISS) and maintain flexible trade avenues beyond the US to insulate domestic producers.	Immediate to Medium-Term (2026–2028)
Regulatory Compliance	The STMO Control List and MC 25-20 give the Philippines a legally credible export control	Internal compliance is uneven across the private sector due to discretionary leeway ("as applicable," "as needed") embedded in the Implementing	There is a need to firm up ambiguous compliance language in the IRR, elevate the STMO into an empowered partner to the private sector, and	Short-Term (2026–2027)

	regime on par with global standards.	Rules and Regulations (IRR).	strengthen its enforcement capacity.	
Infrastructure & Logistics	Industrial zones within the LEC are purpose-built with partner co-investment and cross-border supply chain integration in mind.	Persistent unstable power grid infrastructure, high electricity utility costs, and logistics friction severely undercut competitiveness relative to regional peers.	The government must plan ahead and directly invest in a comprehensive infrastructure ecosystem, sequencing port logistics, customs harmonization, and grid stability ahead of industrial announcements to fit the national industrialization strategy.	Immediate to Medium-Term (2026–2028)
Energy Security	The Philippines remains the world's third-largest geothermal producer with an explicit 2030 capacity expansion target while floating solar and renewable investments are accelerating through resource-sharing designs.	Commercial depletion of the Malampaya gas field by 2027 threatens power supply in Batangas growth centers; Bataan Nuclear Power Plant revival remains contested.	Energy planning must not trail industrial announcements; the economic czar's office must coordinate with the Department of Energy from the outset so baseload geothermal, solar, and prospective nuclear capacity are planned around corridor demand.	Medium to Long-Term (2027–2032)
Human Capital	Growing firm interest and industrial enclave expansions imply a rising demand for a highly trained and specialized engineering workforce.	A widening skills gap and severe workforce brain drain.	Human capital and training pipeline development must be sequenced ahead of or alongside investment announcements, backed by targeted upskilling mandates for locators.	Short to Medium-Term (2026–2028)
Social Consultations & Land Use	Philippine land, economic security zones, and critical mineral resources present a genuine draw for Pax Silica partners and global investors.	Indigenous groups warn of agricultural land conversion impacting food security, and they are concerned about ancestral domain displacement; Free, Prior, and Informed Consent (FPIC) is a strict legal mandate.	Mandate FPIC consultations with Indigenous Cultural Communities and LGU approvals from project inception per IPRA and the Local Government Code, building resource-sharing safeguards into site planning.	Immediate (Prior to ground construction)

b. Policy Recommendations

In an interview conducted for this paper, retired Supreme Court Justice Antonio Carpio argued that the Philippines cannot afford to let this opportunity pass, or it will continue to lag behind regional competitors like Malaysia and Vietnam that have moved further along in developing their own semiconductor industries. Separately, Carpio pointed to Japan and South Korea as a broader historical precedent; both states used industrialization as the primary engine of their own economic development, a process he believes the Philippines has yet to replicate at the scale this opportunity now demands.[135] In his view, the country lacks not a strategy, but a single point of accountability empowered to deliver on it. No one has yet been assigned, backed by real political will, to see the LEC through to implementation. Carpio recommends that the President designate an economic czar with the sole responsibility to oversee the entire economic corridor and ensure a welcoming environment for investors, which means addressing everything required for smooth implementation, starting with cutting red tape.[136] Carpio further identifies the Philippines' high electricity and power costs, compounded by taxation, as a major reason the country continues to lag behind its Southeast Asian neighbors. He recommends the government confront this directly, first by scrapping unnecessary taxes and second by ensuring that providers and investors in the power sector are met with an equally engaging environment in which to invest.[137]

It must be noted that the economic and security contexts of Japan and South Korea are significantly different from those faced by the Philippines and its regional neighbors. Both states received significant US support and attention for over half a century due to commitments and initiatives made for reconstruction after the Second World War and during the campaigns of the Cold War. Both states also continue to host American military forces, thus ensuring the security and economic interests of the US. The Philippines has only recently begun to capitalize on its long relationship with the US given the bilateral issues with China and the wider context of the US-China great power competition.

For the Philippines, Pax Silica is an opportunity, not a guarantee. The Philippines stands to benefit only if the initiative is implemented well, and implementation is not something Washington can do on the Philippines' behalf. The Philippine government must take the lead, working alongside the communities whose land, water, and livelihoods are directly affected and alongside the private sector firms who are already operating on the ground and know where the gaps sit. The United States can and should provide real support (funding predictability, durable commitments, technical partnership) but support is not a substitute for ownership. The heavy lifting, on infrastructure, on institutions, on follow-through, must be the Philippines' own.

The November 2026 framework agreement is where this urgency becomes concrete. Both the Marcos and Trump administrations are finite, and this paper has already shown what happens when a US initiative outlives the administration that created it. ITSI and the CHIPS Act gave way to Pax Silica within a single transition, leaving Philippine agencies to absorb the cost. The Philippines should treat the framework agreement not only as a milestone to celebrate but as an opportunity to lock in durable, binding terms, financing commitments, technology transfer conditions, and dispute resolution mechanisms specific enough to survive a change in government on either side. There is urgency to secure this commitment with specific terms, as political will is high and such leverage may not still be available once new administrations with different priorities take office in Manila or Washington.

For the Philippine Government

The primary driver to support the Philippine semiconductor industry through Pax Silica and the LEC is the Philippine government. Without the vision and strategies in place, the initiative risks becoming lackluster if not wholly detrimental to the Philippines. Ten priorities stand out:

- First, and most foundational, the Philippines needs a designated economic czar with real authority over the LEC—someone who can cut through red tape and hold implementation accountable rather than leave delivery to diffuse political will. To prevent further administrative overlap, this designated office should not exist as a new, standalone bureaucracy. It must hold statutory authority over existing ecozone boards, subordinating relevant functions of PEZA, BCDA, and BOI within the Luzon Corridor under a single, unified approval desk.
- Second, the government should confront the country's high electricity and power costs directly, scrapping unnecessary taxes and building a genuinely investor-friendly environment for power sector providers, as Carpio recommends. This addresses a cost

[135] Carpio, Antonio. Interview. July 14, 2026.
[136] Carpio, Antonio. Interview. July 14, 2026.
[137] Ibid.

disadvantage that undercuts every other reform on this list. Whether or not Bataan itself is ultimately revived, the broader point stands: an economic czar's office coordinating the LEC cannot treat power supply as background infrastructure to be assumed. It needs a seat at the table with the Department of Energy from the outset so that geothermal, renewable, and any future nuclear capacities are planned specifically around the corridor's own industrial demand.

- Third, incentive structures for Pax Silica participants should require technology transfer and local supplier integration as mandatory conditions of entry. Near-term focus must be on prioritizing advanced packaging, IC design, and R&D over AI data center proposals that consume heavy grid resources without fulfilling the promise of thousands of employment or building comparable domestic capability. Full-scale commercial wafer fabrication should remain a long-term goal contingent on baseload energy expansion post-2027.
- Fourth, the STMO's compliance framework needs firmer, less discretionary language, giving the agency the capacity to engage the private sector as an equal partner rather than a passive filer of paperwork.
- Fifth, infrastructure and workforce investment must be sequenced ahead of industrial announcements rather than behind them. Not just the roads and power grids the OECD has repeatedly cited should be addressed, but also the inter-port logistics and customs bottlenecks industry consultations have flagged as quietly eroding the country's cost advantages.
- Sixth, FPIC consultations with affected Indigenous Cultural Communities should be built into site selection and planning from the outset, not initiated only once a location has already been announced. Local government units should be more involved. They should both champion their constituents and relay how the LEC would benefit the communities and the local economies. The LGUs, holding both the direction of local policies and the on-the-ground knowledge of actual land use that national planners often lack, should play the deciding role in determining which specific areas within their jurisdictions can host Pax Silica-related economic zones or activities.
- Seventh, as a traditionally agricultural country, the Philippines needs to be sensitive to food and human security concerns, safeguarding and guaranteeing minimum allocations for surrounding agricultural and residential use, providing transparency in reporting on facility water and power draw, and investing in local water infrastructure as a condition of site placement. The Philippines should plan ahead and build resource-sharing commitments into site planning from the outset rather than after a conflict emerges. The government has a responsibility to be selective of the types of investment, facilities, and equipment that are brought into the LEC. Channeling site selection through that existing process rather than around it would let the Philippines pursue the Pax Silica opportunity without reproducing the pattern of land conflict that has accompanied other extractive and industrial projects in the country's history. Less water and energy intensive practices, such as closed-loop industrial water recycling and prioritization of renewable sources, should be mandatory, along with enforcement of real-time, transparent public reporting on toxic chemical wastes and protection of surrounding municipal aquifers and agricultural land.
- Eighth, an empowered economic czar's office should move away from generic, "vanilla" incentive packaging toward the targeted courtship of specific firms already considering expansion. Ireland's approach of camping out at Intel to learn exactly what the company needed rather than presenting a standard offer is an example. The Philippines has done this in the past, as it retained a Texas Instruments facility after a dedicated team was dispatched to Dallas to address the company's specific concerns directly. Without that kind of standing, intelligence-driven capacity, the risk is that the Philippines will continue to lose contested investments to neighbors that lay out more aggressive, bespoke terms.[138]

[138] Lachica, Remarks to Pacific Forum Philippine Technology Policy Fellows.

- Ninth, the government must catalyze upstream capacities by supporting and funding the facilities that make them possible. Japan's Rapidus model provides an example. The state (via its Ministry of Economy, Trade and Industry) provided public funding alongside private consortiums to catalyze advanced manufacturing. Once it has found its footing in advanced ATP through the LEC, the Philippines must offer direct public bridge financing for domestic prototyping labs and R&D facilities.
- Tenth, given the transaction-heavy nature of US policy across changing administrations, relying solely on bilateral goodwill poses a strategic risk for the Philippines. It is important to simultaneously deepen multilateral ties through the ASEAN Framework for Integrated Semiconductor Supply Chains (AFISS), find convergences of interests with other Southeast Asian states, and maintain flexible trade avenues other than just the US to insulate domestic producers.

For the US Government and Pax Silica Partners

To secure the Philippines as a node vital to the US' and its partners' technological supply chains, five priorities stand out:

- First, Washington should build funding predictability into its own commitments. The ITSI cliff was a direct result of a program ending without a transition mechanism, and Philippine agencies had already built 2026 projects around funding that simply stopped arriving. A partner that consistently delivers, as the Philippines has, should not have to absorb the cost of Washington's funding cycles on its own.
- Second, the US should anchor Pax Silica commitments in more durable instruments, such as legislation or formal agreements, rather than executive-level initiatives that one administration transition already showed can be reshuffled, like when ITSI and the CHIPS Act gave way to Pax Silica.
- Third, Washington should calibrate its guardrails and follow through on financing commitments it has already signaled. CHIPS Act restrictions aimed at China also hampered investment and cooperation from allied states and the private sector, demonstrating the importance of calibration. Looking forward, the Development Finance Corporation's (DFC) $205 billion in stated capacity should translate into actual projects on a visible timeline rather than stagnate as promises.
- Fourth, given how corrosive corruption and red tape have proven domestically, the US and potential partners for Philippine development should make anti-corruption and process transparency guardrails an explicit condition of continued Pax Silica investment, rather than treating them as the Philippines' problem alone to solve. Washington has real leverage here; tying disbursement of DFC financing and Pax Silica participation to demonstrated progress on red tape and procurement transparency would give Manila's own reformers concrete external backing for challenges they are already having domestically.
- Fifth, as the world's leading producers of nuclear power, the United States, South Korea, and Japan (founding signatories of Pax Silica) can provide support in developing Philippine capacities for nuclear energy. South Korea is already doing a feasibility study with BNPP. Japan has the financial and industrial backbone to support the Philippines. The US already has an early foothold in the country that is worth building on. In February 2026, the US Trade and Development Agency (USTDA) committed $2.7 million for Meralco PowerGen to evaluate nuclear options of its own, a modest complement to Korea's larger feasibility push.[139] Washington's regulatory experience, technical expertise, and financing capacity make it a natural partner for the Philippines to lean on more heavily here, and doing so would tie directly into the same supply chain security logic already underpinning Pax Silica itself.

[139]"KHNP To Conduct Study On Revival Of Bataan Nuclear Plant, Say Reports." NucNet, Oct. 1, 2024; US Trade and Development Agency grant to Meralco PowerGen, February 2026, as cited in World Nuclear Association, "Nuclear Power in the Philippines."

For the Private Sector

Government leadership alone cannot make Pax Silica succeed. Private firms already operating in the Philippines also have a role to play. Given widespread public skepticism and mistrust toward government-led infrastructure initiatives after the flood control and Office of the Vice President scandals, the private sector must not remain passive beneficiaries of the Luzon Economic Corridor. Private firms, both foreign and domestic, should actively step up to bridge the trust gap.

- The first step is managing public relations and community concerns. Rather than relying on government agencies such as the BCDA or Office of the President alone, private companies should lead transparent, direct community engagement, publish independently audited environmental/resource-use metrics, and establish co-created corporate social responsibility (CSR) initiatives by consulting with communities from the outset. In high-friction areas involving land rights, power draw, and environmental impacts, a company's credibility is vital to preventing the legal challenges and local resistance that routinely stall Philippine development projects.
- Second, companies should dialogue with the communities surrounding their facilities and treat corporate social responsibility as vital to operations, not an optional charitable façade for public relations. PEZA already recognizes companies that do this. Murata Manufacturing's facility at the First Philippine Industrial Park in Laguna has received the Outstanding Community Project award for three consecutive years for its scholarship programs, medical and dental services, and other community initiatives, with the company's own president framing this as central to Murata's mission.[140] Firms locating within the LEC should be expected to meet that same standard, and the government should coordinate directly with the private sector on which community investments (such as workforce training, local infrastructure, or environmental stewardship) deliver the most benefit to the communities actually hosting these facilities.

Industry practice elsewhere illustrates what proactive community monitoring can look like in operation. In a discussion with semiconductor manufacturing officials in Silicon Valley, one major South Korean manufacturer described community environmental reporting standards strict enough that even a small, visible plume of smoke from its facility prompts a report from surrounding residents. Residents flag even minor incidents because they trust the channels will be taken seriously, and the company treats that scrutiny as routine rather than adversarial. It is a sign of both the transparency the company has built into its operations and the trust that transparency has earned with the community around it.[141] The Philippines should treat that kind of standing, two-way reporting channel (not a one-time environmental impact assessment) as the baseline expectation for any facility operating within the LEC.

For Public and Citizen Engagement

Public and citizen engagement plays a necessary complementary role, but constructive criticism should be the aim. Civil society groups and ordinary citizens serve as an important safeguard, surfacing concerns like the corruption and land-use conflicts before they become full-blown crises. That watchdog function loses its value, however, when it collapses into criticism for its own sake, stuck on arguments based on ideologies and opposition without providing a viable alternative path towards developments that contribute to the national interest. The government should actively engage these groups as partners in monitoring implementation, not treat them as adversaries to be managed. At the same time, civil society space in the Philippines, as elsewhere, needs to be cautious and wary, as it remains vulnerable to disinformation campaigns and foreign influence operations that exploit legitimate grievances for other ends. Building transparent, direct channels between government, communities, and civil society organizations is the most effective safeguard against that kind of manipulation.

Conclusion

[140]"PEZA Caps Remarkable Year by Awarding Outstanding Locators." Philippine Economic Zone Authority, December 2024.

[141] Discussion under Chatham House Rule with semiconductor manufacturing officials, Silicon Valley. July 23, 2026

Beyond its own borders, the Philippines has an opportunity to do more than benefit from Pax Silica alone. It can help legitimize the model for a region that remains wary of it. Most ASEAN states, being more economically entangled with China, have treated Pax Silica as another front in great power competition rather than a genuine supply chain solution. Singapore's experience, balancing deep economic ties to China against a strategic security partnership with the US, offers a precedent the Philippines can point to and one it can actively work alongside as a fellow participant. Singapore is essential to China's supply chain and has quickly become an important node in US production.[142] Neither China nor the US can disentangle from Singapore as the country excels in multiple sectors of the semiconductor supply chain, including ATP and chip production, making it a trusted yet indispensable link to both countries.[143] Even where full Pax Silica membership is not realistic for every ASEAN state, the Philippines can anchor cooperation through AFISS and bilateral coordination with Malaysia and Vietnam, both of which offer directly applicable lessons in trade law modernization and industrial strategy.

The case for friendshoring the Philippines' semiconductor industry rests on the same logic that opened this paper: security in the twenty-first century is inseparable from supply chain resilience. The Philippines has secured a genuine opening. Whether that opening becomes durable industrial capacity or another chapter in a familiar pattern of hosting without building, undermined by corruption and left exposed by ambiguous commitments, depends on whether its security and economic policies mature as quickly as its diplomatic standing.

[142] Jing Ge. "China's chipmaking supply chain runs through Southeast Asia." East Asia Forum, June 20, 2026.

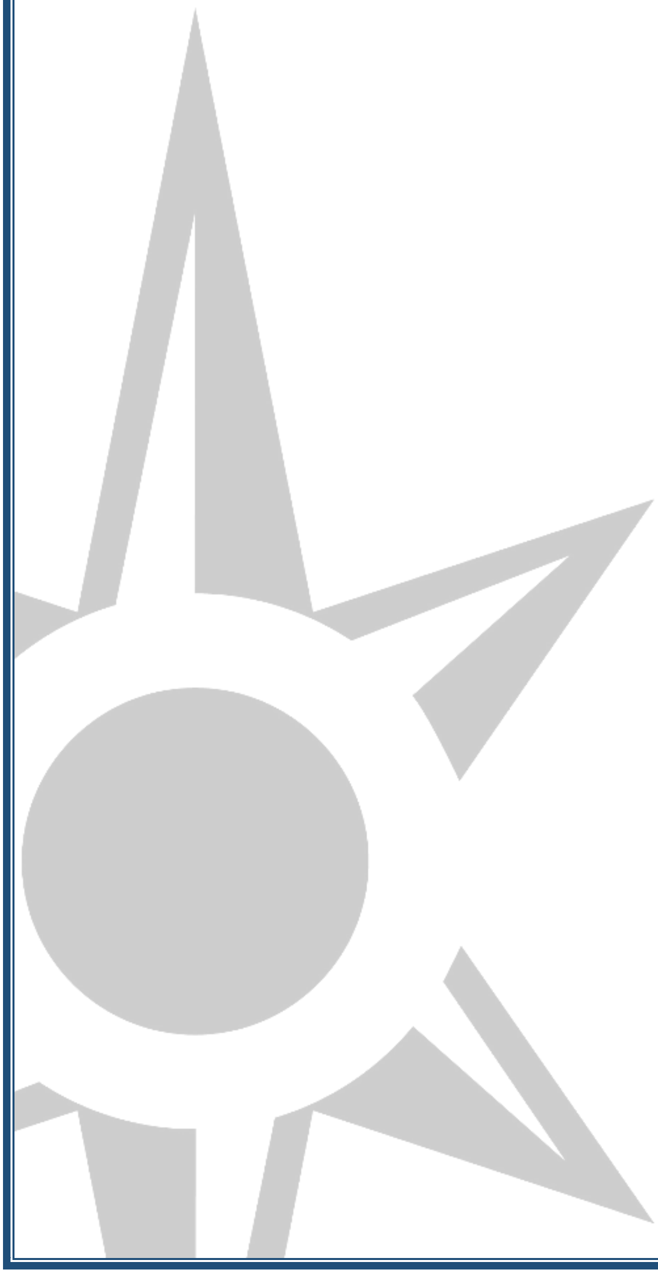
[143] Chok, Ivy and Marcel Pereira. "Why Singapore remains a key player in the global semiconductor race." Channel News Asia, June 20, 2026.

ABOUT THE AUTHOR

FLORENCE PRINCIPE GAMBOA is the Managing Editor and Coordinator of FACTS Asia, a Philippine Technology Policy Fellow at the Pacific Forum, a Fellow at Verve Research, and a Lecturer at the Far Eastern University Department of International Studies. Her work focuses on the intersection of security and emerging technologies, with research interests spanning great power competition, Philippine foreign policy, maritime security, cybersecurity, and Philippines-China relations.

Chip Strategy: Pathways for Philippine Semiconductor Industry Competitiveness

By
Gerald Gracius Y. Pascua



Executive Summary

Gerald Gracius Y. Pascua

This study examines the performance, productivity, and competitiveness of the Philippine semiconductor industry using nationally representative firm-level data. It assesses key dimensions of industry performance, including firm structure, labor and export productivity, sales and expenditure patterns, export orientation, innovation-related activities, and knowledge-based asset accumulation. Semiconductor establishments are compared with other electronics and manufacturing establishments to identify sector-specific characteristics and assess the industry's development trajectory.

The findings indicate that semiconductor establishments generally outperform other electronics and manufacturing establishments in productivity, export orientation, innovation investment, and accumulation of knowledge-based assets. However, these advantages are concentrated among medium and large establishments, pointing to substantial differences in capabilities across firm sizes.

Semiconductor establishments also record significantly higher sales, direct exports, and export intensity than non-semiconductor establishments. However, these differences are driven largely by larger firms.

Pooled ordinary least squares estimates further show that semiconductor establishments have higher labor and export productivity, while firm size is strongly and positively associated with productivity. The results also point to the importance of innovation and intangible assets: a 1 percent increase in research and development expenditure is associated with approximately 0.23 percent higher labor productivity and 0.19 percent higher export productivity, while a 1 percent increase in intangible assets is associated with about 0.18 percent higher labor productivity. R&D personnel are likewise positively associated with productivity, with each additional personnel corresponding to approximately 0.2 percent higher labor productivity.

In contrast, higher utility expenditure shares are negatively associated with productivity. A one-percentage-point increase in the electricity expenditure share is associated with approximately 5.6 percent lower labor productivity and 20.1 percent lower export productivity. Similarly, a one-percentage-point increase in the share of water expenditure is associated with approximately 1.9 percent lower labor productivity and 5.9 percent lower export productivity.

The findings highlight both the strengths and structural constraints of the Philippine semiconductor industry. While established firms demonstrate substantial productivity and export capabilities, the concentration of these capabilities among larger establishments suggests the need to broaden participation in industry upgrading. Policy interventions should therefore complement efforts to sustain the capabilities of established firms with measures that enable smaller establishments to scale up, improve productivity, strengthen innovation capacity, and move toward higher-value segments of the semiconductor value chain.

The study proposes a sequenced approach to industry upgrading that recognizes productivity growth as a gradual and cumulative process, with interventions calibrated to firms' capabilities and stages of development..

Introduction

Technological progress is creating new opportunities for economic growth as the Fourth Industrial Revolution (4IR) reshapes global production and accelerates the adoption of digital and advanced technologies. For developing economies such as that of the Philippines, these developments provide an opportunity to move beyond traditional low-cost manufacturing toward more advanced and higher-value activities that can support productivity growth, innovation, and high-skilled employment. The ability to participate more effectively in these activities is increasingly important as global production becomes more technology-intensive and competition for investment and market share intensifies.

Advanced manufacturing generally refers to production that integrates innovative technologies, processes, and methods, particularly those associated with the 4IR, into manufacturing activities to improve efficiency, product quality, and technological sophistication. A review of national industrial roadmaps, industry strategies, and 4IR development plans identifies electronics and particularly semiconductors and information and communication technology (ICT) devices as among the leading areas of advanced manufacturing.

Within the Philippine context, electronics manufacturing, particularly of semiconductors, represents a strategically important segment of advanced manufacturing. The industry contributes substantially to employment, economic output, and merchandise exports while providing an important platform for the country's participation in global production networks. Its development therefore has implications not only for manufacturing performance but also for technological upgrading, innovation, and value creation and capture. At the same time, the benefits of manufacturing development are not evenly distributed across firms or locations. Differences in infrastructure, connectivity, human capital, market access, and local economic conditions can constrain the ability of firms and regions to participate in higher-value manufacturing activities. These disparities underscore the importance of policies that strengthen domestic capabilities and broaden participation in the opportunities created by advanced manufacturing.

Against this backdrop, this paper has two primary objectives. First, it examines the performance and productivity of the Philippine semiconductor industry using nationally representative firm-level data. The analysis considers key dimensions of industry performance, including firm structure, labor productivity, sales and expenditure patterns, export performance, and innovation-related activities. It also compares semiconductor establishments with those of other electronics and manufacturing domains to identify the characteristics that distinguish the sector and provide evidence of its competitiveness and development trajectory.

Second, drawing on the empirical findings, the paper proposes policy recommendations to support the continued development of the Philippine semiconductor industry. The recommendations focus on strengthening innovation and technological capabilities, supporting workforce development, deepening domestic value creation, and enabling firms to move toward higher-value and more knowledge-intensive segments of the global semiconductor value chain. In doing so, the paper seeks to provide an evidence-based assessment of Philippine semiconductor competitiveness and translate the findings into actionable policy insights for sustained industry development.

The empirical analysis draws primarily on the Annual Survey of Philippine Business and Industry (ASPBI), a nationwide establishment-based survey conducted by the Philippine Statistics Authority (PSA). As the principal source of firm-level information on the formal business sector, the ASPBI provides a rich set of operational and financial indicators, including firm characteristics, employment, sales and revenues, expenditures, and asset holdings.[1] This breadth of information enables a comprehensive assessment of firm performance across multiple dimensions of competitiveness. The study uses comparable ASPBI data for 2012–2022, with establishments classified according to the 2019 Philippine Standard Industrial Classification (PSIC). The semiconductor industry comprises establishments under PSIC Division 261 i.e., Manufacture of electronic components, specifically the manufacture of electronic valves and tubes (2611x) and semiconductor devices and other electronic components (2612x), including sensors (26121),

[1] Philippine Statistics Authority, *Annual Survey of Philippine Business and Industry (ASPBI)*, n.d., https://psa.gov.ph/statistics/survey/business-and-industry/index.

actuators (26122), oscillators (26123), resonators (26124), and others (26129).[2]

To benchmark semiconductor performance, the analysis considers two comparison groups. The first comprises all other manufacturing establishments and provides a broad benchmark for the sector's performance relative to Philippine manufacturing as a whole. The second comprises other electronics industries, consisting of non-semiconductor establishments in PSIC Divisions 26 (Manufacture of Computer, Electronic and Optical Products), 27 (Manufacture of Electrical Equipment), and 28 (Manufacture of Machinery and Equipment not included elsewhere), and provides a more closely matched benchmark among technology-oriented manufacturers.[3] These comparisons help establish whether the semiconductor industry's performance reflects broader manufacturing or electronics-sector characteristics or represents a distinctive pattern of semiconductor production.

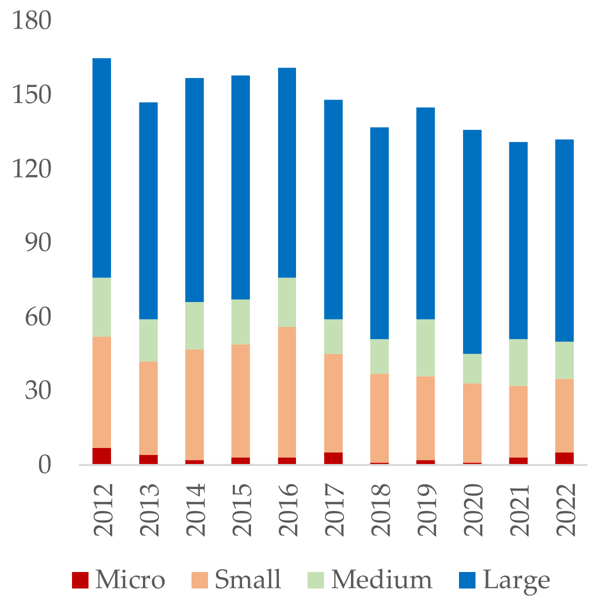
Several limitations of the ASPBI should be considered when interpreting the results. First, it covers only the formal sector and excludes informal enterprises. This may be particularly relevant in the Philippine context, given the country's substantial informal sector. Second, its stratified sampling design gives greater coverage to large establishments. Although the survey is nationally representative when appropriate weights are applied, descriptive results may still reflect the characteristics of larger firms more strongly. This may be particularly relevant to semiconductor manufacturing, which is dominated by large establishments. Finally, some innovation-related variables, particularly R&D expenditures and intangible assets, contain substantial missing values and year-to-year variation. These may reflect reporting practices or the episodic nature of such investments. The findings should therefore be interpreted as broad industry patterns rather than precise measures of firms' innovation behavior.

Performance and Productivity of the Philippine Semiconductor Industry: Evidence from Firm-Level Data

The descriptive evidence points to a clear and consistent pattern: semiconductor firms outperform other manufacturing groups across productivity, export orientation, innovation investment, and knowledge-based asset accumulation. However, these advantages are concentrated largely among medium and large firms, underscoring the uneven distribution of industry capabilities across firm sizes.

Table 1 highlights the distinct firm structure of the semiconductor industry. Large establishments only accounted for about 4% of manufacturing firms and 26% of other electronics firms but just over half of semiconductor establishments in 2012–2022. On average, micro, small, and medium establishments accounted for a minority share of semiconductor firms, at about 2%, 26%, and 12%, respectively (see **Figure 1**). In contrast, other electronics and manufacturing were more broadly distributed across smaller firms. Semiconductors therefore represent a distinctly large firm-oriented segment of Philippine manufacturing.

Figure 1. Firm Size Distribution of Semiconductor Establishments, 2012-2022



Source of basic data: Philippine Statistics Authority, Annual Survey of Philippine Business and Industry, various years.
Notes: Following the PSA employment classification, establishments are categorized as micro (1–9 employees), small (10–99 employees), medium (100–199 employees), and large (200 or more employees).[4] Totals may not add up due to rounding.

[2] Philippine Statistics Authority, *Philippine Standard Industrial Classification (PSIC)*, n.d., https://psa.gov.ph/classification/psic.

[3] Ibid.

[4] Philippine Statistics Authority, "More than 1.08 Million Establishments Operated in 2021 Which Generated Total

Semiconductor establishments comprised less than 1% of all manufacturing establishments on average. Combined, semiconductor and other electronics establishments accounted for about 2% of manufacturing establishments, indicating that the electronics industry represents a relatively small segment of Philippine manufacturing. Despite its small establishment base, the semiconductor industry is distinguished by its concentration of large firms. This structural feature provides important context for interpreting its stronger performance across productivity and exports, among other indicators.

Table 1. Firm Size Distribution and Industry Composition, 2012-2022

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
All Manufacturing Establishments											
Micro	12515	11543	10801	9902	13294	10483	17070	9280	11632	15070	12886
Small	10725	11726	12495	12642	12884	11824	9877	12808	8665	8558	8697
Medium	893	902	896	927	879	876	941	1132	802	714	758
Large	906	953	952	1009	967	994	1050	1040	966	923	966
Total: All Manufacturing	25039	25124	25144	24480	28024	24177	28938	24260	22065	25265	23307
Share of Large to Total (%)	3.6	3.8	3.8	4.1	3.5	4.1	3.6	4.3	4.4	3.7	4.1
Semiconductor Establishments											
Micro	7	4	2	3	3	5	1	2	1	3	5
Small	45	38	45	46	53	40	36	34	32	29	30
Medium	24	17	19	18	20	14	14	23	12	19	15
Large	89	88	91	91	85	89	86	86	91	80	82
Total: Semiconductors	165	147	157	158	161	148	137	145	136	131	132
Share of Large to Total (%)	53.9	59.9	58.0	57.6	52.8	60.1	62.8	59.3	66.9	61.1	62.1
Other Electronics Establishments											
Micro	61	24	40	28	31	25	41	18	24	48	17
Small	185	189	174	160	177	160	186	177	175	199	187
Medium	51	55	59	58	51	52	48	57	38	43	36
Large	89	93	100	101	106	98	91	80	93	79	89
Total: Other Electronics	386	361	373	347	365	335	366	332	330	369	329
Share of Large to Total (%)	23.1	25.8	26.8	29.1	29.0	29.3	24.9	24.1	28.2	21.4	27.1
Share to All Manufacturing Establishments (%)											
Semiconductor (A)	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.5	0.6
Other Electronics (B)	1.5	1.4	1.5	1.4	1.3	1.4	1.3	1.4	1.5	1.5	1.4
Share of Electronics (A+B)	2.2	2.0	2.1	2.1	1.9	2.0	1.7	2.0	2.1	2.0	2.0

Employment of 8.57 Million (2021 Updating of the List of Establishments—Preliminary Results)," January 6, 2022, https://psa.gov.ph/content/more-108-million-establishments-operated-2021-which-generated-total-employment-857-million.

Source of basic data: Philippine Statistics Authority, Annual Survey of Philippine Business and Industry, various years. Notes: Following the PSA employment classification, establishments are categorized as micro (1–9 employees), small (10–99 employees), medium (100–199 employees), and large (200 or more employees) [see Footnote 4]. Totals may not add up due to rounding.

Table 2. Financial and Export Performance of Manufacturing Establishments, 2012-2022 Average Values, in Constant 2024 USD Millions

	Total Sales (USD millions)	Total Expenditures (USD millions)	Total Direct Exports (USD millions)	Share of Direct Exports to Total Sales (%)
All Manufacturing Establishments				
Micro	6.6	6.2	4.9	17.4
Small	108.8	98.5	172.8	61.1
Medium	977.7	900.9	539.5	68.2
Large	5586.7	4975.7	4294.8	73.2
Total	309.0	272.4	1213.4	57.5
Semiconductor Establishments				
Micro	10.0	8.9	10.8	100.0
Small	121.7	109.5	113.5	84.3
Medium	441.7	403.3	293.3	71.6
Large	10091.0	8240.4	10771.9	85.9
Total	4469.4	4958.2	7577.0	84.1
Other Electronics Establishments				
Micro	36.5	29.7	23.0	85.9
Small	152.6	135.7	100.6	74.6
Medium	745.5	703.6	497.6	85.4
Large	5656.6	4975.7	6005.7	87.1
Total	1676.0	1464.8	3002.9	82.8
Semiconductor vs. Non-semiconductor Establishments				
T-statistic	Significant ($p < 0.01$)	Significant ($p < 0.01$)	Significant ($p < 0.01$)	Significant ($p < 0.01$)

Source of basic data: Philippine Statistics Authority, Annual Survey of Philippine Business and Industry, various years. Notes: p = p-value; PHP = Philippine peso; USD = United States dollar. Following the PSA employment classification, establishments are categorized as micro (1–9 employees), small (10–99 employees), medium (100–199 employees), and large (200 or more employees) [see Footnote 4]. Monetary values are deflated to 2024 prices using the Gross Domestic Product deflator from the World Bank's World Development Indicators.[5] Values are converted to US dollars using an exchange rate of USD 1 = PHP 57.2785, based on the 2024 average daily PHP–USD exchange rate published by the Bangko Sentral ng Pilipinas.[6] Total sales comprise sales to the domestic market, interplant transfers, direct exports, and local sales to exporters. Total expenditures comprise the cost of products sold, including commission work performed for others, interest expenses, and general administrative and other operating expenses. Direct exports refer to products produced and shipped directly outside the country by the establishment.[7] Totals may not add up due to rounding.

Table 2 highlights the substantially greater scale and export orientation of semiconductor establishments relative to other electronics and manufacturing establishments. Across the years covered, semiconductor firms recorded higher average sales, expenditures, and direct exports, with the differences

[5] World Bank, "GDP Deflator (Base Year Varies by Country)," *World Bank Open Data*, n.d., https://data.worldbank.org/indicator/NY.GDP.DEFL.ZS.

[6] Bangko Sentral ng Pilipinas, "Exchange Rate," n.d., https://www.bsp.gov.ph/sitepages/statistics/exchangerate.aspx.

[7] Philippine Statistics Authority, *Annual Survey of Philippine Business and Industry (ASPBI)*, n.d., https://psa.gov.ph/statistics/survey/business-and-industry/index.

becoming particularly pronounced among large establishments. The industry also exhibited a high degree of export intensity, with direct exports accounting for about 84% of sales on average compared with about 83% among other electronics establishments and 58% across manufacturing overall. These patterns reflect the industry's distinct economic significance; although semiconductor establishments represent a small share of manufacturing firms, they operate at a substantially larger scale and are more deeply integrated into international markets.

Relative to other electronics and manufacturing, semiconductor establishments exhibit a distinctive scale profile. The differences were relatively modest among smaller firms but widened considerably among large establishments. Large semiconductor firms averaged about US$10.1 billion in sales compared with roughly $5.6 to 5.7 billion among the two comparison groups. A similar pattern appears in expenditures, with large semiconductor establishments averaging about $8.2 billion compared with about $5.0 billion in both other electronics and manufacturing. Differences among smaller establishments were less pronounced. The contrast is strongest for direct exports: large semiconductor establishments averaged about $10.8 billion in direct exports compared with $6.0 billion among other electronics and $4.3 billion across manufacturing. These differences indicate that the semiconductor industry's scale advantage is concentrated among its largest establishments rather than being uniformly distributed across the firm-size spectrum.

The statistically significant differences between semiconductor and non-semiconductor establishments across sales, expenditures, direct exports, and export intensity underscore the semiconductor industry's distinct position within Philippine manufacturing. However, these advantages were concentrated among larger establishments, with important implications for industry policy. Sustaining the capabilities of established firms should be complemented by efforts to help smaller establishments scale up, improve productivity, and move into higher-value segments of the semiconductor value chain.

The differences across manufacturing industries are also reflected in the composition of expenditures, as summarized in **Table 3**. On average, from 2012–2022, semiconductor establishments recorded significantly higher expenditures on raw materials, electricity, water, and research and development (R&D) than other electronics and manufacturing establishments, although the relative importance of these inputs varied across groups. Raw materials remained the largest expense category across all three groups. Among semiconductor establishments, raw materials accounted for about 44% of total expenses, broadly similar to the 43% observed across manufacturing but below the 54% among other electronics establishments. The difference is particularly evident among large firms, where raw materials accounted for about 48% of expenses in semiconductors compared with 55% among other electronics and 51% across manufacturing.

The differences are more pronounced in utility expenditures, particularly electricity. Semiconductor establishments recorded average electricity expenditure of about $130 million compared with $24 million among other electronics establishments and $5 million across manufacturing. The substantially higher absolute expenditure is consistent with the energy-intensive nature of semiconductor manufacturing, which relies on highly controlled production environments and energy-demanding processes. Yet electricity accounted for only about 0.6% of total expenses among semiconductor establishments, similar to other electronics and below the 1.3% observed across manufacturing. Water followed a somewhat different pattern. Average water expenditure was about $17 million among semiconductor establishments compared with $4 million among other electronics and less than $1 million across manufacturing. Water accounted for about 4.1% of semiconductor expenses, broadly comparable to manufacturing at 4.5% and above other electronics at 3.1%. Thus, while semiconductor production entails substantial utility requirements in absolute terms, these costs do not represent a disproportionately large share of the sector's overall expenditure structure.

Table 3. Expenditure Composition by Major Input Category, 2012-2022 Average Values, in Constant 2024 USD Millions

	Raw Materials		Electricity		Water		Research and Development	
	Total expense (USD millions)	Share to Total Expenses (%)	Total expense (USD millions)	Share to Total Expenses (%)	Total expense (USD millions)	Share to Total Expenses (%)	Total expense (USD millions)	Share to Total Expenses (%)
All Manufacturing Establishments								
Micro	4.1	37.5	0.2	1.7	<0.1	4.9	<0.1	<0.1
Small	66.9	48.4	2.4	0.9	0.5	4.3	0.2	<0.1
Medium	600.6	54.6	23.7	0.7	3.7	3.6	0.6	0.1
Large	2741.0	50.6	87.3	0.6	15.3	3.2	7.1	0.1
Total	181.6	43.5	5.4	1.3	0.9	4.5	0.4	<0.1
Semiconductor Establishments								
Micro	4.0	31.6	0.3	0.8	0.1	4.2	<0.1	<0.1
Small	56.2	38.0	3.3	0.5	0.4	3.9	0.2	0.1
Medium	216.5	40.2	14.1	0.8	2.0	4.4	0.4	0.1
Large	5691.5	47.9	216.5	0.5	28.1	4.2	10.1	0.1
Total	3491.7	44.1	130.4	0.6	17.0	4.1	6.1	0.1
Other Electronics Establishments								
Micro	19.0	47.4	0.3	0.8	0.1	2.3	<0.1	0.1
Small	97.9	53.1	2.5	0.7	0.5	3.4	0.1	0.1
Medium	529.0	56.2	13.1	0.5	2.4	2.8	0.5	0.1
Large	3910.7	54.9	80.1	0.4	13.2	3.2	9.2	6.2
Total	1131.3	53.5	23.9	0.6	4.0	3.1	2.5	0.1
Semiconductor vs. Non-semiconductor establishments								
T-statistic	Significant ($p < 0.01$)		Significant ($p < 0.01$)		Significant ($p < 0.01$)		Significant ($p = 0.09$)	

Source of basic data: Philippine Statistics Authority, Annual Survey of Philippine Business and Industry, various years. Notes: p = p-value; PHP = Philippine peso; USD = United States dollar. Following the PSA employment classification, establishments are categorized as micro (1–9 employees), small (10–99 employees), medium (100–199 employees), and large (200 or more employees) [see Footnote 4]. Monetary values are deflated to 2024 prices using the Gross Domestic Product deflator from the World Bank's World Development Indicators [see Footnote 5]. Values are converted to US dollars using an exchange rate of USD 1 = PHP 57.2785, based on the 2024 average daily PHP–USD exchange rate published by the Bangko Sentral ng Pilipinas [see Footnote 6]. Raw materials include fuel expenses used in production. Research and development refers to expenditures on systematic, scientific, and creative work undertaken to increase the stock of knowledge and apply this knowledge to develop new or improved products, processes, services, and other applications [see Footnote 7]. Totals may not add up due to rounding.

R&D expenditure provides another notable distinction. Semiconductor establishments recorded an average R&D expenditure of about $6.1 million, more than twice the $2.5 million recorded by other electronics establishments and substantially higher than the $0.4 million noted across all manufacturing. R&D nevertheless represented only about 0.1% of total expenses across the three groups. The higher absolute R&D spending is consistent with the technology-intensive nature of semiconductor and broader electronics activities, but the expenditure shares do not indicate substantially greater R&D

intensity. Moreover, the difference between semiconductor and non-semiconductor establishments is only weakly significant, which may partly be attributed to the substantial number of missing R&D observations reported by establishments.

The relatively higher R&D spending of semiconductor establishments is accompanied by a substantially larger workforce, particularly among large firms (**Table 4**).

Table 4. Research and Development Personnel, 2012-2022 Average Values

	Research and Development Personnel	
	Total	Average
All Manufacturing Establishments		
Micro	4764	0.5
Small	24996	1.7
Medium	10836	5.1
Large	45458	18.0
Total	86085	2.9
Semiconductor Establishments		
Micro	.	.
Small	143	2.0
Medium	123	4.5
Large	12735	59.9
Total	13001	41.6
Other Electronics Establishments		
Micro	13	0.6
Small	943	2.9
Medium	583	5.8
Large	5496	22.5
Total	7036	10.1
Semiconductor vs. Non-semiconductor Establishments		
T-statistic	Significant ($p < 0.01$)	Significant ($p < 0.01$)

Source of basic data: Philippine Statistics Authority, Annual Survey of Philippine Business and Industry, various years.

Notes: p = p-value; R&D = research and development. Following the PSA employment classification, establishments are categorized as micro (1–9 employees), small (10–99 employees), medium (100–199 employees), and large (200 or more employees) [see Footnote 4]. R&D refers to expenditures on systematic, scientific, and creative work undertaken to increase the stock of knowledge and apply this knowledge to develop new or improved products, processes, services, and other applications. R&D personnel are classified into three categories: researchers, technicians, and other personnel involved in R&D [see Footnote 7]. Totals may not add up due to rounding.

Semiconductor establishments employed substantially more R&D personnel on average than both other electronics and manufacturing establishments, with the difference driven overwhelmingly by large firms. Semiconductor establishments employed an average of 42 R&D personnel compared with 10 among other electronics establishments and 3 across manufacturing. The difference was particularly pronounced among large firms, where semiconductor establishments employed an average of 60 R&D personnel compared with 23 among other electronics establishments and 18 across manufacturing.

The distribution across firm sizes further highlights the concentration of R&D activity among large semiconductor establishments. Large firms accounted for almost the entire reported R&D workforce, with 12,735 of 13,001 personnel, while small and medium establishments reported averages of only 2 and 5 R&D personnel, respectively. This concentration indicates that R&D capacity in the semiconductor industry is largely concentrated among larger establishments, despite similar R&D expenditure shares.

Productivity is another important dimension of industry performance and serves as the key outcome variable in the subsequent analysis. **Table 5** presents labor and export productivity across firm sizes and industry groups. Labor productivity is measured as total sales divided by the number of workers, capturing the value of sales generated per worker. Export productivity is measured as direct exports divided by the number of workers, capturing the value of direct exports generated per worker. Both measures are expressed in constant 2024 US$ million per worker.

Within the semiconductor industry, both productivity measures generally increased with firm size. Labor productivity rose from $1.8 million per worker among micro establishments to $5.6 million among large establishments, while export productivity increased from $1.7 million to $5.8 million. The widening productivity gap across firm sizes suggests that scale is an important dimension of semiconductor firm performance. Larger establishments generated substantially more sales and exports per worker, which may reflect differences in production scale, technology, capital intensity, organizational capabilities, or access to international markets. This size gradient also highlights the importance of accounting for firm-level characteristics when examining the determinants of firm productivity.

The size pattern differs across the comparison groups. In manufacturing, labor productivity increased from $1.5 million among micro establishments to $8.1 million among large establishments, while export productivity was highest among small and medium establishments at $3.8 million. Other electronics establishments exhibited greater variation, with labor productivity particularly high among micro establishments at $11.6 million. These differences underscore the substantial heterogeneity in productivity across firm sizes and industry groups.

The comparison between semiconductor and non-semiconductor establishments is not statistically significant for either labor or export productivity. The absence of a significant sectoral difference notwithstanding, the substantial variation across firm sizes points to firm-level characteristics as an important consideration in understanding productivity differences. This provides the basis for the subsequent regression analysis, which examines the factors associated with labor and export productivity among semiconductor establishments.

Table 5. Labor and Export Productivity, 2012-2022 Average Values, in Constant 2024 USD Millions

	Labor productivity (USD millions)	Export productivity (USD millions)
All Manufacturing Establishments		
Micro	1.5	0.9
Small	3.0	3.8
Medium	7.0	3.8
Large	8.1	3.6
Total	2.6	3.2
Semiconductor Establishments		
Micro	1.8	1.7
Small	3.0	2.9
Medium	3.1	2.0
Large	5.6	5.8
Total	4.5	4.8
Other Electronics Establishments		
Micro	11.6	3.4
Small	4.4	2.1
Medium	5.4	3.7
Large	5.0	4.1
Total	5.3	3.4
Semiconductor vs. Non-semiconductor Establishments		
T-statistic	Not significant (p = 33.2)	Not significant (p = 76.9)

Source of basic data: Philippine Statistics Authority, Annual Survey of Philippine Business and Industry, various years.

Notes: p = p-value; PHP = Philippine peso; USD = United States dollar. Following the PSA employment classification, establishments are categorized as micro (1–9 employees), small (10–99 employees), medium (100–199 employees), and large (200 or more employees) [see Footnote 4]. Monetary values are deflated to 2024 prices using the Gross Domestic Product deflator from the World Bank's World Development Indicators [see Footnote 5]. Values are converted to US dollars using an exchange rate of USD 1 = PHP 57.2785, based on the 2024 average daily PHP–USD exchange rate published by the Bangko Sentral ng Pilipinas [see Footnote 6]. Totals may not add up due to rounding.

Empirical Analysis

In order to examine the factors associated with establishment-level productivity, the paper employs an ordinary least squares (OLS) regression framework using available data on manufacturing establishments from ASPBI for 2012–2022. Adapting the approach done by Pascua (2025), two measures of productivity are considered as dependent variables: labor productivity, defined as total sales per worker, and export productivity, defined as direct exports per worker.[8] Separate regressions are estimated for each productivity measure. The empirical specification is expressed as:

$$Y_{it} = \beta_0 + \beta_1 Size_{it} + \beta_2 Age_{it} + \beta_3 Manila_{it} + \beta_4 Semiconductor_{it} + \beta_5 Exporter_{it} + \beta_6 (Semiconductor_{it} \times Size_{it}) + \beta_7 \boldsymbol{Inputs_{it}} + \beta_8 \boldsymbol{Trade_{it}} + \beta_9 \boldsymbol{R\&D_{it}} + \gamma_t + \varepsilon_{it}$$

[8] Gerald Gracius Y. Pascua, "Philippines," in *Small Tech, Big Impact: Low-Cost ICT and SME Productivity—Microdata Evidence from Nine Economies in Asia*, ed. D. Wie (Asian Productivity Organization, 2025), 124–148, https://doi.org/10.61145/SEAJ2269.

where Y_{it} represents either labor productivity or export productivity of establishment, γ_t is year fixed effects which are included to account for economy-wide and other time-specific factors that may affect productivity across establishments in a given year, and ε_{it} is the error term.

The explanatory variables comprise standard firm characteristics, industry and market participation indicators, interaction terms, and variables capturing potential determinants of productivity. The model first controls for basic firm characteristics, including establishment size, age, and location in Metro Manila. Firm size captures differences in the scale of operations and organizational capacity, while firm age may reflect accumulated experience, capabilities, and established business relationships. The Metro Manila indicator accounts for potential location-specific advantages, including access to infrastructure, services, markets, skilled labor, and business networks.

An indicator for whether an establishment belongs to the semiconductor industry is included to assess whether semiconductor establishments exhibit systematically different productivity levels after accounting for observable firm characteristics. This variable is particularly important given the descriptive evidence that semiconductor establishments differ substantially from other manufacturing firms in terms of firm structure, export orientation, expenditure patterns, and R&D activity. The coefficient on the semiconductor indicator therefore captures the conditional association between semiconductor industry membership and productivity relative to establishments outside the sector.

The model also includes an exporter dummy, identifying establishments that engage in direct exports. Export participation may be associated with productivity through greater exposure to international markets, access to foreign technologies and production networks, and competitive pressures that encourage improvements in efficiency. The exporter indicator therefore allows the analysis to distinguish differences in productivity associated with participation in international markets, beyond the industry's overall export orientation.

To examine whether the relationship between firm size and productivity differs for semiconductor establishments, the model includes an interaction between semiconductor industry membership and firm size. A statistically significant interaction would indicate that the association between firm size and productivity differs between semiconductor and non-semiconductor establishments. It allows the analysis to test whether the productivity implications of operating at a larger scale are distinct within the semiconductor industry rather than assuming a common size-productivity relationship across manufacturing.

Beyond these firm and industry characteristics, the analysis examines several groups of variables that may be associated with establishment-level productivity. Input cost variables include the shares of electricity and water expenditures in total expenses, capturing differences in utility use and production costs. Trade and investment variables include government subsidies received and the value of intangible non-produced assets, reflecting government support and the accumulation of intangible assets that may facilitate production and market activity. R&D indicators include R&D expenditure and its share in total expenditure, capturing the scale and intensity of technological and innovation-related investment. Together, these variables allow the analysis to assess whether productivity differences are associated with factors beyond firm characteristics.

The regressions are intended to identify factors associated with, rather than establish causal determinants of, establishment-level productivity. The estimates therefore provide empirical evidence on the characteristics and activities correlated with labor and export productivity among Philippine manufacturing establishments and help identify factors that may be relevant to strengthening the competitiveness and upgrading of the semiconductor industry.

Table 6 presents the baseline OLS regressions for labor and export productivity, controlling for establishment characteristics and year fixed effects. The results point to several significant correlates of productivity:

For labor productivity, semiconductor establishments exhibit higher productivity in Model 1, holding other factors constant. Firm size has a strong positive association; relative to micro establishments, small, medium, and large firms have significantly higher labor productivity in both models. Older establishments and those located in

Metro Manila also have higher labor productivity. In Model 2, exporter status is positively associated with labor productivity, while each additional R&D personnel is associated with approximately 0.2% higher labor productivity, holding other factors constant.

For export productivity, semiconductor establishments exhibit higher productivity in Model 4. In contrast, establishments located in Metro Manila have significantly lower export productivity than those elsewhere. This may partly reflect the concentration of export-oriented manufacturing activities in major industrial and economic zones outside Metro Manila, suggesting that the location of production may be particularly relevant to export performance.

Table 7 extends the baseline specifications by incorporating electricity and water expenditure shares as measures of input costs.

For labor productivity, a one percentage point increase in the electricity share of total expenditure is associated with approximately 5.6% lower labor productivity, holding other factors constant. Similarly, a one percentage point increase in the water expenditure share is associated with approximately 1.9% lower labor productivity. Both relationships are statistically significant. These results suggest that establishments with relatively higher utility costs tend to exhibit lower productivity. The negative relationship is even larger for export productivity. A one percentage point increase in the electricity share is associated with approximately 20.1% lower export productivity, while a one percentage point increase in the water share is associated with approximately 5.9% lower export productivity, holding other factors constant.

These negative associations suggest that establishments for which electricity and water account for a larger share of total expenditures tend to exhibit lower labor productivity. One possible explanation is that a higher utility cost share represents a greater allocation of the establishment's expenditure budget to operating inputs, potentially limiting resources available for other productivity-enhancing investments such as technology, equipment, skills, or R&D. At the same time, a higher utility share may reflect differences in production processes, input intensity, or operating conditions rather than simply higher spending.

The other significant results remain broadly consistent with the baseline models. Semiconductor establishments are positively associated with labor productivity in Models 5 and 6, while firm size, establishment age, and Metro Manila location continue to show significant associations with labor productivity. The negative semiconductor–medium-size interactions also persist, indicating that the relationship between semiconductor membership and productivity varies across firm sizes. For export productivity, the negative association with Metro Manila also remains significant.

Table 6. Baseline Regressions

Model	1	2	3	4
Dependent Variable	Log of real labor productivity (in PHP)		Log of real export productivity (in PHP)	
Method	OLS	OLS	OLS	OLS
Semiconductor	0.724***	0.037	0.467	1.410***
(1 if yes, 0 otherwise)	(0.245)	(0.118)	(0.295)	(0.172)
Exporter		0.266*		
(1 if yes, 0 otherwise)		(0.150)		
Number of R&D		0.002**		0.000
Personnel		(0.001)		(0.001)
Age	0.012***	0.020***	-0.004	0.011
	(0.002)	(0.007)	(0.004)	(0.006)
Age squared	0.000***	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Located in Metro Manila	0.481***	0.365***	-0.703***	-0.885***
(1 if yes, 0 otherwise)	(0.045)	(0.106)	(0.115)	(0.137)

Size (Baseline: Micro)				
Small	0.549***	0.901***	0.029	-0.222***
	(0.048)	(0.110)	(0.179)	(0.340)
Medium	1.638***	1.368***	0.362***	-0.222***
	(0.047)	(0.105)	(0.169)	(0.343)
Large	1.705***	1.571***	0.184	-0.231
	(0.045)	(0.107)	(0.168)	(0.340)
Semiconductor*Size				
Semiconductor*Small	0.069	0.286	-0.095	-0.385
	(0.256)	(0.235)	(0.311)	(0.479)
Semiconductor*Medium	-0.855***	-0.546***	-0.673***	-0.772***
	(0.260)	(0.198)	(0.337)	(0.241)
Semiconductor*Large	-0.527**		0.406	
	(0.250)		(0.406)	
Constant	16.391***	15.944***	17.525***	17.520***
	(0.050)	(0.174)	(0.185)	(0.331)
Number of observations	54887	9416	10491	2686
Population	257786.9	27114.9	15279.7	3692.2
Time dummies	Yes	Yes	Yes	Yes
F-statistic	322.25***	49.87***	16.81***	9.80***
R-squared	0.18	0.28	0.05	0.08

*Source of basic data: Philippine Statistics Authority, Annual Survey of Philippine Business and Industry, various years. Notes: ***p < 0.01, **p < 0.05, * p < 0.10. A p-value below 10% indicates a statistically significant correlation; more stars indicate stronger evidence that the relationship is not due to chance. Standard errors are reported in parentheses. p = p-value; OLS = ordinary least squares; PHP = Philippine peso; R&D = research and development. Monetary values are deflated to 2024 prices using the Gross Domestic Product deflator from the World Bank's World Development Indicators [see Footnote 5].*

Table 7. Regressions with Input Cost Variables

Model	5	6	7	8
Dependent Variable	Log of real labor productivity (in PHP)		Log of real export productivity (in PHP)	
Method	OLS	OLS	OLS	OLS
Semiconductor	0.662***	0.689***	0.399	0.449
(1 if yes, 0 otherwise)	(0.244)	(0.240)	(0.292)	(0.309)
Exporter	0.233	0.214		
(1 if yes, 0 otherwise)	(0.190)	(0.191)		
Electricity share	-5.635***		-20.111***	
in total expenditure	(0.764)		(3.081)	
Water share in		-1.899***		-5.923***
total expenditure		(0.299)		(0.848)
Age	0.012***	0.012***	0.000	-0.004
	(0.000)	(0.002)	(0.004)	(0.004)
Age squared	0.000***	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Located in Metro Manila	0.498***	0.471***	-0.683***	-0.715***
(1 if yes, 0 otherwise)	(0.044)	(0.044)	(0.115)	(0.117)
Size (Baseline: Micro)				

Small	0.512***	0.535***	0.022	0.042
	(0.049)	(0.048)	(0.182)	(0.185)
Medium	1.589***	1.613***	0.353***	0.390**
	(0.048)	(0.047)	(0.172)	(0.174)
Large	1.650***	1.669***	0.153	0.184
	(0.046)	(0.045)	(0.171)	(0.174)
Semiconductor*Size				
Semiconductor*Small	0.104	0.093	-0.049	-0.006
	(0.255)	(0.251)	(0.305)	(0.323)
Semiconductor*Medium	-0.800***	-0.816***	-0.580*	-0.617*
	(0.259)	(0.254)	(0.336)	(0.350)
Semiconductor*Large	-0.468***	-0.475*	0.483	0.483
	(0.249)	(0.244)	(0.300)	(0.318)
Constant	16.224***	16.288***	17.719***	17.750***
	(0.195)	(0.196)	(0.189)	(0.193)
Number of observations	54869	54871	10490	10490
Population	257776.8	257779.4	15277.2	15277.2
Time dummies	Yes	Yes	Yes	Yes
F-statistic	297.51***	298.58***	21.24***	21.51***
R-squared	0.1888	0.1866	0.0659	0.0691

*Source of basic data: Philippine Statistics Authority, Annual Survey of Philippine Business and Industry, various years. Notes: ***p < 0.01, **p < 0.05, * p < 0.10. A p-value below 10% indicates a statistically significant correlation; more stars indicate stronger evidence that the relationship is not due to chance. Standard errors are reported in parentheses. p = p-value; OLS = ordinary least squares; PHP = Philippine peso. Monetary values are deflated to 2024 prices using the Gross Domestic Product deflator from the World Bank's World Development Indicators [see Footnote 5].*

Table 8 introduces trade and investment variables, particularly the role of intangible assets and government support in establishment-level productivity. Intangible assets are positively associated with labor productivity in Model 10. A 1% increase in intangible assets is associated with approximately 0.18% higher labor productivity, holding other factors constant. This relationship may reflect the contribution of patents and trademarks, franchises, licenses, processes, copyrights, and other knowledge-based assets to production efficiency, coordination, quality control, and the effective use of labor and physical capital. Such assets may also facilitate innovation and technological upgrading, particularly in technology-intensive industries such as semiconductors. The relatively modest elasticity suggests that intangible assets are likely to complement other productive capabilities rather than generate productivity gains independently.

Government subsidies received are also positively associated with productivity. A 1% increase in subsidies is associated with approximately 0.27% higher labor productivity in Model 9 and 0.41% higher export productivity in Model 11. Government support, in the form of special grants, financial assistance or tax exemption, or tax privilege, may enhance productivity by easing financing constraints and enabling firms to invest in technology, skills, R&D, and production upgrading. The stronger association with export productivity may reflect the importance of such support in helping firms meet the technological, quality, certification, and other requirements associated with participation in international markets. At the same time, the positive relationship may partly reflect the targeting of subsidies toward firms that are already larger, more productive, or strategically important. The estimates should therefore be interpreted as associations rather than evidence of a direct causal effect of subsidies on productivity.

Lastly, **Table 9** examines the association between R&D variables and establishment-level productivity. The results indicate a positive and statistically significant relationship between R&D expenditure and labor productivity. In Model 13, a 1% increase in R&D expenditure is associated with approximately 0.23% higher labor productivity, holding other factors constant. A similar relationship is observed for export productivity in Model 15, where a 1% increase in R&D expenditure is associated with approximately 0.19% higher export productivity. These findings suggest that establishments allocating greater resources to R&D tend to generate higher sales and export value per worker. R&D investment may enhance productivity through the development and adoption of improved production processes, product innovation, quality improvements, and greater technological capability. These mechanisms are particularly relevant to semiconductor manufacturing, where production competitiveness depends heavily on process sophistication and continuous technological upgrading/

R&D intensity, measured as the share of R&D expenditure in total expenditure, is also positively associated with labor productivity. In Model 14, a one percentage point increase in the R&D expenditure share is associated with approximately 5.6% higher labor productivity. The positive coefficient suggests that productivity is related not only to the absolute level of R&D spending but also to the extent to which firms allocate their expenditure toward R&D. This may indicate that establishments with a stronger orientation toward R&D are better positioned to develop firm-specific knowledge, improve production processes, and adopt more advanced technologies. However, the corresponding coefficient for export productivity in Model 16 is not statistically significant, indicating that the relationship between R&D intensity and productivity is less evident when productivity is measured in terms of export value per worker. These results reinforce the importance of strengthening firms' capacity to undertake R&D and translate research capabilities into improvements in production efficiency and technological upgrading.

Table 8. Regressions with Trade- and Investment-related Variables

Model	9	10	11	12
Dependent Variable	Log of real labor productivity (in PHP)		Log of real export productivity (in PHP)	
Method	OLS	OLS	OLS	OLS
Semiconductor	2.375***	-0.112	1.145**	0.930***
(1 if yes, 0 otherwise)	(0.600)	(0.108)	(0.554)	(0.192)
Exporter	-0.045	-0.147		
(1 if yes, 0 otherwise)	(0.989)	(0.505)		
Log of intangible assets		0.177***		0.033
		(0.032)		(0.044)
Log of total subsidies	0.272***		0.406***	
Received	(0.052)		(0.053)	
Age	-0.011	0.011*	-0.001	-0.029***
	(0.020)	(0.009)	(0.024)	(0.011)
Age squared	0.000	0.000	0.000	0.000*
	(0.060)	(0.000)	(0.000)	(0.000)
Located in Metro Manila	-0.236	-0.202	0.120	-1.903***
(1 if yes, 0 otherwise)	(0.483)	(0.192)	(0.338)	(0.412)
Size (Baseline: Micro)				
Small	-0.324	1.322***	-1.263**	-0.307
	(0.473)	(0.446)	(0.553)	(0.676)
Medium	0.497	1.871***	-1.339**	-0.396
	(0.516)	(0.444)	(0.555)	(0.632)
Large	0.172	1.695***	-2.131***	-0.377
	(0.489)	(0.436)	(0.546)	(0.614)
Semiconductor*Size				
Semiconductor*Small	-1.880***	0.620	-1.273*	0.139
	(0.668)	(0.770)	(0.667)	(1.467)
Semiconductor*Medium	-2.297***	-0.033	-0.659	-3.336***

	(0.711)	(0.236)	(0.638)	(0.950)
Semiconductor*Large	-2.232***		-0.557	
	(0.653)		(0.608)	
Constant	12.942***	13.730***	10.760***	18.499***
	(1.405)	(0.846)	(1.137)	(0.884)
Number of observations	554	1462	287	791
Population	1672.6	2613.9	378.8	994
Time dummies	Yes	Yes	Yes	Yes
F-statistic	10.82***	33.76***	7.34***	75.43***
R-squared	0.2979	0.3835	0.317	0.2455

*Source of basic data: Philippine Statistics Authority, Annual Survey of Philippine Business and Industry, various years. Notes: ***p < 0.01, **p < 0.05, * p < 0.10. A p-value below 10% indicates a statistically significant correlation; more stars indicate stronger evidence that the relationship is not due to chance. Standard errors are reported in parentheses. p = p-value; OLS = ordinary least squares; PHP = Philippine peso. Monetary values are deflated to 2024 prices using the Gross Domestic Product deflator from the World Bank's World Development Indicators [see Footnote 5].*

Table 9. Regressions with Research-related Variables

Model	13	14	15	16
Dependent Variable	Log of real labor productivity (in PHP)		Log of real export productivity (in PHP)	
Method	OLS	OLS	OLS	OLS
Semiconductor	-0.483	0.721***	1.007***	0.470
(1 if yes, 0 otherwise)	(0.124)	(0.245)	(0.180)	(0.295)
Exporter	-0.438	0.200		
(1 if yes, 0 otherwise)	(0.323)	(0.187)		
Log of R&D	0.228***		0.191***	
expenditure	(0.018)		(0.024)	
R&D share in		5.626***		3.339
total expenditure		(1.696)		(2.375)
Age	0.028***	0.013***	-0.001	-0.004
	(0.007)	(0.002)	(0.006)	(0.004)
Age squared	0.000***	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Located in Metro Manila	0.287**	0.481***	-0.779***	-0.705***
(1 if yes, 0 otherwise)	(0.128)	(0.045)	(0.141)	(0.115)
Size (Baseline: Micro)				
Small	-0.033	0.546***	-2.893***	0.027
	(0.230)	(0.048)	(0.365)	(0.179)
Medium	0.045	1.633***	-2.108***	0.359***
	(0.234)	(0.047)	(0.369)	(0.168)
Large	-0.105	1.697***	-2.417***	0.181
	(0.243)	(0.044)	(0.363)	(0.167)
Semiconductor*Size				
Semiconductor*Small	0.698**	0.068	-0.067	-0.089
	(0.270)	(0.256)	(0.369)	(0.311)
Semiconductor*Medium	-0.235	-0.857***	-0.530	-0.678***
	(0.221)	(0.260)	(0.329)	(0.337)
Semiconductor*Large		-0.574***		0.405
		(0.250)		(0.302)

Constant	14.771***	16.194***	16.421***	17.522***
	(0.427)	(0.191)	(0.521)	(0.186)
Number of observations	4469	54865	1603	10488
Population	8612.3	257767.3	2126.5	15273.7
Time dummies	Yes	Yes	Yes	Yes
F-statistic	25.56***	292.91***	12.20***	16.01***
R-squared	0.2217	0.1807	0.1363	0.0546

*Source of basic data: Philippine Statistics Authority, Annual Survey of Philippine Business and Industry, various years. Notes: ***p < 0.01, **p < 0.05, * p < 0.10. A p-value below 10% indicates a statistically significant correlation; more stars indicate stronger evidence that the relationship is not due to chance. Standard errors are reported in parentheses. p = p-value; OLS = ordinary least squares; PHP = Philippine peso; R&D = research and development. Monetary values are deflated to 2024 prices using the Gross Domestic Product deflator from the World Bank's World Development Indicators [see Footnote 5].*

The empirical analysis indicates that productivity is a multidimensional outcome shaped by the interaction of firm capabilities, production conditions, and the broader operating environment. The positive associations of R&D investment, intangible asset accumulation, and government support with productivity highlight the importance of technological and knowledge-based capabilities, while the negative associations of electricity and water expenditure shares underscore the relevance of input cost conditions. Firm scale and other establishment characteristics also matter, although their relationships with productivity vary across specifications and between labor and export productivity. These findings call for a targeted, needs-based approach that recognizes differences in firm capabilities and operating conditions. They also underscore the need for a comprehensive strategy for industry upgrading where research, innovation, and technological capabilities serve as platforms for moving Philippine semiconductor firms toward higher-value and more competitive activities.

Policy Recommendation: Establishing a Semiconductor Productivity and Innovation Upgrading Program

The empirical results discussed in the previous section provide a basis for designing a targeted approach to semiconductor industry upgrading. The findings suggest that the constraints and capabilities relevant to productivity extend across several dimensions including but not limited to R&D and innovation, intangible assets, production inputs, and access to government support. Policies aimed at strengthening semiconductor competitiveness should therefore not rely on a single instrument or apply uniformly across firms. Instead, interventions should be designed around the specific capabilities and constraints of establishments and their position within the industry.

The proposed Semiconductor Productivity and Innovation Upgrading Program would provide this framework. Its central objective is to strengthen the productivity and technological capabilities of Philippine semiconductor establishments, with particular attention to micro, small, and medium establishments that may face greater constraints in accessing technology, R&D capabilities, and other productivity-enhancing resources. The program would identify firm- and segment-specific constraints and direct appropriate forms of public support toward addressing them. It would use research and firm-level evidence to determine where support is most needed while leveraging R&D and innovation as platforms for strengthening technological capabilities.

The proposed program should be implemented through a sequenced approach that recognizes that productivity upgrading is a gradual and cumulative process (**Table 10**). The objective is not to introduce all interventions simultaneously but to build the information, institutional capacity, and firm capabilities needed for each successive stage. The sequencing, therefore, moves from diagnosis and preparation to piloting and testing, followed by scaling and deepening and ultimately upgrading and institutionalization. This approach also allows government to use evidence from earlier stages to refine subsequent interventions and allocate resources more effectively.

The immediate phase establishes the foundation for evidence-based intervention, while the short-term phase tests whether the proposed approach can translate identified needs into measurable improvements at the firm level. Successful interventions can then be expanded and deepened over the medium term, enabling firms and supporting institutions to develop the capabilities required for more substantial upgrading.

Table 10. Proposed Implementation Sequence and Expected Outcomes

Time horizon	Phase/ Strategic Focus	Expected outcomes
Immediate term: 0 to 6 months	Phase I: Diagnose and prepare	- Established data and evidence base on firm capabilities, productivity, and constraints - Agreed priorities and targets - Established baseline, monitoring and evaluation indicators - Coordinated policy framework - Identified initial productivity and resource efficiency opportunities
Short term: 6 to 12 months	Phase II: Pilot test	- Validated model for needs-based firm support - Observed initial improvements on firm capabilities and productivity - Strengthened industry-academe linkages - Increased link between government support and measurable upgrading outcomes
Medium term: 1 to 5 years	Phase III: Scale up and deepen	- Broadened adoption of advanced technologies and research and development practices among participating firms - Strengthened workforce and innovation capabilities - Improved production and resource efficiency - Increased participation in higher-value activities - Strengthened linkages to regional and global value chains - Increased domestic value creation
Long term: 5 to 10 years	Phase IV: Further upgrade and institutionalize	- Deeper integration into higher-value segments of global semiconductor value chain - Greater domestic technological and innovation capacity - Sustained productivity and export upgrading - Stronger domestic value capture and industry resilience - Institutionalized government-industry-academe collaboration for continuous innovation - Recognition as a competitive regional hub for semiconductor manufacturing, research and development, and innovation

The long-term phase represents the transition from firm-level capability development to sustained industry transformation. By this stage, accumulated capabilities should support greater movement into higher-value activities and strengthen the Philippines' position within regional and global semiconductor value chains. This sequencing also allows interventions to be monitored and refined as industry conditions, technologies, and market opportunities evolve, ensuring that government support remains targeted, evidence-based, and responsive to emerging needs.

Table 11 translates the proposed program into concrete actions, identifying the lead agencies and key stakeholders for implementation. This matrix clarifies institutional roles while allowing interventions to evolve from diagnosis and pilot testing toward broader capability development and industry upgrading.

Table 11. Proposed Key Actions

Phase/ Strategic Focus	Specific Actions	Lead Actor	Other relevant stakeholders
Phase I: Diagnose and prepare	Designate/Establish a semiconductor industry upgrading task force	DTI-BOI	CHED, DEPDev, DOE, DOST, Industry groups
	Develop a standardized diagnostic which serves as a firm-level capability and constraints assessment that covers productivity, R&D, technology adoption, workforce, intangible assets, exports, utility costs, and value chain position; assess firms across different sizes and capabilities	DTI-BOI	PEZA, PSA, Industry groups, Academe
	Develop baseline indicators for productivity	DTI-BOI/PSA	DEPDev, DOST, PEZA, Industry groups, Academe
	Use firm diagnostics and industry consultations to identify three to five priority areas for upgrading, including potential higher-value activities and key capability gaps	DOST/DTI-BOI	DEPDev, PEZA, PSA, Industry groups, Academe
	Map existing incentives, grants, training, and technical assistance against identified constraints; identify gaps, overlaps, and opportunities for better targeting. Coordinate the program with relevant national and local initiatives, including the Tatak Pinoy Strategy, Trabaho Para sa Lahat, and other related measures	DOF /DTI-BOI/PEZA	CHED, DEPDev, DFA, DOLE, DOST, PEZA, TESDA
	Conduct rapid electricity and water assessments among selected firms and industrial zones; identify feasible efficiency and process-improvement measures	DTI	DOE, PEZA
Phase II: Pilot testing	Select candidate firms with different sizes, capabilities, and constraints; develop firm-specific upgrading plans and provide targeted technical assistance	DTI-BOI/PEZA	DOST, Industry groups
	Provide targeted support for process innovation, automation, testing, design, software, databases, and other technology-upgrading activities, with clear project outputs	DTI-BOI	DOST-PCIEERD, Industry groups, Academe
	Match industry problems with university researchers, laboratories, and technical expertise; support pilot collaborative projects	CHED/DOST	DOLE, TESDA, Industry groups, Academe
	Support firms in acquiring, developing, protecting, and deploying software, databases, intellectual property, licenses, and other knowledge-based assets	IPOPHIL	DICT, DOST, DTI, Industry

			groups, Academe
Phase III: Scale up and deepen	Scale successful firm-level upgrading interventions, with support differentiated according to firm needs and capability levels	DOST/DTI-BOI	PEZA, Industry groups, Academe
	Establish semiconductor technology extension services that provide technical assistance to firms in process optimization, automation, quality management, digitalization, R&D management, and export readiness	DOST/DTI-BOI	PEZA, Industry groups, Academe
	Develop or expand facilities for prototyping, testing, characterization, failure analysis, product development, design, and certification, with access for smaller firms	DOST/DTI-BOI	PEZA, Industry groups, Academe
	Develop industry-aligned curricula, engineering fellowships, internships, technician training, and specialized programs in design, process engineering, testing, automation, and advanced manufacturing	CHED/TESDA	DOLE, DOST, DTI, Industry groups, Academe
	Expand resource-efficiency assessments and support efficient equipment, process improvements, water recycling, energy management, and other measures across relevant production areas	DOE/DTI	DOST, PEZA, LGUs Industry groups, Academe
	Align incentives, R&D, skills, infrastructure, and investment facilitation around priority higher-value activities and firm upgrading pathways	DOF/DTI-BOI	DEPDev, PEZA, Industry groups
	Establish targeted partnerships with semiconductor-producing economies and regional partners for joint R&D, technology transfer, skills development, industry linkages, and participation in regional value chains; prioritize partnerships aligned with identified Philippine upgrading needs and priority value chain segments	DFA/DTI	DEPDev, International partners
Phase IV: Further upgrade and institutionalize	Institutionalize monitoring, evaluation, and policy learning by tracking productivity, R&D, exports, employment, investment, domestic value creation, and value chain upgrading; periodically assess the effectiveness and sustainability of public support	PSA	DEPDev, DTI-BOI, Industry groups
	Maintain a rolling semiconductor technology roadmap; sustain government–industry–academe R&D consortia, shared facilities, and technology partnerships	DEPDev/ DTI	DOST, PEZA, Industry groups, Academe
	Build on accumulated capabilities to support expansion into advanced testing, product and process engineering, semiconductor design, specialized manufacturing, and other knowledge-intensive activities	DOST/DTI-BOI	PEZA, Industry groups, Academe
	Develop long-term bilateral, regional, and multilateral arrangements covering joint R&D, technology development, talent mobility, investment, supply-chain resilience, and market access; position the Philippines as	DFA/DTI	DEPDev, International partners

	an active partner in regional and global semiconductor innovation and production networks

Notes: BOI = Board of Investments; CHED = Commission on Higher Education; DEPDev = Department of Economy, Planning, and Development; DICT = Department of Information and Communications Technology; DOE = Department of Energy; DOF = Department of Finance; DOST = Department of Science and Technology; DFA = Department of Foreign Affairs; DOLE = Department of Labor and Employment; DTI = Department of Trade and Industry; IPOPHIL = Intellectual Property Office of the Philippines; LGUs = Local Government Units; PCIEERD = Philippine Council for Industry, Energy, and Emerging Technology Research and Development; PEZA = Philippine Economic Zone Authority; PSA = Philippine Statistics Authority; TESDA = Technical Education and Skills Development Authority.

Conclusions

The Philippine semiconductor industry occupies a strategically important position within the country's advanced manufacturing landscape, providing a major link to global production networks despite representing a relatively small share of manufacturing establishments. The descriptive analysis discussed in this paper show that the industry is distinguished by its concentration of larger establishments, strong export orientation, substantial R&D capacity, and relatively large-scale operations. At the same time, these capabilities are unevenly distributed across firms, with R&D personnel and other indicators of technological capacity concentrated among larger establishments. The findings point to an industry with significant existing capabilities, but also with scope to broaden participation and strengthen the capacity of smaller firms to move toward higher-value activities.

The empirical analysis further highlights the multidimensional nature of productivity. Firm size, establishment characteristics, intangible assets, government support, and R&D investment are positively associated with productivity in selected specifications, while higher electricity and water expenditure shares are negatively associated with labor and export productivity. The results also show that these relationships vary across firm sizes and between labor and export productivity, underscoring the importance of differences in firm capabilities and operating conditions. One of the key insights from the analysis is that semiconductor industry competitiveness cannot be strengthened through a single policy instrument; rather, sustained productivity upgrading requires complementary improvements in technological capabilities, innovation, workforce capacity, and the broader production environment.

Against this backdrop, the paper proposes a research-based and needs-based Semiconductor Productivity and Innovation Upgrading Program. The proposed approach moves from firm-level diagnosis and pilot interventions toward the scaling of effective measures, deeper industry–academe collaboration, improved resource efficiency, stronger international partnerships, and sustained movement into higher-value activities. By linking government support to measurable capability-building and productivity outcomes, the program seeks to make industrial policy more targeted, adaptive, and evidence-based. Ultimately, sustained investment in research, innovation, skills, infrastructure, and firm capabilities can help the Philippines move beyond its established role in semiconductor manufacturing toward greater domestic value creation and a stronger position in higher-value segments of regional and global semiconductor value chains.

ABOUT THE AUTHOR

GERALD GRACIUS Y. PASCUA is an economics lecturer and researcher at the Ateneo de Manila University Department of Economics. He has over a decade of experience in economic research, project monitoring and implementation, and policy evaluation and analysis. He has undertaken consultancy work for various institutions, including the Philippine Department of Trade and Industry, Asian Development Bank, Asian Productivity Organization, Economic Research Institute for ASEAN and East Asia, and the ASEAN Secretariat. His research interests in international trade include the empirical analysis of trade agreements, emerging issues in trade policy, particularly issues related to the digital economy, and regional economic integration in Developing Asia. He holds a Master of Arts in Economics from the University of the Philippines School of Economics.

Developing Strategies to Attract Semiconductor Investment into ASEAN: A Look at Intellectual Property and Strategic Trade Management

By
Francis Mark Quimba

Executive Summary

Francis Mark Quimba

The reorganization of semiconductor supply chains around geopolitical alignment has opened a window for Southeast Asia, but ASEAN's maximization of that window is not assured. Announced greenfield investment since 2021 has flowed disproportionately to the advanced benchmark economies, and the investment environment within ASEAN is highly uneven with regard to the dimensions that increasingly govern eligibility for trusted supply chains: intellectual property protection and strategic trade and export control management. This paper asks which features of the investment environment are statistically associated with attracting greenfield investment, assesses the investment environment in the Philippines to identify the gaps and translates the findings into an agenda that operationalizes the ASEAN Framework for Integrated Semiconductor Supply Chains (AFISS). Finally, the paper identifies available United States support instruments to support the Philippines in addressing these gaps.

Using a mixed methods approach, this paper begins by looking at the announced greenfield FDI project values from UNCTAD's World Investment Report 2025 (Annex Table 14) and regresses this on the International Property Rights Index (IPRI) and the Peddling Peril Index (PPI), each entered both as a composite and decomposed into pillars alongside macroeconomic, infrastructure and human capital controls and regional bloc dummies. Contemporaneous and lagged specifications are estimated. The econometric results are complemented by a key informant interview with an official from the Semiconductor and Electronics Industries in the Philippines Foundation (SEIPI) and by a synthesis of eight anonymized private sector consultations conducted under the Chatham House Rule.

Three findings stand out. First, the intellectual property environment is positively and significantly associated with greenfield FDI, and decomposition shows the effect is specifically intellectual: the IP pillar carries the result, while the legal-political and physical property pillars are not statistically distinguishable from zero. The association survives a one-year lag. Second, strategic trade management matters through demonstrated capability rather than statute; the PPI total is positive and highly significant, and among the five pillars, the result is concentrated in monitoring and detection, which is significant across all pillar specifications—including a two-year lag—while proliferation financing and enforcement are not. Third, the control variables behave largely as theory predicts, with faster-growing economies and better electrification attracting more investment and with trade openness entering negatively in a pattern consistent with tariff-jumping FDI. Gross tertiary enrolment is insignificant or negatively signed, suggesting that enrolment volume is a poor proxy for the specific engineering and technical skills the industry requires. These results are associations rather than causal effects, and these may partly capture broader governance quality.

The qualitative evidence points in the same direction. Industry consultation identifies the absence of even a small prototyping wafer facility as a structural ceiling on moving up the value chain, favors customized anchor investor engagement over generic incentive menus, and flags input dependence on China as a recognized vulnerability. Private sector consultations locate the binding regional constraint in regulatory fragmentation rather than tariffs or infrastructure, and they identify three concrete strategic trade gaps: the transit and transshipment jurisdiction gap, the absence of interoperable product traceability, and weak destination confirmation mechanisms, for which one member state's practice of releasing an export bond only on confirmed destination clearance offers a codifiable regional model.

The paper proposes a three-phase roadmap. Phase 1 (0-12 months) builds foundations and credibility through a shared ASEAN capability map and single investment pipeline, an IP and strategic trade credibility baseline benchmarked on the IPRI and PPI, and a targeted-incentive playbook. Phase 2 (1-3 years) pursues

complementarity and capability through a piloted regional division of labor in one product line, shared centers of excellence, a talent compact oriented to a regional target of more than 200,000 engineers by 2030, and semiconductor-specific infrastructure prioritization. Phase 3 (3-5 years) delivers integration and resilience through a trusted supply chain standards package, critical materials diversification, and an ASEAN semiconductor policy observatory. Credibility actions come first because they are inexpensive and are valued more by investors than incentives.

For the United States, the instruments already converge on the same geography through the Luzon Economic Corridor and Pax Silica. The paper provides five actionable recommendations: sequence the instruments into an explicit USTDA-to-DFC pipeline anchored on a New Clark City advanced packaging or AI-hardware park; close the awareness gap around Pax Silica through State Department convening and ASEAN-wide communication; lead on intellectual property enforcement and strategic trade management technical assistance, which are United States comparative advantages and precisely the variables the analysis links to investment; revive advanced assembly, test, and packaging (ATP) and talent support following the lapse of CHIPS Act-linked training; and fund a modest proof of concept feasibility study for a shared prototyping wafer laboratory or advanced packaging park. For the Philippines, the Semiconductor and Electronics Industry Roadmap 2026-2030 now supplies the domestic counterpart to the regional agenda so that national and regional timetables can be run together rather than in sequence.

The Changing Global Economy and High-Tech Governance

Background

The global semiconductor industry is being reorganized by geopolitics as much as by technology. The United States–China rivalry, the expanding reach of export controls, the U.S. CHIPS Act and comparable incentive programs in Japan, Korea and Europe, and the diversification strategies of the major chipmakers are redrawing the map of where design, fabrication and assembly, test, and packaging (ATP) capacity is located, even as the global market is projected to grow from roughly USD 600 billion in 2024 to over USD 980 billion by 2029 (ERIA, 2025). For Southeast Asia, this realignment opens an opportunity for firms and allied governments actively seeking trusted, cost-competitive locations outside existing geographic chokepoints (Dorakh, 2024; Hinrich Foundation, 2025).

Whether ASEAN takes full advantage of that window is not guaranteed. Announced greenfield investment since 2021 has flowed disproportionately to the advanced benchmark economies, and within ASEAN, the investment environment is highly uneven on precisely the dimensions that increasingly govern eligibility for trusted supply chains: intellectual property protection and strategic trade and export control management. The region's collective response is the ASEAN Framework for Integrated Semiconductor Supply Chains (AFISS), endorsed in 2025, which seeks to transform ASEAN from a regional back-end service provider into a vertically integrated production base (ERIA, 2025). For the Philippines, the regional agenda in AFISS is aligned with a bilateral partnership in the Luzon Economic Corridor and the Pax Silica Declaration. The Philippines signed with the United States in April 2026, placing the country inside an emerging economic security architecture that comes with concrete instruments such as USTDA project preparation, DFC financing and State Department convening power.

This paper contributes an evidence base for that agenda. It examines how the investment environment (measured through the IPRI and the PPI alongside macroeconomic, infrastructure and human capital controls) is associated with announced greenfield FDI across ASEAN-6 and four benchmark economies, complements the econometrics with industry interviews and private sector consultations, and assesses the Philippine investment environment to identify the gaps. The paper then translates the findings into a phased roadmap that operationalizes AFISS and matches U.S. support instruments address the gaps identified. The remainder of the paper proceeds as follows: Section II describes the semiconductor investment landscape in ASEAN; Section III sets out the methodology; Section IV presents the determinants of greenfield FDI; Section V draws implications for the policy and regulatory frameworks of ASEAN Member States; Section VI reports industry perspectives; Section VII develops the strategic roadmap; Section VIII maps U.S. instruments as entry points; and Section IX concludes.

Objectives and Scope

This study aims to achieve the following objectives:

1. Analyze the existing policy and regulatory frameworks of ASEAN Member states and identify best practices for semiconductor investment attraction
2. Assess the requirements (physical capital, human capital and policies) necessary for manufacturing competitiveness
3. Develop a phased strategic investment roadmap that operationalizes the ASEAN Framework on Integrated Semiconductor Supply Chains (AFISS).

As much as possible, descriptive statistics on the region (or the individual AMS) is presented. However, the empirical analysis focuses on ASEAN-6 (Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam) with some benchmarking made on reference economies such as Japan, South Korea, Taiwan and United States.

Limitations

Three limitations frame the analysis. First, in the absence of a publicly available, harmonized panel of semiconductor-specific FDI, the dependent variable is total announced greenfield FDI, used as a proxy whose justification and implications are discussed in Section III. A corollary to this would be limiting the dataset to ASEAN-6 because of the unavailability of explanatory variables during the time period for the other AMS. Second, the econometric results are OLS associations rather than causal estimates and may partly capture broader governance quality. Third, the

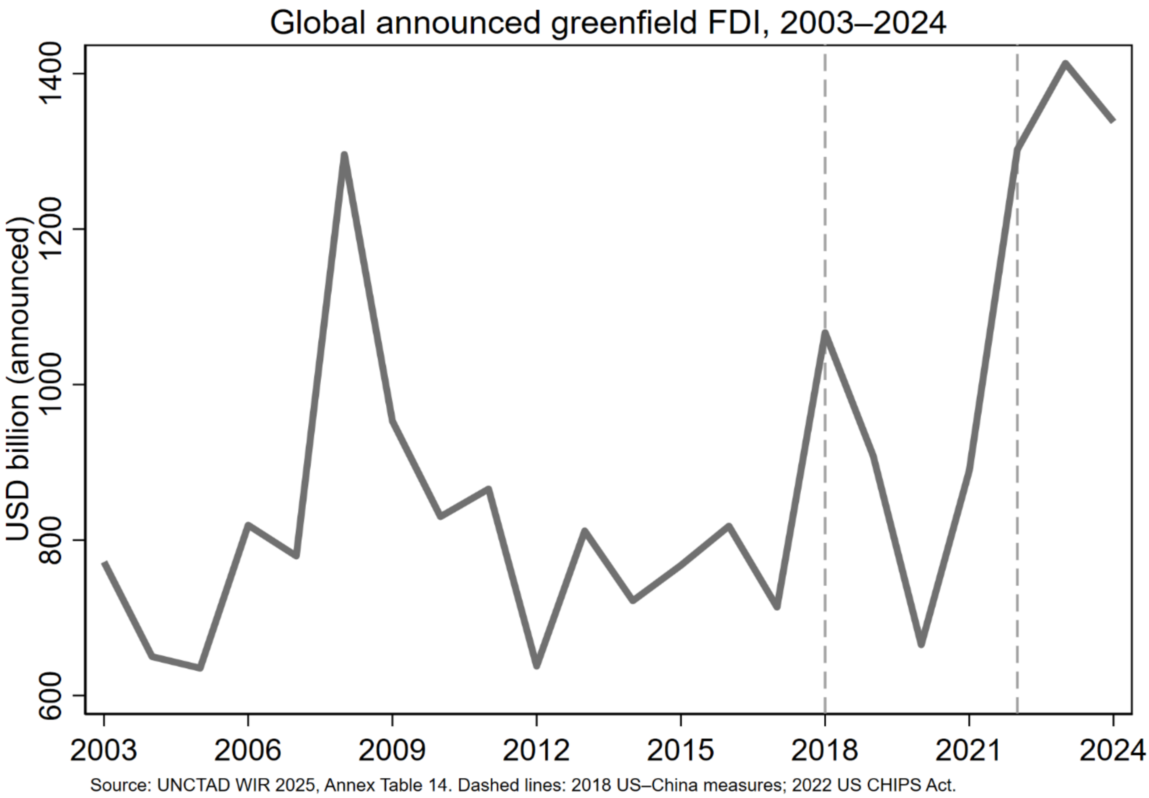
IPRI methodology was revised after its 2020 edition, so index levels are not strictly comparable across the 2020–2022 boundary.

Semiconductor investment landscape in ASEAN

I. *Investment landscape*

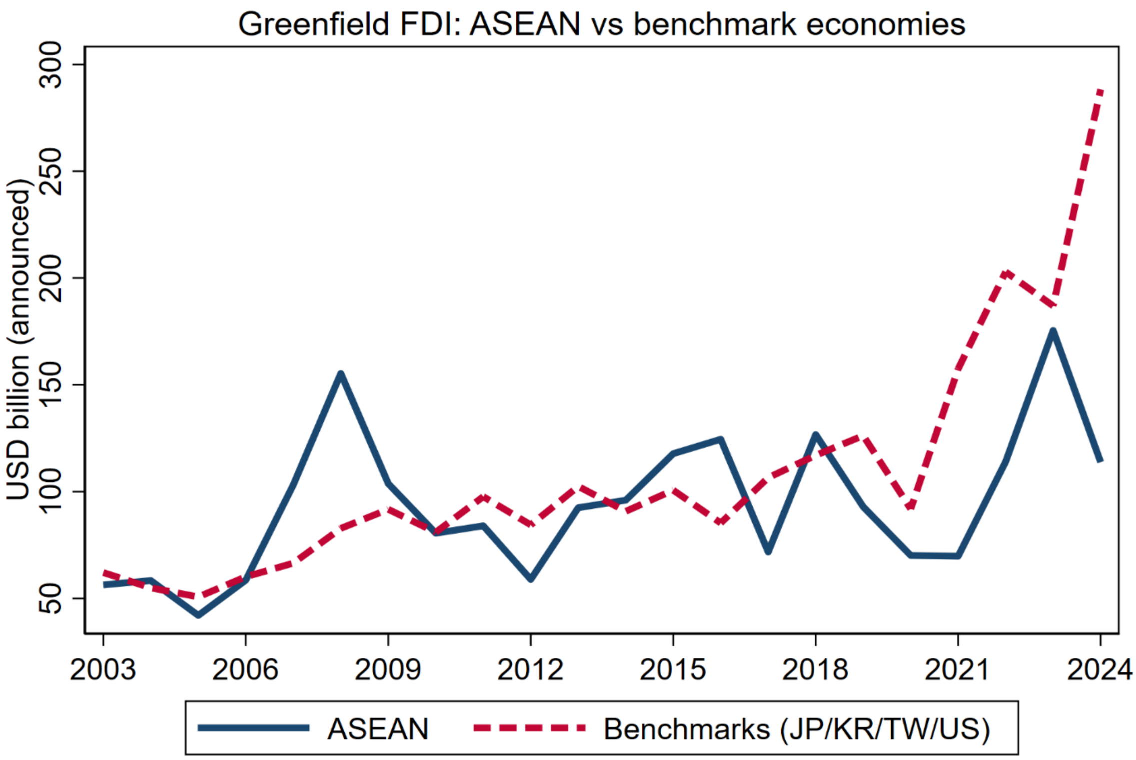
Global greenfield investments may be considered as a strong predictor of where production capacity is being committed. Figure 1 shows the global performance of greenfield FDI which reached its lowest point in 2012, recovered until 2018, and experienced another major decline. Recovery is seen in 2021, and a sharp upward push was made in 2022. Key global events that may have affected FDI trends include the 2018 U.S.-China trade war and the 2022 U.S. Chips Act. Of course, the 2020 COVID-19 pandemic is also a key global disruption that could explain the decline in 2020.

Figure 1. Global announced greenfield FDI



Comparing the global performance on greenfield FDI with selected benchmark economies with that of ASEAN Member States, it is evident that up until 2021, ASEAN was doing relatively well, performing on par with and sometimes even better than the benchmark economies (Figure 2). Post-2021, the benchmark economies have done relatively well, with their announced greenfield FDI ballooning in 2024 while the AMS have faltered. This discrepancy in performance presents a window of opportunity for the AMS to improve its investment environment by looking at export controls, IP protection policies and business environment improvements.

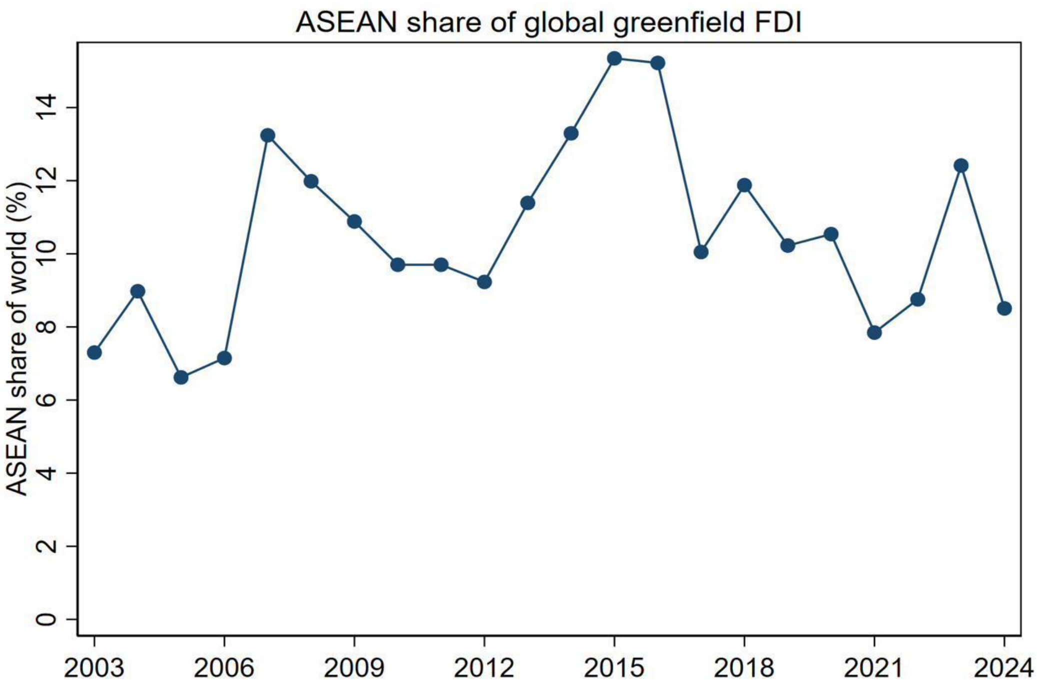
Figure 2. Announced greenfield FDI: ASEAN vs benchmark economies



Source: UNCTAD WIR 2025, Annex Table 14.

Digging deeper, Figure 3 looks at ASEAN's share of globally announced greenfield FDI. ASEAN's share of global greenfield FDI peaked at more than 15 percent and then fluctuated in the range of 8 to 12 percent in recent years. Figure 3 illustrates that there is currently room for the region to reach its peak global FDI share which it has already achieved in 2015.

Figure 3. ASEAN share of global announced greenfield FDI

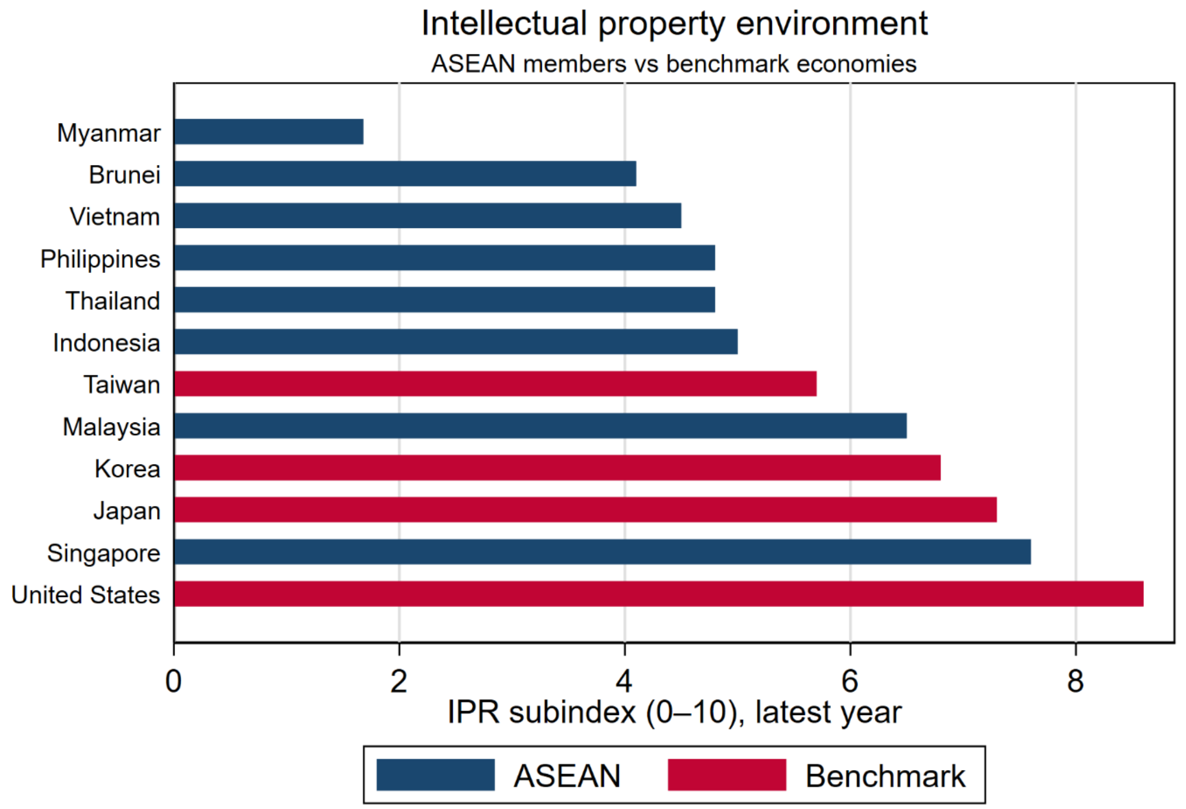


Source: UNCTAD WIR 2025, Annex Table 14.

II. *IP Environment*

IP protection is important because the semiconductor industry relies on value produced through design and process know-how. Weak IP protection in a country increases the riskiness of that country receiving higher-value, design-intensive activities of the semiconductor value chain. To illustrate ASEAN's IP protection environment, Figure 4 ranks selected economies according to the Intellectual Property (IP) subindex of the IPRI (Box 1). Compared to the advanced economies, such as the United States of America (U.S.), Japan and South Korea, Singapore is performing at an advanced economy level, while Malaysia is the next best performing ASEAN member state. The rest of ASEAN, such as Indonesia, Thailand, the Philippines, and Vietnam, are trailing behind the advanced economies. Myanmar ranks lowest among the AMS selected for the figure.

Figure 4. Intellectual property environment: ASEAN members vs benchmark economies



Source: International Property Rights Index (latest available 2022–2024).

Taken as a whole, it becomes clear that ASEAN would need to improve IP regulations and demonstrate capability in safeguarding intellectual property in order to be able to attract more investments into the region and further integrate itself in semiconductor manufacturing.

Box 1. ASEAN's intellectual property performance through the lens of the IPRI

The IPRI, published annually by the Property Rights Alliance, scores economies on a 0–10 scale as the equal-weighted average of three pillars: a legal and political pillar (judicial independence, rule of law, political stability and control of corruption), a physical property pillar (protection, registration and financing of tangible assets), and an intellectual property pillar capturing perceptions of IP protection, the strength of patent protection and the extent of copyright piracy (Property Rights Alliance, 2016–2025). Because the IP pillar combines de jure protection with perceived enforcement, it is well suited to capturing what design-intensive investors actually experience rather than what statutes promise.

ASEAN's performance on the index spans nearly the entire global distribution. Two features matter for interpretation; first, the regional gap is largely an enforcement gap rather than a legislation gap. All AMS are WTO members bound by TRIPS and most have modern IP statutes, but judicial capacity, enforcement against infringement, and the commercialization of IP lag the law on the books, which is precisely the dimension the IPRI's perception-based components penalize. Second, the IPRI methodology was revised after the 2020 edition (no 2021 edition was published), producing a level break in 2022 that cautions against comparing pillar levels across that boundary.

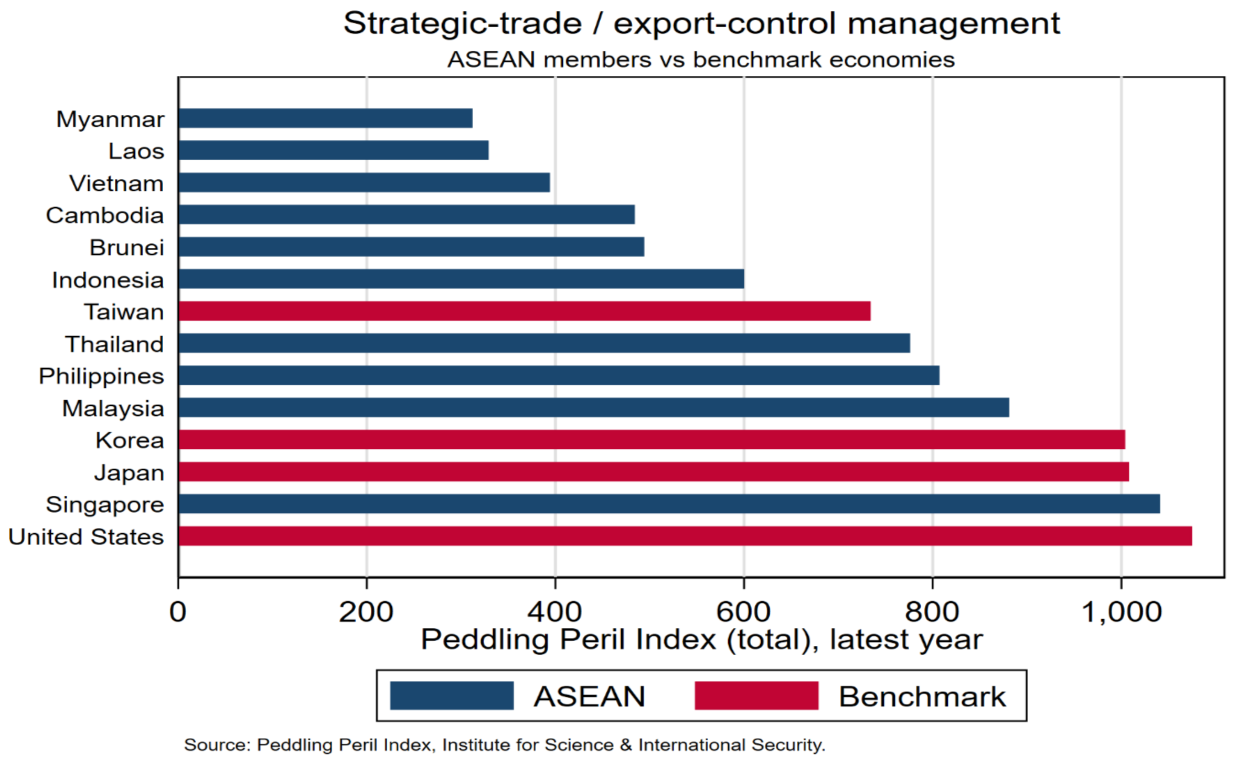
The investment implication is segment specific. Back-end ATP can tolerate a middling IP environment because the know-how at risk is largely embodied in equipment and process discipline; IC design, electronic design automation and core-IP licensing cannot, because their value is the design itself. ASEAN's ambition under AFISS to move from a back-end service provider to a vertically integrated production base with technology transfer, R&D collaboration and IP development as explicit objectives (ERIA, 2025) makes IP upgrading in the trailing economies a precondition of the regional strategy.

Source: Author's elaboration based on Property Rights Alliance (2016–2025) and ERIA (2025); see Figure 4.

III. Strategic Trade Management

With export control compliance becoming a precondition for participation in trusted supply chains, it is important to also look at the performance of ASEAN in terms of strategic trade/export control management. The indicator for this is the PPI score, which ranks countries according to their national strategic trade control systems. Figure 5 presents the performance of the AMS with regard to the PPI score.

Figure 5. Strategic trade / export control management (PPI): ASEAN members vs benchmark economies



Singapore leads AMS in terms of strategic trade management (STM), with scores close to the benchmark economies. Meanwhile, Malaysia and the Philippines score moderately—above 800 out of 1000. A number of AMS have scores below 400, which is considered low by the PPI; these include Cambodia, Vietnam, Laos and Myanmar. For U.S. semiconductor companies looking for locations for investment, locations that have reliable STM and export control management would be more preferred as these ensure they comply with U.S. Export Administration Regulations (EAR).

Box 2. Strategic trade management in ASEAN through the lens of the Peddling Peril Index

The Peddling Peril Index (PPI), compiled biennially by the Institute for Science and International Security, ranks 200 countries, territories and entities on the capabilities and demonstrated performance of their strategic trade/export control systems, drawing on roughly one hundred indicators of export, import, transit and transshipment controls over strategic goods and technologies (Institute for Science and International Security, 2024). Scores aggregate five supercategories: international commitment, legislation, the ability to monitor and detect strategic trade, the ability to prevent proliferation financing, and adequacy of enforcement. The index thus rewards demonstrated operational capability and not merely the existence of laws.

As with intellectual property, ASEAN spans the global range. Singapore scores close to the benchmark economies; Malaysia and the Philippines occupy a moderate tier; and Vietnam, Cambodia, Laos and Myanmar record low scores, reflecting gaps in legislation, monitoring capacity and enforcement. This dispersion matters more than it once did. Under the United States' Foreign Direct Product Rule, export controls are attached to any product made anywhere using U.S. technology, software or design tools, so a chip designed or packaged in ASEAN with American EDA tools or equipment falls within the U.S. regulatory perimeter regardless of where it ships (The Diplomat, 2025). Jurisdictions that cannot demonstrate credible strategic trade management expose investors to compliance risk they cannot contract away.

The region's specific vulnerabilities are concentrated on transit and transshipment nodes. Private sector consultations reported that goods in transshipment often cannot be inspected because they fall outside the physical jurisdiction of local authorities (one respondent identified this as the largest regulatory gap in the region) and interoperable product traceability is absent precisely where illicit flows concentrate. The same consultations identified a regional best practice worth codifying: one member state requires exporters to post a bond released only when the destination country confirms clearance, creating end-to-end accountability of exactly the kind strategic trade/ export controls require. The implication of Box 2 mirrors that of Box 1: strategic trade management has become an investment attraction variable, and the AMS that can demonstrate monitoring and detection capabilities are the ones that qualify as trusted nodes in controlled semiconductor supply chains.

Source: Author's elaboration based on Institute for Science and International Security (2024); see Figure 5.

Methodology

This paper uses a mixed methods approach that combines quantitative analysis of investment, review of the investment environment, and qualitative consultations with stakeholders.

Quantitative approach

Data sources

Due to data limitations on the availability of a publicly available, ready-made dataset on semiconductor-specific FDI, this study uses announced greenfield FDI project values from UNCTAD's World Investment Report 2025 Annex Table 14 as the dependent variable. Three considerations justify this choice. First, announced greenfield FDI is a forward-looking measure of where new productive capacity is being committed, which is precisely the policy question this paper asks; unlike balance-of-payments FDI flows, it is not diluted by mergers and acquisitions, retained earnings, intra-company loans, or financial round-tripping that transfer ownership of existing assets without creating new capacity. Second, semiconductor investment is overwhelmingly greenfield in character: wafer fabs, ATP plants, and each of their supporting infrastructure are new-build, capital-intensive projects, so the greenfield aggregate is the component of total FDI in which semiconductor projects are concentrated and through which the industry's locational decisions are expressed. Third, the use of FDI project data to study semiconductor location choices has precedent: Yoffie (1993) analyzes how policy and market-access conditions shaped foreign direct investment in semiconductors, and Dorakh (2024) uses FDI and trade measures to assess the capability of European and Asian economies, including Vietnam and Malaysia, to attract semiconductor investment.

The use of total (rather than semiconductor-only) greenfield FDI also remains informative for technology investment more broadly. The explanatory variables tested here (intellectual property protection, strategic trade/export control credibility, infrastructure reliability, and human capital) are the location factors that technology investors weight most heavily, and recent greenfield flows are themselves disproportionately composed of manufacturing and technology megaprojects, with semiconductors among the largest announced categories (UNCTAD, 2025). If anything, because the aggregate includes sectors that are less sensitive to IP and export control regimes (for example, real estate or construction), the estimated associations for the full greenfield aggregate plausibly understate the strength of these relationships for semiconductor and technology-specific projects; the estimates reported in this report are therefore best read as conservative lower bounds for the technology segment. The limitation that the dependent variable is not semiconductor-specific is nonetheless acknowledged, and the qualitative evidence in Section VI is used to test whether the mechanisms implied by the regressions are the ones semiconductor practitioners actually report.

The investment environment that explains the flow of greenfield FDI is captured using a number of explanatory variables. Intellectual property protection is measured by the IPRI and its corresponding pillars (See Box 1). Meanwhile, strategic trade/export control management is measured using the PPI and its corresponding pillars as well.

Institutional quality is captured using the World Bank's Worldwide Governance Indicators (WGI). Finally, other controls, such as macroeconomic performance, human capital, and infrastructure availability, are included. Table 1 summarizes the variables used and their sources.

Table 1. Variables used

Variable	Definition (abbreviated)	Source
Greenfield FDI (dep. var.)	Announced greenfield FDI project value, USD millions	UNCTAD WIR 2025
IPRI (overall)	Composite property rights index, 0–10 (equal-weighted average of the three pillars)	Property Rights Alliance / IPRI
– Legal & political (LP)	Judicial independence, rule of law, political stability, control of corruption	IPRI
– Physical property (PPR)	Protection, registration and financing of physical/tangible assets	IPRI
– Intellectual property (IPR)	Protection of IP: patents, copyright, trademark protection and enforcement	IPRI
PPI (total)	Strategic trade control performance; higher = stronger controls	Peddling Peril Index (ISIS)
– International commitment	Commitment to non-proliferation of WMD and controlled materials	PPI
– Legislation	Laws/authorities controlling trade in strategic commodities	PPI
– Monitoring & detection	Operational capacity to monitor and control strategic trade	PPI
– Proliferation financing	Ability to prevent financing of WMD proliferation	PPI
– Enforcement	Adequacy of enforcement against strategic-commodity trafficking	PPI
GDP growth	Annual % growth of real GDP (constant 2015 US$)	WDI
Trade openness	Trade (exports + imports) as % of GDP	WDI
Electrification	Access to electricity, % of population	WDI
Tertiary enrolment	Gross tertiary school enrolment ratio, %	WDI
Rule of law / Reg. quality / Corruption	Governance scores 0–100 (higher = better)	WGI

Source: Author's compilation

Econometric model and Estimation procedure

OLS is used to obtain the correlation between announced greenfield FDI and the explanatory variables (Equation 1). These would include macroeconomic and human capital controls together with the variables of interest: IPRI and its pillars and the PPI and its pillars. Contemporaneous and lagged estimations were also conducted as robustness checks. Finally, regional bloc dummies (e.g. ASEAN, RCEP, CPTPP) have been added to absorb membership effects.

$$FDI_{it} = \beta_0 + \beta_1(IP_{it}\ or\ STM_{it}) + \gamma' X_{it} + \delta' B_i + \varepsilon_{it} \quad (1)$$

where FDI_{it} is the announced greenfield FDI project value (USD millions) of country i in year t; IP_{it} is the intellectual property environment, entered either as the consolidated IPRI or decomposed into its legal-political, physical property and intellectual property pillars; STM_{it} is strategic trade/export control management, entered either as the PPI total or decomposed into its five pillars (international commitment, legislation, monitoring and detection, proliferation financing, and enforcement); X_{it} is the vector of macroeconomic and human capital controls (GDP growth, trade openness, electrification and tertiary enrolment); B_i is a vector of regional bloc membership dummies (ASEAN, RCEP, CPTPP, etc.); and ε_{it} is the error term. The IP and STM blocks are estimated in separate sets of regressions (Tables 2 and 3, respectively). Lagged specifications replace the contemporaneous indices with their one-year (IPRI) or two-year (PPI) lags to reduce simultaneity between investment announcements and the measured investment environment.

Panel data estimation with fixed effects was also conducted as robustness checks. These panel data estimate control for time-invariant country characteristics that may affect the relationship of the greenfield FDI and the explanatory variables.

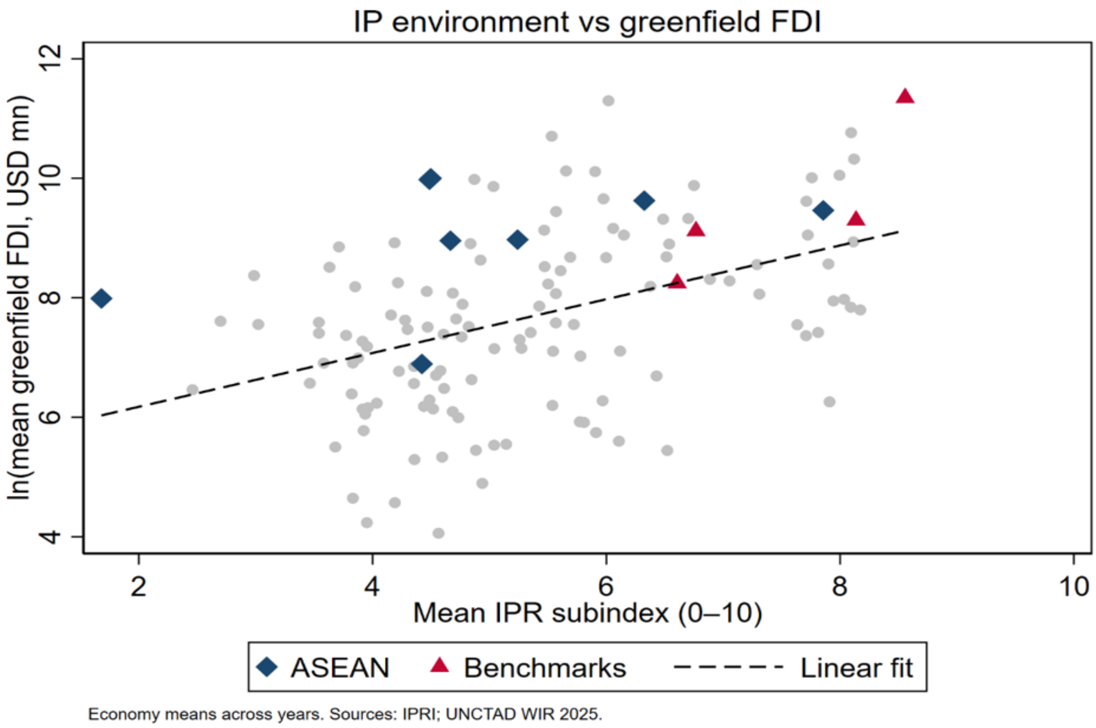
Qualitative approach

The quantitative results are supplemented by key informant interviews with representatives from businesses with ASEAN interests and industry associations along with academics from ASEAN. These are complemented by a synthesis of eight one-on-one strategic consultations with officials from firms operating across ASEAN, conducted between October and November 2025 under the Chatham House Rule in preparation for the Philippines' 2026 ASEAN Chairship. Respondents are anonymized and findings are mapped to the AFISS and strategic trade management agendas by thematic correspondence. The SEIPI key informant is identified with the respondent's consent, while the strategic consultation respondents are anonymized (Respondents 1–8) in line with the Chatham House Rule. Their responses highlight the importance of a number of factors to support ASEAN as a semiconductors manufacturing hub in Asia.

Determinants of Greenfield FDI

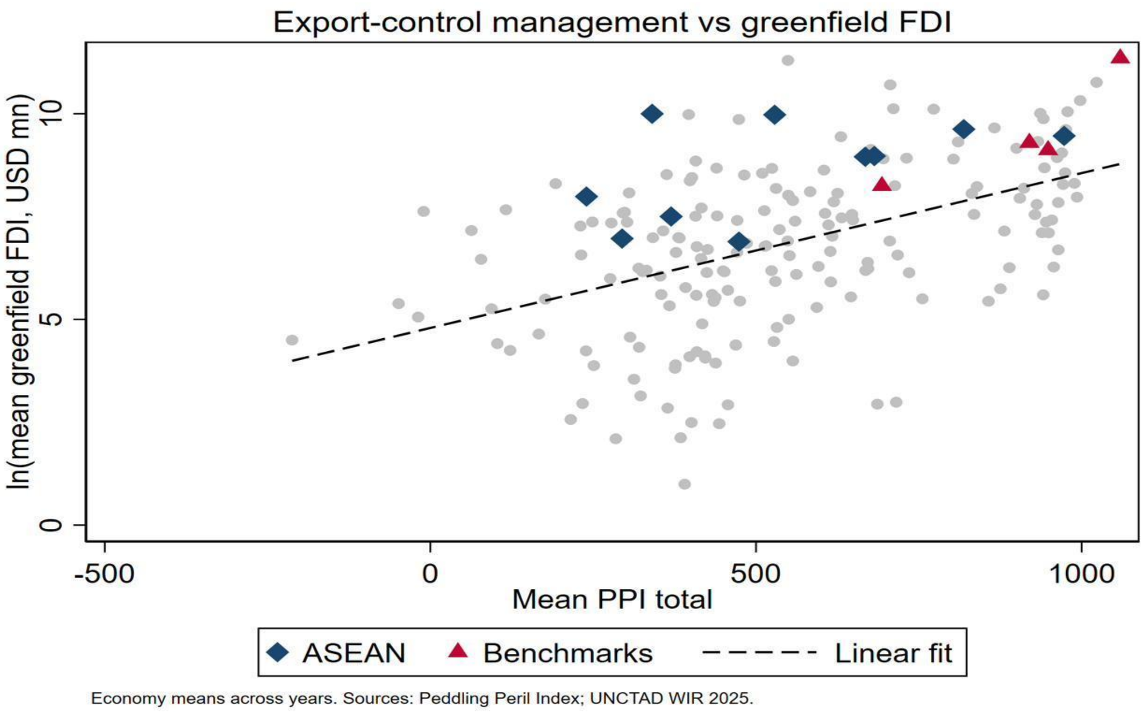
This section presents the estimated determinants of greenfield FDI with key variables of interest. Scatterplots illustrate the correlation between greenfield FDI and the key variables of interest. These relationships were tested using econometrics, as explained in the previous chapter. Figure 6 presents the IP environment vis-à-vis greenfield FDI. The relationship is positive, which indicates economies with stronger IP protection tend to attract more greenfield investment, with the ASEAN members spread across the distribution and the benchmark countries clustered toward the upper right (high greenfield FDI and high IP protection).

Figure 6. Intellectual property environment and greenfield FDI



Similarly, a scatterplot for export control management and strategic trade as measured by the PPI and greenfield FDI is presented in Figure 7. A positive relationship is observed, which supports the hypothesis that credible IP and trusted supply chain governance attract the flow of greenfield investment to these countries

Figure 7. Strategic trade management (PPI) and greenfield FDI



To investigate further the statistical significance of these relationships, we conduct regression analysis. Two sets of OLS regressions are estimated. The first relates greenfield FDI with the IPRI and its components (Table 2). The second is focused on the PPI and looks at export control measures (Table 3). Before turning to the variables of interest, we first look at the control variables included in the model. In general, we observe that most of the control variables (GDP growth, trade openness ratio, electrification and tertiary enrolment rate) have coefficients that are consistent with *a priori* economic relationships, which lends credibility to the specifications.

Going through each of the control variables, GDP growth, which is measured as the annual percentage change in real GDP, is positive and significant throughout all the models. This means that the faster-growing economies tend to attract more market-seeking greenfield investment. Access to electricity (the share of the population with electricity, a proxy for basic infrastructure and grid reliability) is likewise positive and significant (except for model 3), consistent with the assumption that reliable power is a semiconductor manufacturing constraint. Trade openness (trade as a share of GDP) is negative and significant in every model that includes it. This may contradict the theory that trade openness would induce free flow of investment to the receiving economy, but this relationship may also reflect a familiar cross-country pattern observed in literature in which large, less trade-dependent economies attract disproportionate market-seeking FDI, while highly open economies tend to be smaller.[1]

Another puzzling result is that gross tertiary enrolment is largely insignificant and, in the models where it is significant, the coefficient is negative. One possible explanation for this relationship is that the sheer volume of tertiary enrolment is a poor proxy for the specific engineering and technical skills semiconductors require. Further specification and modeling should be done to investigate this. The workforce discussion returns to this area for further research in Section V.

Table 2. Relationship of IP indicators and greenfield FDI (OLS).

Greenfield FDI (USD mn)	(1)	(2)	(3)	(4) lag
GDP growth	804.3***	857.2***	493.0**	0.000***
Trade openness	−76.2***	−64.7***	36.5	−48.0***
Electrification	158.8***	205.6***	104.0	139.3***
Tertiary enrolment	32.0	−2.4	30.3	−0.2
IPRI (consolidated)	4193.6***	—	—	—
Legal & political pillar	—	−999.2	608.6	−989.6
Physical property pillar	—	−1419.2	−1036.0*	−1002.8
Intellectual property pillar	—	7422.9***	−1111.6	4814.3***
Trade bloc dummies	Yes	Yes	Yes	Yes
N	390	390	390	393
R^2	0.243	0.303	0.851	0.479

*Note: Col. (4) uses one-year-lagged pillars. * p<.1; ** p<.05; *** p<.01.*
Source: author's estimation from IPRI, UNCTAD WIR 2025 and WDI.

[1]Greater trade openness makes exporting and importing a more viable substitute than establishing factories and local production making the relationship negative. This relationship has been captured in earlier studies by Horstmann and Markusen (1992), Helpman et al. (2004) and Dua and Garg (2015). Dua and Garg explain the relationship as tariff-jumping FDI.

Relationship of Intellectual Property indicators and greenfield FDI (OLS).

The intellectual property dimension is a strong, positive determinant of greenfield FDI. The consolidated IPRI index, calculated as the equal-weighted average of the legal-political, physical property and intellectual property pillars, reflects a relationship that is positive and highly significant (column 1). Models 2 to 4 look at each of the components of the index by decomposing it to its pillars. Decomposing the index shows the effect is specifically intellectual; in other words, it is the intellectual property pillar that carries the result (column 2), while the legal-political pillar and the physical property pillar are not statistically distinguishable from zero. The association persists when the IP pillar is lagged one year (column 4), so it is not merely contemporaneous. The magnitude is economically large, which signifies that IP protection is a first-order consideration for design- and know-how-intensive investment, so the finding is best read as robust in direction rather than invariant in size. This result is consistent with the ranking gap in Figure 4: the ASEAN economies that trail on IP protection are, other things equal, associated with lower greenfield investment.

Relationship of export control management and greenfield FDI (OLS)

The results for export control management shows the pattern as that of the intellectual property variables. When used as a composite index, the PPI variable is positive and highly significant (Table 3, column 0). When we decompose the PPI into its five pillars, the positive relationship seems to be more concentrated in monitoring and detection, which pertains to the operational capacity of a state to monitor and control strategic or sensitive trade. The relationship is positive and significant across all six pillar specifications, including when lagged two years. Legislation (having strategic trade laws and authorities in place) and international commitment (formal non-proliferation commitments) are significant only in some specifications, notably once trade openness is dropped, while proliferation financing controls and enforcement are not significant. The pattern is intuitive: investors respond less to laws on paper but more on the demonstrated operational capability, which is precisely what qualifies a jurisdiction as a trusted node in a controlled supply chain. These results mirror Figure 5, where the ASEAN economies that score well on strategic trade management are best positioned to host sensitive, trusted supply chain investment

Table 3. Relationship of export control management and greenfield FDI (OLS)

Greenfield FDI (USD mn)	(0)	(1)	(2)	(3)L	(4)	(5)	(6)
GDP growth	+***	+***	+***	+***	+***	+***	+***
Trade openness	−51.7***	−51.9***	−47.7***	−52.7***	—	—	—
Electrification	79.9***	78.9***	47.7**	63.6**	55.1***	34.3*	43.7*
Tertiary enrolment	−14.0***	−35.2	−3.1	−3.3	−34.7	−6.9	−7.6
PPI (total)	18.0***	—	—	—	—	—	—
Intl. commitment	—	10.2	39.2	29.4	57.0	93.8**	103.1**
Legislation	—	29.5	42.7**	31.2	14.9	28.2*	14.6
Monitoring & detection	—	99.9***	53.8*	76.0**	99.5***	64.6**	85.2***
Proliferation financing	—	9.9	13.4	11.1	2.2	7.0	4.2
Enforcement	—	0.5	−1.4	12.2	−3.1	−1.6	11.5
Regional bloc dummy	No	No	Yes	Yes	No	Yes	Yes
N	465	465	465	342	495	495	364
R^2	0.282	0.300	0.453	0.467	0.264	0.425	0.436

*Note: Col. (0) uses the PPI total; cols (1)–(6) use the five pillars; cols (4)–(6) exclude trade openness; cols (3) and (6) use two-year-lagged pillars ("L"). GDP growth is positive and significant throughout (small-scale coefficients in the source). * p<.1; ** p<.05; *** p<.01. Source: author's estimation from PPI, UNCTAD WIR 2025 and WDI.*

Interpretation and limitations

Altogether, Table 2 and Table 3 indicate the importance of both the intellectual property environment and the operational quality of export control management as positively and significantly associated with greenfield FDI, even beyond the macroeconomic fundamentals and trade bloc membership. The results are robust whether we look at the consolidated indices (the IPRI overall index and the PPI total) or through their most relevant pillars (IP protection and monitoring and detection). Despite these results, there are three caveats that need to be considered. First, these are OLS associations and should not be identified as causal effects. Second, the results may suffer omitted variable bias, unable to fully consider potentially relevant aspects such as institutional-quality controls, and this may be captured in part by the IP and export control coefficients. Thus, the relationship may reflect broader governance quality. Finally, the IPRI methodology break across 2020–2022 may warrant caution in interpreting pillar levels.

Implications to Policy and Regulatory Frameworks of ASEAN Member States

How would these results affect the implementation of industrial policy roadmaps for the region on semiconductor supply chain resilience? To respond to this question, we first need to assess the strategies of AMS on semiconductor supply chains. ASEAN Member States approach semiconductors through two channels: direct semiconductor roadmaps and indirect, semiconductor-adjacent industrial policies. The most explicit national strategies are found in Malaysia and Vietnam; Thailand has released a draft long-horizon roadmap; Singapore embeds semiconductors within R&D, investment and advanced manufacturing frameworks; the Philippines anchors upgrading in electronics roadmaps and investment promotion; and Indonesia is an emerging case linked to AI, critical minerals and EVs. Brunei, Cambodia, Laos, and Myanmar have no dedicated roadmaps but maintain digital economy and diversification strategies that may connect them to adjacent segments over time.

Malaysia's National Semiconductor Strategy is the region's most fully specified, sequenced in three phases: modernizing OSAT toward advanced packaging while growing existing power and trailing-edge fabs and seeding IC design champions; attracting cutting-edge fabrication and test investment; and ultimately building world-class Malaysian firms that draw major chip buyers (MITI, 2024; Hinrich Foundation, 2025). It is backed by at least RM25 billion (about USD 5.9 billion) in fiscal support, supplemented by GLC funds and central bank soft loans, against targets of RM500 billion in semiconductor investment and 60,000 engineers trained by 2030 (Hinrich Foundation, 2025). Early implementation signals are visible in the design push, including a USD 250 million agreement with Arm for chip design blueprints, the Cyberjaya IC design park, and X-FAB's RM3 billion expansion in Sarawak (Hinrich Foundation, 2025).

Vietnam's Decision 1018/QD-TTg is distinctive for its quantified, three-phase targets: 100 design firms, one small-scale fab, and ten packaging and test facilities by 2030; 200 design firms, two fabs, and fifteen facilities by 2040; and 300 design firms, three fabs, and twenty facilities by 2050, with industry revenue rising from over USD 25 billion in 2030 to over USD 100 billion in 2050 (Socialist Republic of Viet Nam, 2024; Hinrich Foundation, 2025). The strategy is summarized in the formula "C = SET + 1" (specialized chips, electronics, talent, plus Vietnam as a new safe destination) and is resourced with roughly USD 380 million in financial support and a USD 1.05 billion human resource plan targeting an addition of at least 50,000 engineers by 2030 (VIR, 2024; Hinrich Foundation, 2025). Governance runs through a National Steering Committee chaired by the Prime Minister, while Samsung's anchor investor presence continues to pull accredited suppliers into the ecosystem (Vietnam Briefing, 2023).

Singapore, by contrast, pursues semiconductors without a standalone roadmap, embedding the sector in successive Research, Innovation and Enterprise plans backed by about S$28 billion plus a S$3 billion top-up for R&D and advanced manufacturing (Hinrich Foundation, 2025). The approach has sustained roughly 10 percent of global chip output and about 20 percent of global semiconductor equipment production from a city-state platform (Hinrich Foundation, 2025). Recent commitments, such as the USD 7.8 billion VSMC fab with NXP, UMC's fab expansion, GlobalFoundries' USD 4 billion facility, and Micron's USD 7 billion high bandwidth memory advanced packaging plant, confirm that the ecosystem and credibility model continues to win front-end and advanced packaging investment without headline subsidy races (Hinrich Foundation, 2025).

Thailand's framework was approved by a National Semiconductor Board chaired by the Prime Minister in 2024, with the Board of Investment finalizing the draft national roadmap announced in 2026 (BOI, 2026; Hinrich Foundation, 2025). The strategy targets THB500 billion (about USD 15.3 billion) in foreign semiconductor investment by 2029, concentrated on power chips, sensors, photonics, and analog and discrete devices that leverage the country's automotive and EV and expanding data center base (BOI, 2026). It is paired with an explicit talent program to train some 86,000 workers, including 1,400 MSc/PhD researchers, supported by a THB6.9 billion upskilling budget and dedicated R&D funding (Hinrich Foundation, 2025).

The Philippines has moved within the last year from a set of dispersed initiatives to a more consolidated national strategy. The Semiconductor and Electronics Industry Roadmap 2026-2030 issued by the Department of Trade and Industry under the guidance of the Semiconductor and Electronics Industry Advisory Council (SEIAC) sets a 2030 vision of the country as a trusted global partner packaging USD 70 billion in semiconductors, assembling USD 40 billion in electronics and delivering world-class IC design services against a combined global total of about USD 110 billion (DTI, 2026). The vision is organized on two prongs: sustaining ATP and electronics manufacturing services (EMS) as core businesses of the country and driving transformation into advanced packaging IC design, supply chain resilience and front-end readiness. To achieve this, five strategic thrusts have been identified: production and promotion; ease of doing business and the investment regime; markets and partnerships; talent; and infrastructure and utilities (DTI, 2026). Sub-sector targets have also been outlined in the roadmap. ATP share of global capacity will be raised from 4 to 7 percent. Meanwhile, the EMS share of global assembly is targeted to increase from 1 percent to 4 percent of global assembly anchored by two new global EMS locators and a local supplier network. Another target is generating USD 2-3 Billion in annual IC design export revenue, supported by a pipeline of 1,000 new IC designers per year until 2035 (DTI, 2026).

The Tatak Pinoyu (Proudly Filipino) Act adds a complementary industrial policy layer. Targets in that strategy include 15,000 new jobs and 10 local chip design or fabless firms by 2030. Capitalizing on the 2026 Philippine chairship of ASEAN, the Philippines can advance these goals through "semiconductor diplomacy" such as regional supplier certification and firm-to-firm partnerships (Enriquez, 2025).

The Philippines' roadmap is directly related to the results of this paper in two ways: first, it answers the OECD's recommendation of consolidating dispersed initiatives into a single long-term national strategy with defined funding, goals and governance (OECD, 2024). Implementation runs through the SEIAC, created by Administrative Order No. 31 in March 2025 and amended by Executive order No. 108 in January 2026. SEIAC is chaired by the Executive Secretary, with the DTI secretary as vice chair, and divided into three technical working groups: industry promotion, business environment, and policy; talent development and innovation; and infrastructure and supply chain resilience. Each of these working groups carry monitoring dashboards and quarterly reports to the Council and a scheduled midterm review. Second, the roadmap internalizes the two investment environment variables that this paper tests. Under Strategic Thrust 2, the paper commits to an IP Protection and Export Control Framework comprising legislation classifying trade secret infringement as a criminal offense, the establishment of a National Export Control Framework meeting international standards and an industry compliance education program with a measurable improvement in the rule of law-based IP protection as the stated outcome indicator (DTI, 2026). The roadmap thus treats IP credibility and strategic trade capability as investment attraction assets and gives those results a concrete domestic implementation vehicle and timeline.

The Roadmap also supplies the workforce and infrastructure detail that a regional strategy must be able to plug into. It quantifies a combined requirement of about 128,000 workers by 2030 (roughly 59,000 in ATP, 66,000 in EMS, and 2,000 in

IC design), implying an annual intake of close to 27,000 people once attrition of about 17 percent a year is taken into account, and a shift in the ATP skill mix from a 40:60 professional-to-vocational ratio toward 50:50 as advanced packaging expands (DTI, 2026). On the enabling side, it targets a 20 percent reduction in the effective cost of power for locators in specialized ecozones, a 30 percent reduction in logistics lead times, and a “Semiconductor and Electronics Super Green Lane” aiming at 12-hour customs clearance for pre-accredited firms by 2027 (DTI, 2026). These power, water, logistics, and clearance times are the constraints that Section V.b of this paper identifies as first-order across the region, and they are also the categories that the U.S. instruments discussed in Section VIII (of this paper) are best equipped to address.

Indonesia’s semiconductor grand strategy remains under discussion at Bappenas, but its adjacent policies already give it distinctive upstream leverage: nickel downstreaming and raw mineral export restrictions that force domestic processing, a fast-growing EV battery ecosystem, and a 2025 AI roadmap aimed at attracting foreign investment in compute-intensive demand (Bappenas, 2025; Hinrich Foundation, 2025). Its plausible near-term semiconductor niches are materials processing, power electronics linked to the EV chain, and possible OSAT entry, rather than front-end fabrication. The strategic question for Jakarta is whether minerals leverage can be converted into solid value chain positioning without the investor frictions that export restrictions can create.

For Brunei, Cambodia, Laos, and Myanmar, the realistic near-term path runs through semiconductor-adjacent participation rather than core chip production: digital infrastructure, industrial zones and logistics, renewable energy, standards adoption and supplier upgrading for electronics-adjacent activities. Their digital economy master plans provide the policy levers for this participation, though implementation capacity varies widely and is severely constrained in Myanmar. Regional policy should therefore create on-ramps such as skills programs, traceability systems scaled for SMEs, and investment facilitation support so that the integration of ASEAN economies further deepens. Without these on-ramps, there is a risk that regional policy on semiconductors would divide the region into one group being able to participate in the semiconductor value chain and another which is excluded from it.
Table 4 summarizes the national positions. The policy challenge is to translate these national ambitions into regional complementarities rather than parallel, competing bids for the same investments.

Table 4. Direct semiconductor strategies and indicative regional roles.

Economy	Direct semiconductor strategy	Indicative regional role
Malaysia	National Semiconductor Strategy (NSS), 2024 (MITI, 2024)	Back-end leader moving into advanced packaging, IC design, equipment
Vietnam	Decision 1018/QD-TTg: strategy to 2030, vision 2050 (2024)	Design, ATP, workforce and FDI; long-term manufacturing build-out
Singapore	Embedded in RIE2030 / EDB strategy (no standalone roadmap)	High-end node: wafer fabs, IC design, equipment, R&D, HQ functions
Thailand	Draft National Semiconductor Roadmap (BOI, 2026)	Power chips, sensors, photonics, analog/discrete linked to EVs
Philippines	Semiconductor and Electronics Industry Roadmap 2026-2030 (DTI/SEIAC, 2026)	ATP/OSAT moving into advanced packaging; high-reliability EMS; IC design and test-engineering services; Front-end readiness
Indonesia	Grand strategy under discussion (Bappenas, 2025)	Critical minerals, EV/power electronics, AI demand, possible OSAT
Brunei / Cambodia / Laos / Myanmar	No dedicated roadmap identified	Digital infrastructure, logistics, skills, energy, supplier upgrading

Sources: national policy documents as cited; AFISS (ERIA, 2025).

Best practices for investment attraction

Across the cases, a number of strategies have often been implemented that have resulted into successful attraction of investments. One important example is having a clear national strategy with specifically identified target segments (see Malaysia's NSS, Vietnam's Decision 1018) as this signals commitment and reduces investor uncertainty. Another often-cited strategy is having competitive but targeted incentives similar to that of the U.S. CHIPS Act's 25% investment tax credit (CSIS, 2024) and Japan's framework covering up to roughly half of fab construction costs (East Asia Forum, 2024). Corollary to the incentives framework is a credible implementation plan for these incentives incorporating awareness and promotion strategies, hand-holding and capacity building support for incentives utilization and monitoring and evaluation (including an exit strategy) for the assessment of the effectiveness of the incentives. Also important are strategies that would attract an Anchor investor,i.e. a major firm that draws in its accredited suppliers and build agglomeration (as Vietnam's experience with Samsung illustrates). Finally, IP credibility and export control reliability are increasingly treated as part of the offer to possible investors, because they determine eligibility for trusted supply chains.

a. Providing the infrastructure, workforce, and industrial networks

Semiconductor manufacturing is resource-intensive. A single advanced fab can require on the order of ten million gallons of ultrapure water per day and around 100 megawatts of reliable power, alongside cleanroom facilities and high-quality logistics (WEF, 2024). For ASEAN economies pursuing front-end ambitions, water security, firm low-carbon power, and resilient logistics corridors are first-order constraints; for those consolidating back-end strength, the binding constraints are typically power cost and reliability, logistics efficiency, and the depth of the local supplier base.

In addition, talent is a shared regional bottleneck and an area of explicit national targets. As outlined previously, Malaysia is building toward a 60,000-engineer goal (Bernama, 2025); Vietnam has committed about USD 1.08 billion to train 50,000 semiconductor engineers by 2030 (VIR, 2024); and the Philippines targets a combined industry workforce of about 128,000 by 2030, requiring an annual intake of near 27,000 hires across ATP, EMS and IC design (DTI-BOI, 2024; DTI, 2026). The Philippines' large annual flow of engineering graduates and English-proficient workforce is a comparative strength for higher-value design and test engineering roles (OECD, 2024; ASEAN-BAC, 2025). A coordinated regional target, such as adding roughly 200,000+ engineers by 2030 across ASEAN, would let members specialize rather than duplicate.

Industry perspectives: evidence from industry consultations

SEIPI interview

A key informant interview with the industry's umbrella organization, whose members are concentrated in the semiconductor space, offered a candid practitioner view from the Philippine industry (Lachica, 2026). Several themes emerged. The Philippines remains concentrated in back-end ATP and lacks domestic wafer fabrication; the absence of even a small prototyping wafer lab to seed an IC design community and train talent was described as a structural ceiling on moving up the value chain, with proposals repeatedly stalled on cost and on limited official understanding of the supply chain. Expected U.S.-linked training support for advanced ATP (a CHIPS-Act ITSI-type fund) did not materialize as anticipated, leaving an upgrading gap. Investment attraction was seen to work best when targeted and customized. This would really entail asking anchor investors what they need rather than offering generic incentives. Furthermore, the country's input dependence on China for critical materials was a recognized vulnerability from which disentangling would be hard and costly.

On regional cooperation, a concrete complementarity model was suggested: for a product such as power devices, IC design would be done in Singapore, wafer fabrication in Malaysia, ATP in the Philippines, PCB in Thailand and EMS in Indonesia. Admittedly, the respondent raises the caveat that national self-interest makes such a division of labor hard to implement without deliberate coordination. The respondent also flagged two U.S.-linked initiatives: the "Pax Silica" AI and semiconductor hub (associated with New Clark City, Tarlac) and the Luzon Economic Corridor.

However, literature flags low awareness across ASEAN on Pax Silica so there may be a need to initiate an awareness and promotion communication strategy to address this (Lowy Institute, 2025; The Diplomat, 2025).

b. Private sector consultations on supply chain integration and strategic trade management

The SEIPI interview is complemented by a synthesis of eight strategic consultations with firms operating across ASEAN, conducted under the Chatham House Rule as part of the Philippines' 2026 ASEAN Chairship. Although none of the consultations addressed semiconductor supply chains as such, the structural problems respondents identified, such as regulatory fragmentation, weak transit controls, absent traceability infrastructure, restrictions on cross-border data flows, and thin visibility, are precisely the horizontal conditions that AFISS-type frameworks must resolve for any strategically sensitive goods category—semiconductors included. The single most consistent theme was that regulatory fragmentation, not tariffs or infrastructure, is the binding constraint on integrated regional supply chains; respondents called for regulatory harmonization and mutual recognition of standards and conformity assessment, and one proposed a staged, risk-tiered mutual recognition mechanism that begins with lower-risk product classes and expands as confidence builds. This mechanism presents a politically feasible sequencing that transfers directly to conformity assessment, testing and certification for semiconductor components and manufacturing inputs. Respondents also stressed that supply chain policy begins upstream of trade facilitation; production lead times, conformity assessments, licensing queues, and poorly synchronized clearances between sectoral regulators and customs are the binding constraints, so an integrated framework must encompass pre-shipment regulatory processes, with multi-year contracting and pooled procurement as demand aggregation tools of the kind that anchor fabrication and assembly test investment.

On strategic trade management, the consultations rendered ASEAN's limitations more concrete in three gaps, each with a partially proven remedy. The first is the transit and transshipment jurisdiction gap discussed in Box 2, for which ASEAN-Single-Window-aligned digital customs documentation paired with cooperative vessel monitoring offers a near-term solution. The second is the absence of interoperable product traceability; legitimate manufacturers already assign unique trackable codes to their products, and a public-private partnership could make such systems scalable and affordable for the SMEs through which illicit flows disproportionately move. The third is the weakness of destination confirmation mechanisms, for which the Philippines' export bond with destination confirmation practice provides a codifiable regional model. Respondents further identified cross-border data flows as the connective tissue of any integrated supply chain, warning that data localization mandates would undercut both integration and trade integrity functions such as screening and tracing; DEFA's data flow provisions and the AFISS and strategic trade management agendas should therefore be treated as a single interdependent package.

The consultations also spoke directly to investor interest in the Philippines. Respondents identified three enabling conditions for expanded investment during the chairship year: elevated public trust in established, accountable foreign partners following domestic controversies over irregular public projects; the New Government Procurement Act's provision for multi-year engagements, which permits the long-horizon contracting that infrastructure-grade initiatives require; and alignment with the priorities of the lead national agency as the decisive variable in whether pilots progress. The realistic chairship objective that emerged is institutionalization: operationalizing the joint customs enforcement task force agreed upon by the ASEAN Directors-General of Customs, launching traceability and data-sharing pilots under technical working groups, and setting agendas like mutual recognition and circular economy and extended producer responsibility incentives whose completion falls to successor chairs.

Strategic Roadmap and Policy Recommendations

This section presents the recommendations stemming from the evidence presented in the earlier chapters, translating their implications into a phased agenda that operationalizes AFISS and is implementable through existing ASEAN frameworks and bilateral channels. These recommendations are organized around a core proposition: ASEAN should convert geopolitical tailwinds into durable investment by pairing competitive incentives with credible IP and export control governance, coordinated for complementarity.

It is useful to recall what AFISS itself provides, because the phases below are designed to map onto its architecture. Endorsed in 2025, AFISS envisions transforming ASEAN from a regional back-end service provider into a vertically integrated semiconductor production base in a global market projected to grow from about USD 600 billion in 2024 to over USD 980 billion by 2029 (ERIA, 2025). It pursues five objectives: enhancing regional integration, strengthening supply chain resilience, boosting innovation and technology transfer, supporting MSMEs and human capital, and securing strategic partnerships with the United States, Japan, India, and other like-minded partners. It is organized around three focus areas (Supply Chain; Technology and Infrastructure; Talent) and operationalized through six strategic thrusts: infrastructure quality and resilience; technology innovation, transfer and sharing; supply chain hubs and clusters; industrial and trade policies; market access and connectivity; and talent development and mobility (ERIA, 2025). AFISS explicitly covers the extended value chain; beginning with design to front-end manufacturing and then ending with assembly test-packaging, together with EDA and core IP, equipment, materials and related research. It is deliberately non-binding, providing room for each AMS to improve according to its technological level, with ERIA recommending a dedicated coordination task force such as the Focus Group on Global Value Chains (FG-GVC) to drive implementation. The recommendations that follow are therefore framed as contributions to AFISS's thrusts.

Phase 1 (0–12 months): foundations and credibility

- Map and pipeline. Build a shared ASEAN semiconductor capability map and a regional investment pipeline so investors see one integrated platform rather than fragmented markets (ASEAN-BAC, 2025).
- IP and export control credibility track. Establish a regional baseline on IP enforcement and strategic trade management, prioritizing the trailing economies, and use the PPI/IPRI benchmarks to set improvement targets by treating credibility as an investment-attraction asset, not only compliance.
- Targeted-incentive playbook. Replace generic incentive menus with a customized anchor investor approach ("what do you need?"), benchmarked against the CHIPS Act and Japan's subsidy framework but tailored to each segment (CSIS, 2024; East Asia Forum, 2024; Lachica, 2026).

Phase 2 (1–3 years): complementarity and capability

- Regional division of labor. Pilot complementarity in one product line (e.g., power devices), assigning design, fabrication, ATP, PCB and EMS roles across members with a coordination mechanism to manage national interest frictions.
- Centers of excellence. Stand up shared, regionally accessible centers for advanced packaging, IC design, power electronics, compound semiconductors and workforce training, rather than duplicating facilities.
- Talent compact. Coordinate curricula, micro-credentials, mobility and mutual recognition toward a regional engineering target, letting members specialize (Bernama, 2025; VIR, 2024; DTI-BOI, 2024).
- Infrastructure prioritization. Address semiconductor-specific requirements including ultrapure water, firm low-carbon power, and logistics corridors aligned to each member state's segment (WEF, 2024).

Phase 3 (3–5 years): integration and resilience

- Trusted supply chain standards as a public good. Cooperate on traceability, cybersecurity, strategic trade management and anti-counterfeit enforcement so ASEAN is recognized as a trusted production platform. Concrete instruments identified in consultation include ASW-aligned digital customs documentation with cooperative vessel monitoring, interoperable product traceability delivered through public-private partnership with SME affordability provisions, and regional codification of the export bond with destination confirmation model (Strategic consultations, 2025).
- Supply chain diversification. Reduce single-source dependence in critical materials through regional processing and supplier development, recognizing the proprietary material and processing constraints identified in industry consultation (Lachica, 2026).
- Observatory and alignment. Create an ASEAN semiconductor policy observatory to track roadmaps, incentives, export control changes, and investment announcements and align the agenda with the AEC Strategic Plan 2026–2030 and DEFA.

Based on the three phases above, Table 5 sets out when, by whom, and against what verifiable milestone each phase and action would be completed. Calendar dates are indicative and are anchored to the Philippines' 2026 ASEAN Chairship as the opening window and the AFISS implementation cycle. Meanwhile, for national-level actions in the Philippines, the 2026–2030 horizon of the Semiconductor and Electronics Industry Roadmap is used so that regional commitments and the national roadmap are executed on the same clock rather than in sequence (DTI, 2026; ERIA, 2025). The sequencing logic is that credibility actions come first because they are inexpensive and are prerequisites for the rest; an investor evaluating a five-year capital commitment prices IP and export control risk before it prices incentives.

Table 5. Indicative implementation timeline for the phased roadmap.

Action	Indicative timing	Lead / vehicle	Verifiable milestone
Phase 1 — Foundations and credibility (0–12 months)			
Regional capability map and single investment pipeline	Q3 2026 – Q2 2027	ASEAN Chair (Philippines) with ERIA / FG-GVC and ASEAN-BAC	Published capability map; consolidated regional pipeline presented at the 2026 ASEAN Semiconductor and Electronics Summit
IP and strategic trade credibility baseline	Q4 2026 – Q4 2027	AMS IP offices and strategic trade authorities; IPRI / PPI as benchmarks	Baseline scorecard for all ten AMS; improvement targets adopted by the trailing economies
Targeted-incentive playbook (anchor investor approach)	Q4 2026 – Q3 2027	National investment promotion agencies	Segment-specific playbook issued; at least one anchor investor negotiation concluded per participating AMS
Philippine national alignment: IP Protection and Export Control Framework	2026–2028	SEIAC TWG 1 (DTI-BOI lead) under the SEI Roadmap	Trade secret legislation filed; National Export Control Framework established; compliance education launched
Phase 2 — Complementarity and capability (1–3 years)			
Pilot regional division of labor in one product line (e.g. power devices)	2027–2029	AFISS coordination task force with industry associations	Signed complementarity pilot assigning design, fabrication, ATP, PCB and EMS roles
Shared regional centers of excellence	2027–2030	Host AMS with development partners; Philippine national laboratories under the SEI Roadmap	At least three shared centers operating with cross-border access protocols
Talent compact and mutual recognition	2027–2030	Education and skills authorities; industry-academe councils	Mutual recognition arrangement in force; measurable progress toward 200,000+ regional engineers by 2030
Semiconductor-specific infrastructure prioritization (ultrapure	2027–2029	National infrastructure agencies (Luzon	Site readiness assessments completed; priority projects entered into

water, firm low-carbon power, corridors)		Economic Corridor in the Philippine case)	national investment programs
Phase 3 — Integration and resilience (3–5 years)			
Trusted supply chain standards package	2029–2031	ASEAN Directors-General of Customs joint task force; strategic trade working group	Traceability pilot scaled with SME provisions; export bond with destination confirmation model codified regionally
Critical materials diversification	2029–2031	AMS trade and industry ministries with private sector	Regional processing capacity established for at least one critical input
ASEAN semiconductor policy observatory	2029–2031	ERIA with the ASEAN Secretariat	Observatory operating; annual monitoring report aligned to the AEC Strategic Plan 2026–2030

Sources: author's elaboration based on ERIA (2025); DTI (2026); ASEAN-BAC (2025); Strategic consultations (2025).

Leveraging U.S. Support: Instruments and Entry Points

A distinctive feature of the Philippine case is that U.S. support for semiconductor-relevant investment is not a single program but an architecture of complementary instruments that converge on the same geography. The entry point for U.S. support would be to align these instruments behind the gaps this paper identifies and then to use convening power in cases where capital and project preparation alone are insufficient.

The strategic frame: Pax Silica and the Luzon Economic Corridor

The Luzon Economic Corridor (LEC), which is a trilateral Philippines–United States–Japan initiative coordinated on the Philippine side by the Department of Finance, organizes investment across three key sectors: transport infrastructure, energy, and digital infrastructure and advanced manufacturing. The third is defined explicitly to strengthen semiconductor and advanced manufacturing for resilient and trusted supply chains, and semiconductors and electronics sit among the corridor's named priority sectors alongside mineral processing, renewable energy, and infrastructure (DOF, 2026). New Clark City in Tarlac is emerging as the corridor's base. It is expected to host an industrial estate, ICT passive infrastructure, a power distribution joint venture and a commuter rail extension. It is also the announced site of Pax Silica, the U.S.-led effort to build an AI and semiconductor industrial hub aimed at securing semiconductor and AI supply chains, reducing dependence on high-risk suppliers, promoting technology and industrial cooperation, and developing AI-native industrial infrastructure (Lachica, 2026). For the Philippines, the semiconductor, AI hub and corridor infrastructure agendas physically coincide. Pronouncements in media seem to indicate that the corridor is already backed by a financing coalition from a USTDA grant for the Subic–Clark–Manila–Batangas (SCMB) Railway study, a Swedfund grant for corridor planning technical assistance, and active engagement with the ADB and JICA (DOF, 2026).

Pax Silica has since acquired formal expression. On 16 April 2026, the Philippines and the United States signed the Pax Silica Declaration, which frames reliable supply chains as indispensable to mutual economic security and artificial intelligence as a transformative force reorganizing the world economy and reshaping global supply chains (Pax Silica Declaration, 2026). The Declaration commits the two governments to deepen their economic partnership through shared efforts on investment security practices, infrastructure and incentives, and encourages partnership across the "strategic stacks" of the global technology supply chain enumerating software applications and platforms, frontier foundation models, information connectivity and network infrastructure, compute and semiconductors, advanced manufacturing, transportation logistics, mineral refining and processing, and energy. It emphasizes mobilizing private industry and entrepreneurship, reducing excessive dependencies while endeavoring to give trusted partners access to the full technology stack, addressing non-market practices and overcapacity that distort competition, cooperating on the enforcement of policies that protect sensitive technologies and critical infrastructure from undue access or control, and building trusted information networks, including ICT systems, fiberoptic cables and data centers (Pax Silica Declaration, 2026). The Declaration is, in short, a trusted ecosystem construct; it privileges partners that can demonstrate investment security and export control credibility. This aligns exactly with the investment environment variables this paper's regressions associate with greenfield FDI.

Institutional content is now being proposed beneath the Declaration. One week before the signing, the Bases Conversion and Development Authority (BCDA) transmitted through the Philippine Embassy in Washington a proposal to establish a Pax Silica Coordination Office on approximately 4,000 acres in New Clark City within the Luzon Economic Corridor, offered lease-free for a two-year grace period as the Philippines' in-kind contribution to the bilateral economic security partnership (BCDA, 2026). The proposed office would serve as the principal bilateral facility for five functions: coordination of critical mineral supply chain security initiatives; facilitation of joint strategic industrial planning and infrastructure development within the corridor; coordination of allied investment and private capital mobilization for economic security projects; support for workforce development, technology transfer and capacity building; and such other activities as the two governments may determine. The proposal is anchored in the Special Economic Zone Act of 1995 and the BCDA's charter under the Bases Conversion and Development Act of 1992, with the property and permanently affixed improvements reverting to the Philippine government absent renewal (BCDA, 2026). Taken together, the Declaration and the Coordination Office proposal begin to convert Pax Silica from an announced ambition into a bilateral institution with defined governance, land, and functions, offering the kind of specificity that investors can underwrite. It also partially answers the awareness and definition concerns flagged in the industry consultations and in commentary (Lachica, 2026; Lowy Institute, 2025). What remains to be articulated is the program layer: financing terms, the anchor tenant pipeline, and the incentive package that will apply within the site.

Project preparation: USTDA

The U.S. Trade and Development Agency (USTDA) funds the early de-risking stage that turns an ambition into a bankable, well-specified project through feasibility studies, technical assistance, pilot projects, engineering and design, and transaction advisory services, all complemented by reverse trade missions, workshops and training (USTDA, 2026). The USTDA has supported more than 500 major infrastructure projects across all ten ASEAN states and maintains a Manila country office. Within the LEC, it is already advancing several semiconductor-relevant enablers: the SCMB Railway feasibility study (a roughly 212-km link connecting three major ports) for the logistics corridor; a civil nuclear small modular reactor study with Meralco's generation arm for firm low-carbon power; a nationwide internet exchange point and fiber expansion study for digital infrastructure and data center demand; and a nickel and cobalt processing feasibility study in Zambales for critical minerals and battery precursor materials (USTDA, 2026). The last is directly responsive to the dependence and diversification problem raised in industry consultation, where the Philippines exports raw materials, pays to have them processed abroad, and re-imports them (Lachica, 2026).

For Philippine stakeholders, the entry points are well defined: USTDA awards are fixed-price grants generally ranging from about USD 0.5–2 million, open to public, private or state-owned grantees, requiring a U.S. firm to perform the work, covering project preparation labor (not equipment), and targeting large, capital-intensive projects, awarded either sole-source (where a U.S. partner is identified) or competed via SAM.gov (USTDA, 2026). A semiconductor-specific application is well within scope, like a feasibility study for an advanced packaging park, a shared prototyping wafer lab, ultrapure water or power infrastructure for a fab-ready site, or a workforce training facility.

a. Capital mobilization: DFC

Where the USTDA prepares projects, the U.S. International Development Finance Corporation (DFC) finances them. The DFC is the U.S. government's international investment arm, mandated to mobilize private capital, drive development for allies and partners, and secure supply chains to counter and outcompete strategic rivals (DFC, 2026). Its December 2025 reauthorization raised investment capacity to up to USD 205 billion, added a USD 5 billion equity revolving fund, and granted authority to take up to 40% equity; its portfolio exceeds USD 40 billion across more than 100 countries, including roughly USD 6.1 billion of Indo-Pacific exposure (DFC, 2026).

The DFC can invest flexibly across the capital structure. It is capable of providing debt with tenures as long as 25 years, direct equity, debt and equity support for funds, political risk insurance (covering currency inconvertibility, government interference, and political violence), guaranties, and project development support (DFC, 2026). This matters for semiconductors because the binding constraints are capital intensity and risk: fabrication and advanced packaging lines, supplier parks, power and water infrastructure, and critical minerals processing all need long-term capital and risk mitigation. The DFC's own priority sectors (critical minerals, infrastructure and logistics, energy, and technology and telecom) track the semiconductor enabler stack, and its case studies are instructive: the Lobito Atlantic Railway (about USD 553 million in debt) for a logistics corridor securing mineral supply chains and project development support for rare earth processing in Brazil designed to bypass processing in China may be considered a direct template for Philippine nickel and cobalt processing and a response to the China diversification imperative the industry consultation emphasized (DFC, 2026; Lachica, 2026).

b. Matching U.S. instruments to identified gaps

Table 6 maps the gaps identified earlier in this paper to the U.S. instruments best suited to address them, with an illustrative entry point for each. The pattern is a natural sequence: the USTDA prepares and de-risks, the DFC and Japanese co-financing supply capital, and the State Department supplies convening power and the IP/export control support that only government can credibly lead

Table 6. Mapping identified gaps to U.S. support instruments and entry points.

Gap identified in this paper	Relevant U.S. instrument(s)	Illustrative entry point
Logistics corridors (ports, rail, airports)	USTDA (feasibility); DFC (debt); LEC	SCMB Railway; Clark airport; integrated transport in motion
Firm, low-carbon power for fabs / data centers	USTDA (feasibility); DFC (debt + insurance)	Meralco SMR study; grid and IPP financing
Ultrapure water and fab-ready industrial sites	USTDA (engineering & design); DFC (debt / equity)	New Clark City industrial estate; site feasibility
Digital infrastructure and data centers	USTDA (feasibility); DFC (technology & telecom)	Internet-exchange / fiber study; data center finance
Critical minerals processing (diversify from China)	USTDA (feasibility); DFC (project dev / debt)	Zambales nickel and cobalt; Aclara-style processing
Moving up the value chain (advanced packaging, IC design, prototyping wafer lab)	USTDA (feasibility / pilot); DFC (equity)	Packaging-park and wafer-lab feasibility → financing
Workforce and talent	USTDA (workshops, training, reverse trade missions)	Advanced ATP training; engineering pipeline TA
IP enforcement and export control credibility	State Dept / interagency technical assistance	Strategic trade management and IP enforcement TA

Awareness and coordination (Pax Silica / LEC)	State Dept convening	Regional briefings; investors forum; ASEAN observatory link

Sources: DOF (2026); USTDA (2026); DFC (2026); Lachica (2026).

Recommendations for the United States

1. Sequence the instruments. Establish an explicit USTDA-to-DFC pipeline for a small number of flagship semiconductor-enabling projects. This means using the USTDA to prepare and de-risk, then the DFC (with Japanese co-financing via the LEC) to provide long-tenor capital anchored, for example, on a New Clark City advanced packaging / AI hardware park within Pax Silica.

2. Close the awareness gap. Industry consultation found low awareness of Pax Silica even among ASEAN electronics economies; the State Department is well placed to convene briefings, an LEC / Pax Silica investors forum, and ASEAN-wide communication so the initiative is understood as an inclusive, trusted supply chain platform rather than a bilateral arrangement (Lachica, 2026).

3. Lead on the variables only government can credibly support. IP enforcement and strategic trade management capacity are U.S. comparative advantages and precisely the investment environment variables the analysis links to greenfield FDI; targeted technical assistance to trailing ASEAN economies advances both non-proliferation goals and investment attraction.

4. Revive advanced ATP and talent support. The lapse of CHIPS Act-linked advanced ATP training left an upgrading gap; restoring training support through USTDA workshops and reverse trade missions and university partnerships would address the workforce constraint and the “moving up, locked in” problem (Lachica, 2026).

5. Back a proof of concept up the value chain. A modest, well-scoped USTDA feasibility grant for a shared prototyping wafer lab or advanced packaging park would test the Philippines’ move beyond legacy ATP and could anchor subsequent DFC-financed commercial investment.

Conclusion

ASEAN stands to gain materially from the reconfiguration of semiconductor supply chains, but its position is contestable. Announced greenfield FDI shows the region capturing a meaningful but volatile share of global flows, with the post-2021 surge led by the advanced benchmark economies. The investment environment within ASEAN is highly uneven on IP protection and strategic trade management, and these gaps move together with institutional quality. The regression evidence links both to greenfield FDI: the intellectual property pillar of the IPRI and the monitoring and detection pillar of export control management are each positive and significant, indicating that credible IP and demonstrated strategic trade capability are part of the investment attraction calculus. Planned robustness (PPML two-way fixed effects, WGI controls, and post-2018 / post-CHIPS-Act interactions) will test whether these associations strengthen in the realignment window. The policy task is to pair competitive, targeted incentives with credible IP and export control governance, organized for regional complementarity and operationalized through AFISS. The Philippines must also sequence the ready U.S. support architecture behind these gaps. The Philippine Semiconductor and Electronics Industry Roadmap 2026–2030 now supplies the domestic counterpart to the regional agenda, with its IP protection and export control commitments scheduled for 2026–2028 and its sub-sector workforce and infrastructure targets set to 2030 so that the regional and national timetables can be run together rather than in sequence (DTI, 2026).

ABOUT THE AUTHOR

DR. FRANCIS MARK QUIMBA is an economist and development policy expert whose career spans over two decades of impactful research and public policy contributions. A Senior Fellow at the Philippine Institute for Development Studies (PIDS), Dr. Quimba specializes in international trade, regional integration, innovation, and industrial development policies. His work has significantly informed the policy landscape in the Philippines and the broader ASEAN region, addressing pressing economic and developmental challenges. Dr. Quimba holds a Ph.D. and an M.A. in Development Economics from the National Graduate Institute for Policy Studies in Tokyo, Japan. He also earned a Master's degree in International Development from the International University of Japan. Throughout his tenure at PIDS, Dr. Quimba has undertaken research projects that resonate globally. His recent work includes an in-depth analysis of the Indo-Pacific Economic Framework, examining the Philippines' perspectives and strategies for engagement. He has also led studies on free trade agreement utilization among Philippine micro, small, and medium enterprises (MSMEs), ASEAN-India trade relations, and the interplay between innovation, sustainability, and digital transformation in Southeast Asia. An accomplished author, Dr. Quimba has contributed to numerous peer-reviewed journals, discussion papers, and policy briefs. His research covers diverse topics, including the digital economy, innovation in manufacturing firms, the impact of foreign linkages on industry development, and the implications of trade policies on economic performance. Among his notable works are studies on green and digital transitions, which emphasize sustainable development as a cornerstone of future policy directions.

Governing the Intangible:

Philippine Policy Options for Semiconductor and Electronics Design, Intellectual Property Protection, and Strategic-Trade Compliance

By
Lean Karlo S. Tolentino

Executive Summary

Lean Karlo S. Tolentino

The Philippines has built one of the largest semiconductor and electronics manufacturing bases in the Indo-Pacific, but most of that strength is in assembly, test and packaging (ATP), not chip design. As the country attempts to move up the value chain into design, research and development (R&D), and fabless innovation, it is confronted with a governance problem that traditional intellectual property (IP) policy was not designed to address. Semiconductor design work is no longer contained within a single company or jurisdiction; it is present in foreign electronic design automation (EDA) software, foundry-supplied process design kits (PDKs), cloud platforms, shared code repositories, and collaborators spread across the globe. The most valuable assets, such as design files, licensing terms, foundry data, and know-how, are intangible, moving by keystroke rather than by shipment, and need governance of access, licensing, and digital infrastructure, not just patents.

This paper draws on a qualitative policy research design combining doctrinal and institutional analysis, comparative benchmarking of Taiwan, Singapore, South Korea, Japan, and the Philippines, five case studies of legal disputes and shared-infrastructure models, documentary evidence from a Luzon Economic Corridor infrastructure-financing event, and a Pacific Forum discussion on artificial intelligence (AI) compute and export controls. It also is informed by interviews with Philippine and international stakeholders, including an open-source IC design researcher, engineering deans and program leaders at three universities, officials of the Intellectual Property Office of the Philippines (IPOPHL), the Board of Investments (BOI), a Taiwanese university comparator, the president of the Philippine Integrated Circuit Design Association (PICDA), and a government-affairs executive at a leading global semiconductor manufacturer. .

Four findings are presented. First, semiconductor design governance is a stack issue, not a single-instrument issue: design projects carry overlapping rights and restrictions across the EDA tool license, the design itself, PDK and foundry data, third-party IP, the infrastructure that carries the work, and the people allowed to touch it. Treating one layer as the whole picture leaves the others exposed.

Second, access is now a governance event in itself. A student logging into a shared repository, running a cloud build, or opening a remote desktop session can move or expose sensitive technical information without a formal export or file transfer. Philippine institutional practice, including university IP policy, still largely assumes technology transfer as a shipment or signed license, not as a login.

Third, the Philippine legal and institutional base is real. It is also incomplete. The IP Code protects local licensees but is structured for inbound licensing and does not itself prohibit outbound or controlled technology transfer. The country’s IC layout design statute may not yet be operationalized for a true manufacturable chip layout. Trade secrets are lightly regulated in practice but are technically protected by law. Taiwan, Singapore, South Korea, and Japan have sophisticated semiconductor regimes that blend patents, special protection for IC layouts or “mask works”, trade-secret regimes and, in the case of Taiwan and South Korea, extra safeguards for strategically sensitive technologies. No single instrument does the job, and the Philippines should not expect one to.

Fourth, capability building and compliance readiness should be developed in parallel, not sequentially. The experience of universities such as the Mindanao State University-Iligan Institute of Technology (MSU-IIT) shows the feasibility of building credible IC-design capability in the regional universities, but only if research governance, IP management, and controlled EDA/PDK access mature together with the technical training. International comparators suggest a phased approach—attract investment and talent first and deepen compliance as projects become more sensitive rather than imposing heavy controls before there is an ecosystem to protect. An operating Philippine IC design firm confirms this on the demand side: the binding

constraint is the rate at which the ecosystem can produce qualified engineers, and overly rigid compliance risks widening, rather than closing, that capability gap.

A Semiconductor Design Governance Stack as an organizing framework is proposed, with a three-tier risk-based compliance model and a public/internal/restricted information classification scheme, which Philippine universities and government-funded projects can adopt at low cost. Immediate recommendations include a joint IPOPHL-BOI-DTI Strategic Trade Management Office (DTI-STMO) guidance note on inbound licensing, trade secrets and intangible technology transfer; clarified IPOPHL filing and confidential deposit rules for IC layout designs; minimum remote-access restrictions for university EDA and PDK use; and analytics tracking Patent Cooperation Treaty (PCT) filings entering the Philippine national phase by origin and technology field. Medium- to long-term options include a shared national or regional semiconductor design infrastructure hub, model IP clauses for university-industry agreements, a funded PhD pipeline for IC design faculty, and a mission-oriented five-year national IC design program adapted to Philippine institutional capacity and domestic needs such as energy, agriculture, and health.

The policy implication for the Philippines is simple: the country's economically dominant semiconductor and electronics sector will not advance up the value chain on incentives and infrastructure alone. Design-intensive growth requires a governance layer purpose-built for intangible, digitally mediated technology, protecting investors and local institutions without discouraging the open collaboration that research and education depend on.

1. Introduction

Semiconductor and electronics design is increasingly distributed and digitally mediated, not dependent on physical movement of goods. Today's design work can involve register-transfer level (RTL) source code, schematic and layout databases, foreign EDA software, foundry PDKs, reusable IP blocks, cloud compute resources, shared code repositories, and international collaborators. The governing question for policy is therefore no longer only who may ship what to whom; it is who may access which technical information, under what license, from what jurisdiction, through what infrastructure, and with what compliance obligations.

This is a specific policy challenge for the Philippines. The country already has one of the largest bases of electronics and semiconductor manufacturing in the region, and the sector is by far its largest source of export earnings. But the Philippine government wants to go beyond ATP – as defined by Administrative Order No. 31 and the Semiconductor and Electronics Industry Advisory Council (SEIAC) – and move toward higher-value chip design, research, and fabless innovation. The transition requires institutional arrangements not needed in conventional manufacturing: governance of design IP ownership, EDA and PDK licensing, cloud-based collaboration, trade secrecy, and cross-border technical access.

This paper's research question is how the Philippines can improve the governance of semiconductor and electronics design IP, technology transfer, and strategic trade compliance while continuing to support university-driven, fabless, and internationally collaborative R&D. The inquiry is framed around five sub-questions:

1. What Philippine laws and institutional practices shape the design of IP, technology transfer and export compliance?
2. What governance gaps emerge from reliance on foreign EDA tools, PDKs and cloud platforms?
3. How are similar issues addressed by peer Indo-Pacific jurisdictions?
4. What risks and capacity gaps are identified by stakeholders across government, academe and industry?
5. What proportionate policy options could improve compliance readiness without unduly constraining research, education and international collaboration?

This question is important to policy For three reasons. First, Philippine research institutions' credibility with investors and partners could be damaged by unresolved ownership disputes and the risk of IP leakage. Second, it is now easy to accidentally cause non-compliance. Opening a shared repository or hosting a foreign collaborator on a remote desktop can create a compliance event without anyone intending an export. Third, investor confidence increasingly depends on the ability of the legal architecture to treat intangible assets, patents, trade secrets, and licensing obligations as reliably as it treats physical trade.

This paper argues that the governance of Philippine semiconductor design is best understood as a stack of legal categories rather than a single central legal category. A design project is simultaneously subject to EDA tool licensing, design ownership and reuse rights, PDK and foundry-data restrictions, third-party IP obligations, infrastructure and access control, and collaboration rules. Again, access to any layer, not just formal export, can transfer technology. Based on this stack idea, this paper develops a three-tier risk-based compliance model and an information classification scheme, benchmarks Philippine practices against those of Taiwan, Singapore, South Korea and Japan, and proposes short-, medium- and long-term policy options for validation by government, industry and academic stakeholders.

2. Methodology

The study employs a qualitative policy research design that incorporates doctrinal and institutional analysis, comparative benchmarking, and semi-structured key informant interviews. The approach links formal legal and policy arrangements with the operational realities of the semiconductor design and research environments. It does not aim to achieve statistically representative results but rather to generate a grounded policy framework by triangulating primary documents, expert interviews, and institutional materials.

The evidence base combines several strands. Key informant interviewees include Dr. Alexander C. Abad on open-source IC design and repository governance; [1] Dr. Jefferson A. Hora, dean of the College of Engineering and director of the Center for Integrated Circuit Design at MSU-IIT, on university readiness and regional innovation hubs;[2] officials of IPOPHL on technology transfer, trade secrets, and enforcement; [3] Prof. Chua-Chin Wang of National Sun Yat-sen University (NSYSU) on Taiwan's semiconductor ecosystem;[4] a director of government affairs at a leading global semiconductor manufacturer on global investment and value-chain positioning; [5] Charade Avondo, president of the Philippine Integrated Circuit Design Association (PICDA) and chief executive of Xinyx Design Consultancy and Services Inc., on industry talent constraints, design-asset protection hierarchies, and operational EDA/PDK compliance practice; [6] Prof. Louis Alarcon, program leader of the University of the Philippines Diliman Center for Integrated Circuits and Devices Research (UP CIDR), on graduate-level talent pipelines, technology-vertical prioritization, and university openness; [7] Dr. Ira Estropia, head of the Department of Biomedical, Manufacturing, and Robotics Engineering at De La Salle University (DLSU) and chair of IEEE Philippines Section, on AI/data governance, university IP enforcement, and engineering-education policy;[8] and a representative of a leading global semiconductor lithography equipment manufacturer on distributed supply-chain intellectual-property protection. [9] Documentary evidence includes BOI materials on industry performance and investment incentives; [10] presentation materials from the "Leveraging USTDA Grants to Advance Luzon Economic Corridor Priority Projects" event held May 11, 2026, in Manila;[11] and a Pacific Forum-hosted discussion with a representative and expert from a leading AI-computing hardware company on AI compute, accelerated computing, and export controls.[12] Legal and institutional sources supported comparative benchmarking of Taiwan, Singapore, South Korea, and Japan on patent protection, IC layout protection, and trade secret and confidential information regimes, and US export-control statutes, regulations, and strategic trade scholarship informed the discussion of intangible technology transfer in sections 3 and 5.11.

Coding combined deductive categories drawn from the research questions, IP ownership, EDA licensing, PDK governance, remote access, intangible technology transfer, strategic trade compliance, and inter-agency coordination, with inductive categories that emerged from the interviews, including layered licensing, the distinction between access and disclosure, and staged compliance. Three interviewees are referenced throughout by role rather than name or firm, consistent with the Chatham House Rule under which those interviews were conducted.

3. The Governance Challenge of Intangible Semiconductor Design

Traditional trade and IP policy assumed physical goods: a chip crossing a border, a patent protecting an invention, an export license controlling a shipment. This model does not apply to semiconductor design, where one project can mix RTL code, a schematic and layout database, a commercial or open-source EDA

[1]Alexander C. Abad, interview by Lean Karlo S. Tolentino, written response, 2026.

[2]Jefferson A. Hora, interview by Lean Karlo S. Tolentino, written response, 2026.

[3]Intellectual Property Office of the Philippines (IPOPHL), group interview by Lean Karlo S. Tolentino, 2026.

[4]Chua-Chin Wang, interview by Lean Karlo S. Tolentino, written response, 2026.

[5] Government-affairs director, global semiconductor manufacturer, interview by Lean Karlo S. Tolentino, Pacific Forum expert interview, May 21, 2026.

[6]Charade Avondo, interview by Lean Karlo S. Tolentino, written response, 2026.

[7] Louis Alarcon, interview by Lean Karlo S. Tolentino, written response, 2026.

[8]Ira Estropia, interview by Lean Karlo S. Tolentino, written response, 2026.

[9] Representative, global semiconductor lithography equipment manufacturer, interview by Lean Karlo S. Tolentino, written response, 2026. Identity withheld at interviewee's request, consistent with the Chatham House Rule.

[10]Board of Investments, Manufacturing Industries Service, "Semiconductor & Electronics Industry Profile" (unpublished presentation, prepared as of April 2026); Board of Investments, "BOI Deck: Incentives and Business Registration" (unpublished presentation, 2026).

[11]US Trade and Development Agency, "Leveraging USTDA Grants to Advance Luzon Economic Corridor Priority Projects" (presentation, May 11, 2026); US International Development Finance Corporation, "US DFC 101" (presentation, May 11, 2026).

[12]Pacific Forum, interview with a representative and expert from a leading AI-computing hardware company on accelerated computing, AI chips, export controls, and semiconductor supply-chain dependencies (researcher-provided summary, unpublished, 2026).

toolchain, a foundry PDK, reusable IP blocks, a cloud-hosted verification environment, and contributors working from several countries at once. None of these components is a finished product in itself; each is layered on the others, and each carries its own license, ownership claim, or confidentiality obligation. This layering reflects a broader pattern in strategic trade literature: capability acquisition requires equipment, materials, and knowledge, and knowledge splits into explicit information, which travels easily through blueprints or code, and tacit know-how, which does not and is typically acquired only through hands-on experience.[13] Export and IP controls historically target the explicit, documented layer, while the harder-to-regulate channel, tacit knowledge moving through personnel, is where a design capability is most often actually transferred.

This hierarchical structure means that a single classification like 'open source' can hide real differences in what is actually permitted. A tool may be free, but the design created with it may be proprietary. A PDK may be free for research download, but the underlying foundry data may be strictly confidential A shared repository may be visible to a research team but still legally restricted from public release. When students or small design teams mix up these layers, they either expose sensitive material when they do not intend to or they err on the side of caution and shut down legitimate collaboration.

The principal governance risk comes from the very same digital infrastructure that allows for collaboration. A design file does not have to be formally exported to escape institutional control; it can be exposed the minute a private repository is mirrored publicly, a foreign server processes it through a continuous integration runner, or a foreign collaborator is given remote desktop access to a restricted environment. Access is now a governance event. There is a direct legal analog to this principle in United States export control law, in which a controlled "release" of technology may take place purely by visual inspection or oral exchange, regardless of any physical shipment.[14] TPhilippine institutional practice, including the IP policies of most universities, has yet to catch up with that reality.

4. The Philippine Semiconductor and Electronics Landscape

The scale of the existing industry gives this governance question practical urgency. According to BOI's industry profile, the sector was the country's largest export contributor in 2025, accounting for roughly 58.8 percent of total exports, or $49.6 billion, with semiconductors alone contributing $34.6 billion. It was also the third-largest contributor to manufacturing gross value added, at 10.3 percent, and employed around 368,000 workers, while electronics imports of $31.9 billion indicate continued dependence on imports.[15]

Roughly 70 percent of Philippine electronics firms remain concentrated in manufacturing services and ATP, although BOI materials describe growing capability in IC design, listing firms such as Xinyx, Smartfox, ROHM, and Embedded Silicon Technology Solutions Corp. as active IC design players.[16] Administrative Order No. 31, issued in March 2025, seeks a whole-of-government approach and created the SEIAC as the primary advisory body to the president on industry development and global competitiveness. Government support measures identified in the BOI materials include incentives under the CREATE and CREATE MORE Acts, green lanes for strategic investments, faculty immersion and IC design workshops, academe-industry matching, support facilities such as the Electronics Product Development Center and the Advanced Manufacturing Center, and implementation of the Philippine Advanced Technology and Human Resources Strategy (PATHS) and the IC Design Roadmap.[17]

These measures show that several building blocks of a design-oriented policy already have an institutional home. What remains largely unspecified is the operational governance layer for design-intensive

[13]Ian J. Stewart, "The Contribution of Intangible Technology Controls in Controlling the Spread of Strategic Technologies," Strategic Trade Review 1, no. 1 (2015): 41–55.
[14]US Department of Commerce, Bureau of Industry and Security, "Release," 15 C.F.R. § 734.15, https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-734/section-734.15.
[15]Board of Investments, Manufacturing Industries Service, "Semiconductor & Electronics Industry Profile" (unpublished presentation, prepared as of April 2026).
[16]Board of Investments, Manufacturing Industries Service, "Semiconductor & Electronics Industry Profile" (2026).
[17]Board of Investments, Manufacturing Industries Service, "Semiconductor & Electronics Industry Profile" (2026).

work itself, which includes EDA licensing, PDK access, repository management, cloud workflows, and intangible technology transfer. The CREATE MORE incentives, which include income tax holidays, enhanced deductions, duty exemptions, and VAT relief, were designed with capital investment and manufacturing expansion in mind; whether they suit fabless firms whose principal assets are engineering talent, software, design IP, and verification capability rather than physical facilities is a question this paper's interviews raise but cannot yet answer conclusively.

5. Evidence from Philippine and International Stakeholders

5.1 Open-Source IC Design: An Access Pathway, not a Complete Strategy

Dr. Alexander C. Abad's experience with platforms such as Tiny Tapeout, OpenLane/OpenROAD, and multiple open PDKs illustrates how open-source IC design can convert student work into a silicon-proven credential. At the same time, Abad cautioned that open-source tools do not by themselves create advanced-node capability, a domestic foundry, or an industry base able to absorb graduates.[18]

License cost is the barrier open-source EDA most directly addresses, but Abad identified remaining bottlenecks that no software choice can solve alone: faculty learning curves, slow design-rule checking turnaround, mixed-signal complexity, and the need for at least one locally trained faculty champion. He recommended a hybrid model: open-source EDA and PDKs for introductory and low-cost shuttle tapeout projects, with proprietary tools reserved for advanced or industry-aligned tracks.

A recurring theme in the interview was that semiconductor design projects involve multiple licensing layers at once which consists of the tool, the design, the documented process, the PDK, the library, the model, and any restricted third-party IP may each carry different conditions. These layers are often flattened into a single phrase such as "open source," creating a real risk of misuse or unauthorized redistribution. Abad also observed that students and researchers can mistake material visible on a shared drive for material cleared for public release, and he therefore recommended a simple public/internal/restricted classification system to close that gap at low cost. On compliance, he favored a proportionate, risk-tiered approach: routine student projects should proceed through light self-certification, with escalation reserved for projects flagged for radio-frequency content, cryptography, defense-adjacent applications, or certain foreign-funded collaborations.

5.2 University Readiness: Governance Capacity, Not Only Technical Capacity

Dr. Jefferson A. Hora described the university role in four interrelated pillars: the development of globally competitive talents, industry-relevant research, IP generation, and trusted technology translation. Regional universities should be able to link government, industry and international partners and anchor regional innovation hubs so that advanced capability is not concentrated only in Metro Manila, he said in his narrative.[19]

Hora said the challenges identified are the same governance risks this paper identifies elsewhere in its stack framework. These include limited availability of commercial EDA tools and foundry technologies, fragmented research funding landscape, lack of faculty with industrial IC design experience, ambiguous IP ownership arrangements, procurement delays, and lack of governance frameworks for commercially sensitive semiconductor technologies. For universities to take on advanced projects, he said, they need mature research governance, a developed IT and cybersecurity infrastructure, robust IP management, legal and contract support, controlled EDA and PDK access, and clear policies for industry collaboration and responsible technology transfer—that is, institutional readiness as measured by governance capacity, not just technical ability.

Hora recommended authenticated accounts, role-based access, non-disclosure agreements, activity logging, secure VPNs, restrictions on unauthorized copying, periodic audits, and immediate account revocation once a project ends. Only a limited number of Philippine universities currently have the maturity to handle foundry materials responsibly, he warned. Most university IP policies were written before cloud-based collaborative research was common and do not yet consider overseas servers or

[18] Alexander C. Abad, interview by Lean Karlo S. Tolentino, written response, 2026.

[19] Jefferson A. Hora, interview by Lean Karlo S. Tolentino, written response, 2026.

remote repositories. Technology transfer can happen through remote logins and screen sharing, not only through a formal transfer of files. He favored a risk-tiered compliance regime with a designated compliance officer and enhanced screening for advanced technologies, embedded within the research lifecycle. "Public universities have their own structural constraints to contend with: rigid procurement, project-based funding, high licensing costs and administrative delay," he added. As institutions like MSU-IIT show, however, advanced IC-design capability is possible outside Metro Manila when there is strategic government support and partnerships with industry.

5.3 Intellectual Property Institutions: An Inbound-Oriented Framework

Officials of IPOPHL confirmed in interview that the Philippine IP Code governs technology-transfer arrangements and prohibits clauses harmful to local licensees—for example, clauses that prevent a licensee from contesting patent validity, restrict adaptation of imported technology to local conditions, or exempt the licensor from responsibility—but agreed that this framework is structured mainly to attract inbound technology transfer and protect local licensees. It does not itself restrict outbound transfers or prevent the export of controlled technology.[20] This is a significant gap for a country trying to encourage design-intensive collaboration; Philippine IP law can support investor confidence in inbound licensing, but a separate governance layer is still needed for outbound, digital, intangible, or controlled technical transfers that may arise in EDA and PDK access or cloud-enabled research.

Philippine law protects trade secrets, but the IPOPHL interview confirmed that registration and regulatory treatment is still underdeveloped and that companies may be reluctant to register a trade secret for the very reason that secrecy is its value. This implies that patent registration alone cannot shoulder the governance load. Design know-how, process information, and PDK-derived information are better protected by contract, cybersecurity, and employment obligations layered on top of trade secret law—a gap further examined in section 8.6.

IPOPHL had several options for enforcement, including civil and criminal proceedings before the commercial courts as well as administrative proceedings before its Bureau of Legal Affairs. The Philippines already has a mechanism for enforcement coordination through the National Committee on Intellectual Property Rights (NCIPR) chaired by DTI, with IPOPHL as vice-chair. However, technology transfer cases have not been a frequent subject of NCIPR referral in recent years, suggesting an opportunity to broaden current coordination to address semiconductor-specific issues rather than creating a new institution. IPOPHL has also experienced regional cooperation through the ASEAN Network of IP Enforcement Experts, although this has been more focused on e-commerce enforcement than on technology transfer.[21]

5.4 Investment, Infrastructure Financing, and Trusted Supply Chains

Presentation materials from the May 11, 2026 Luzon Economic Corridor event in Manila frame the corridor as a trilateral partnership among the Philippines, the United States, and Japan, with digital infrastructure and advanced manufacturing identified as a key sector alongside transport and energy. The corridor's stated purpose here was deployment of secure digital infrastructure and strengthened semiconductor manufacturing capacity for resilient, trusted supply chains—support that already involves the US Trade and Development Agency (USTDA), the US International Development Finance Corporation (DFC), and multilateral partners such as the Asian Development Bank and the Japan International Cooperation Agency.[22] This connects semiconductor design governance to a wider national infrastructure and supply chain resilience agenda rather than treating it as a purely academic or firm-level matter.

USTDA's own tools, feasibility studies, technical assistance, and transaction advisory services are relevant because several interventions this paper proposes, such as a shared national IC design facility, require project preparation before implementation. USTDA grants are fixed-price awards of $500,000 to $2 million, funding labor for project preparation rather than equipment, provided a US firm conducts

[20] IPOPHL, group interview by Lean Karlo S. Tolentino, 2026.

[21] IPOPHL, group interview by Lean Karlo S. Tolentino, 2026.

[22] US Trade and Development Agency, "Leveraging USTDA Grants to Advance Luzon Economic Corridor Priority Projects" (presentation, May 11, 2026).

the funded work; a semiconductor design-governance proposal would be better framed as a feasibility study for a bankable infrastructure platform than as a request for EDA licenses alone.[23]

The DFC materials describe the agency as the US government's development finance arm, mobilizing private capital through debt, equity, and guaranties in priority sectors, including technology and data centers. Together, the USTDA and DFC materials suggest that a national semiconductor design ecosystem will need more than research grants. It will require blended public funding, investment incentives, and development finance to sustain shared design facilities over time.[24]

5.5 The Global Industry View: Value-Chain Positioning Over Fabrication

A director of government affairs at a leading global semiconductor manufacturer cautioned in interview against treating full-scale advanced fabrication as the Philippines' only meaningful semiconductor objective. Modern fabrication facilities cost roughly $12 billion to $30 billion, commonly around $20 billion, and once built tend to remain in place for decades, generating broad supplier and local-economy effects that make them a fundamentally different kind of investment than design or research infrastructure. The director linked the decline in US semiconductor manufacturing share from roughly 36 percent in 1990 to about 12 percent in 2020 to the political case for the US CHIPS Act and observed that incentives of that scale only work when paired with credible execution, workforce readiness, and reliable power.[25]

For the Philippines, the director pointed to advanced testing and packaging as a more realistic near-term area for building on existing strengths, consistent with the BOI evidence on the country's established manufacturing services base. He described workforce availability spanning high-school graduates, technicians, engineers, and doctoral researchers as one of the first factors considered in any investment decision, citing his company's own practices in early science, technology, engineering, and mathematics (STEM) engagement, community-college pathways, and apprenticeships as a model for broadening what counts as "infrastructure" beyond physical facilities. When asked directly what mattered most, he emphasized consistent power and workforce availability as mattering most, ranking above incentive predictability, tariffs, land, and geopolitical alignment. He framed the current environment as one shaped by a search for allied or trusted supply chain partners and suggested the Philippines could benefit from this friendshoring logic if it defines a realistic supply chain role and demonstrates credible governance of IP, technology transfer, and strategic trade risk. That framing aligns closely with this paper's concept of compliance-ready innovation.

5.6 The AI Compute Dimension: Chips, Export Controls, and a Third Axis of Progress

A Pacific Forum-hosted discussion with an expert from a leading AI-computing hardware company framed AI capability as a function of three interacting inputs—algorithms, data, and compute—and traced how large foundation-model training, fine-tuning, and distillation have made access to compute a strategic input to national technology capacity, not merely an IT procurement question.[26]

The discussion also addressed export controls on high-performance chips and advanced manufacturing equipment, including extreme ultraviolet lithography, as a central feature of current technology competition and supply chain security. A key analytical point for this paper is that computing system improvement occurs across at least three axes which are process technology, packaging, and design. This paper cautions against equating semiconductor progress with process-node scaling alone. For a country such as the Philippines without near-term advanced-node fabrication, mature-node design access, advanced packaging and test capability, and targeted design specialization may be a more realistic strategy than pursuing leading-edge fabrication.

[23]US Trade and Development Agency, "Leveraging USTDA Grants to Advance Luzon Economic Corridor Priority Projects" (2026).

[24]US International Development Finance Corporation, "US DFC 101" (presentation, May 11, 2026).

[25] Government-affairs director, global semiconductor manufacturer, interview by Lean Karlo S. Tolentino, Pacific Forum expert interview, May 21, 2026.

[26]Pacific Forum, interview with a representative and expert from a leading AI-computing hardware company (researcher-provided summary, unpublished, 2026).

5.7 The Industry View: Talent, Layered IP, and Proportionate Compliance

Ms. Charade Avondo offered the view of a Philippine IC design firm in operation. The binding constraint, Avondo argued, is not a shortage of clients, but rather the local ecosystem's inability to develop qualified engineering capacity rapidly enough due to its unstable EDA and computing infrastructure, a scarcity of IC design faculty, short-term training that is not integrated into curricula, weak pathways from undergraduate exposure to internships and employment, and initiatives that depend on individual faculty champions or temporary grants rather than sustained institutional commitment.[27] This further supports the paper's main argument that semiconductor policy cannot simply rely on investment incentives but must also develop a sustainable human capital pipeline.

The interview also provided an industry-derived hierarchy of sensitive design assets, which improves the classification model presented in section 9. At the top are foundry-related information and externally licensed reusable IP that require the strongest protection. Customer specifications, RTL code, schematics, and internally developed reusable IP constitute a middle tier. Verification environments and design methodologies carry comparatively lower sensitivity. This supports a differentiated, rather than flat, approach to classification.

For joint R&D projects among firms, universities, and government agencies, Avondo identified IP ownership and usage rights as a recurring source of friction, noting that disputes involving Department of Science and Technology (DOST)-funded projects may be referred to the DOST Fairness Opinion Board for an independent opinion.[28] The practical implication is that semiconductor R&D agreements should settle background and foreground IP, commercialization and licensing rights, publication timing, and technology-transfer pathways before a project begins, not after a dispute arises.

On operational risk, Avondo described concrete problems that a purely legal reading of EDA and PDK governance can miss: remote-access latency, storage limits, and the recurring cost of training and tool-version updates. She recommended project-specific PDK access and regular NDA compliance monitoring that treats screen sharing and remote logins as possible technology transfer channels alongside conventional risks such as credential theft.[29] On university collaboration, she counseled a staged trust model: begin with educational tools and non-sensitive process information, then extend access to customer data or advanced commercial PDKs only once an institution demonstrates the infrastructure and governance maturity to protect it. Finally, she cautioned that compliance obligations are still understood unevenly, often resting with individual compliance officers or IT administrators rather than being institutionalized, and she warned that overly rigid rules risk widening the capability gap they are meant to close. This is a significant industry check on the paper's recommendations: governance must be credible enough to protect intellectual property and sensitive technology, but flexible enough that universities, startups, and small design firms are not deterred from collaborating in the first place.

5.8 The Academic Research-Leadership View: Graduate Talent, Vertical Specialization, and Institutional Openness

Prof. Louis Alarcon framed the university's central role as producing globally competent graduate-level, not undergraduate-level, IC designers. In his account, the complexity of modern IC design now approaches that of medical or pharmaceutical technology, which is why no jurisdiction offers a bachelor's-level path into independent chip design; the country instead needs more PhD-level faculty, more universities offering graduate programs, and more graduate-level research funding.[30] CIDR is pursuing a proposed government-backed program of 500 doctoral scholarship slots aimed at building a base of 100 PhD-level IC design faculty—a threshold Alarcon estimates could sustain a pipeline of roughly 1,000 MS or PhD-level IC designers annually. This reframes the paper's talent pipeline finding around graduate education specifically and supplies a concrete numerical target that the paper's earlier discussion of workforce constraints, drawn from Hora and Avondo, does not.

---

[27]Charade Avondo, interview by Lean Karlo S. Tolentino, written response, 2026.

[28]Charade Avondo, interview by Lean Karlo S. Tolentino, written response, 2026.

[29]Charade Avondo, interview by Lean Karlo S. Tolentino, written response, 2026.

[30] Louis Alarcon, interview by Lean Karlo S. Tolentino, written response, 2026.

On strategic focus, Alarcon cautioned against framing the sector's near-term pathway as a choice among "horizontal" categories such as fabless design, packaging, testing, or embedded systems. He argued the Philippines should instead prioritize technical "verticals" defined by application, such as low-power communications, energy harvesting, and edge artificial intelligence directed at food security; only then should it select the commercial mechanism, whether fabless design, licensing, or another route, that fits the resulting technology.[31] This converges with, and sharpens, this paper's own long-term recommendation of a mission-oriented national IC design program organized around urgent domestic applications (section 10.3), suggesting that the applications-first sequencing Alarcon describes should guide the medium-term design of that program, not only its eventual framing.

On EDA and PDK access, Alarcon confirmed the practical account this paper's evidence base has already assembled: entry-level teaching can rely on open-source EDA tools, but PDK and multi-project wafer access require a funded research program and security infrastructure adequate to satisfy foundry NDAs, with faculty typically responsible for building the research agenda, grant proposals, and laboratory infrastructure that make this possible.

On IP protection, Alarcon took a notably different position from other respondents in this paper's evidence base. Asked about the sufficiency of university IP policy and the protection of IC layout designs, reusable IP blocks, and know-how, he declined to treat these as priority problems, warning against "gatekeeping" policies that keep university-generated technology locked inside institutions.[32] Given how scarce venture funding is for Philippine deep tech startups, he argued universities should give local industry every advantage, including ready access to university-generated technology, on the expectation that companies will generally reciprocate. This stands in some tension with the more protection-oriented views of Hora, Avondo, and IPOPHL officials, and must therefore be flagged as a genuine point of stakeholder disagreement requiring further validation rather than a settled conclusion.

On remote access and compliance, Alarcon converged again with the paper's other respondents, agreeing that the primary risk is inadvertent disclosure of ideas and technology during remote access or collaborative work, which argues for carefully designed rules and safeguards. However, he framed the underlying solution as relational rather than procedural, arguing that trust and competence, built through a track record of reliable collaboration, do more to reduce collaboration risk than compliance training alone. On overall policy priority, Alarcon argued that the policies that matter most are the ones that let the Philippines continuously generate globally competitive research at scale, meaning they support faculty development, research infrastructure, funding, and scholarships, since these are what will ultimately persuade international partners to collaborate with and invest in the Philippines.

5.9 A Third University Perspective: AI Models, Data Governance, and IP Literacy in Engineering Education

Dr. Ira Estropia extended this paper's university governance findings from IC design specifically to the broader category of AI models, datasets, source code, and research know-how, a category increasingly relevant as design automation and verification workflows themselves come to rely on AI and machine learning tooling. Her core recommendation echoes Hora's as a second, independent university source: a documented institutional policy backed by a secured database with access limited to authorized users, together with clear internal rules on ownership.[33]

On collaboration risk, Estropia identified miscrediting of data ownership and improper downstream use, rather than technical breach, as the most common failure mode when students share technical data through cloud platforms or international collaborations. This concern sits alongside, rather than replaces, the access control risks such as credential theft that Avondo identified. She recommended explicit, clearly written Data Use Agreements as the primary safeguard.

On institutional capacity, Estropia pointed to university IP offices as the appropriate locus of

[31] Louis Alarcon, interview by Lean Karlo S. Tolentino, written response, 2026.

[32] Louis Alarcon, interview by Lean Karlo S. Tolentino, written response, 2026.

[33] Ira Estropia, interview by Lean Karlo S. Tolentino, written response, 2026.

responsibility for compliance with the Philippine IP Code and argued the central challenge for university-industry collaboration is less about drafting new IP policy than about strict implementation of policy that, in her account, already exists at most universities.[34] This qualifies this paper's recommendations: several medium-term proposals in section 10.2 assume university technology transfer offices still need to be built; Estropia's account suggests that at some universities, the more binding constraint may be enforcement capacity rather than policy design.

Estropia's most distinctive contribution concerns engineering education itself. She argued that IP protection, data security, and responsible technology transfer should be taught directly to engineering students so that awareness, and the ability to protect one's own work, begins as early as possible, rather than being acquired informally after a graduate enters industry or research. This supports a curricular recommendation this paper's evidence base had not previously identified: embedding IP, data-governance, and technology transfer literacy directly into undergraduate and graduate engineering curricula alongside the technical EDA, PDK, and design training that Abad, Hora, and Alarcon each described.

5.10 Distributed Supply-Chain IP Protection: The Equipment-Manufacturer View

A representative of a leading global semiconductor lithography equipment manufacturer explained in interview that the firm's IP was protected less by any single patent than by the structural complexity of its supply chain. The company works with more than 1,000 suppliers, each holding proprietary IP embedded in specific subsystems.[35] A rival seeking to replicate the equipment would need to acquire or reverse-engineer IP held across most of these suppliers at once, not simply breach the manufacturer itself, since no single supplier holds a complete picture of the finished system.

This offers a governance lesson distinct from the concentrated, single-firm disputes examined elsewhere (see section 8.1): deliberately distributing critical know-how across a wide supplier base can itself function as a protective strategy, complementing rather than replacing patents, trade secrets, and export controls. For the Philippines, the lesson is double-edged. Supply chain fragmentation is a plausible defensive model for a mature equipment manufacturer with the scale to coordinate hundreds of contractors, but it is not readily available to a Philippine university, startup, or single design firm working with a handful of partners; for these smaller actors, the classification and access control recommendations in section 9 remain a more realistic path to a comparable protective outcome.

5.11 US Export-Control Architecture as a Reference Point for Intangible Technology Governance

Although the Philippines' policy problems, legal tradition, and institutional capacity differ substantially from the United States', several features of the US export control system are directly relevant to this paper's governance stack framework and are documented here as reference points rather than a model for direct adoption. Beyond the deemed export "release" rule discussed in section 3, the Foreign-Direct Product Rule extends US jurisdiction to foreign-made items that are the direct product of controlled US-origin technology or software or are produced using equipment that is itself such a direct product, and this rule has been progressively expanded to specifically cover advanced computing and semiconductor-manufacturing items.[36] This is directly relevant to Philippine semiconductor design policy; firms and universities that build outputs using US-origin EDA software, PDKs, or design tools may find those outputs carry downstream US jurisdictional reach, regardless of where the design work itself occurs—a dependency Philippine institutions should map explicitly rather than assume away when drafting compliance guidance.

Current US controls on advanced computing extend beyond physical chips to the associated software and technology needed for their development and separately impose end-use restrictions that can apply even where an item's baseline classification would

[34]Ira Estropia, interview by Lean Karlo S. Tolentino, written response, 2026.

[35] Representative, global semiconductor lithography equipment manufacturer, interview by Lean Karlo S. Tolentino, written response, 2026. Identity withheld at interviewee's request, consistent with the Chatham House Rule.

[36]US Department of Commerce, Bureau of Industry and Security, "Foreign-Direct Product (FDP) Rules," 15 C.F.R. § 734.9, https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-734/section-734.9.

not otherwise require a license.[37] This dual structure offers a template for the Philippines' own strategic trade posture: a project can be low-risk by its tools yet high-risk by its intended end user, a distinction the tiered review model in section 9 is designed to capture.

Stewart's more recent work argues that export control policy is shifting from an item-based model toward a broader access capability model, where what matters is not only which commodities are controlled but who can remotely access technology and whether technical assistance itself transfers a restricted capability.[38] He is also skeptical that existing multilateral regimes, such as the Wassenaar Arrangement referenced in section 6, can keep pace with fast-moving dual-use technologies, a version of the "small yard, high fence" targeting debate in the previous Biden administration’s technology policy.[39] For a middle power such as the Philippines, this suggests that a proportionate strategic trade posture should prioritize depth of control over a small number of genuinely sensitive nodes (advanced PDK access and cross-border design collaboration involving restricted end users among them) rather than attempting the broad, list-based coverage the country does not yet have the institutional capacity to administer.

6. Comparative Benchmarking: Taiwan, Singapore, South Korea, and Japan

The comparative benchmark below covers patents, IC layout protection, trade secrets, and special safeguards for strategically important technologies across four Indo-Pacific jurisdictions chosen because they represent distinct models: a semiconductor-centered ecosystem (Taiwan), a trusted IP hub (Singapore), a strategic-technology protection model (South Korea), and a mature specialized IP system (Japan). The objective is not to advocate uncritical adoption of any model but to identify institutional practices that could be tailored to Philippine universities and fabless design initiatives.

The World Intellectual Property Organization (WIPO) notes that the physical configuration of circuit elements is not sufficiently protected by patent or copyright law alone, which is why IC layout designs are protected internationally as a distinct type of IP.[40] This baseline supports a tiered Philippine approach spanning patentable inventions, circuit layout rights, confidential design information, and PDK-derived data.

Taiwan is the most comparable case given its globally significant semiconductor ecosystem. Its dedicated Integrated Circuit Layout Protection Act protects IC layouts, and its enforcement rules allow confidential drawings to be withheld from public examination within specified limits.[41] Taiwan has also moved to directly protect “national core technologies”: amendments made in 2022 to its National Security Act created new offenses for economic espionage and extraterritorial misuse of trade secrets involving such technologies.[42] Taiwan’s high-control model would need careful adaptation for the Philippines, starting with semiconductor-specific university guidance and trade secret management rather than the wholesale importation of its controls.

Singapore's comparative advantage is legal predictability, not manufacturing scale. Its Layout-Designs of Integrated Circuits Act 1999 protects original layout designs for 10 to 15 years depending on when they are commercially exploited.[43] More

[37] US Department of Commerce, Bureau of Industry and Security, "Advanced Computing and Semiconductor Manufacturing Controls," accessed 2026, https://www.bis.gov/advanced-computing-and-semiconductor-manufacturing-controls; 15 C.F.R. Part 744 (End-User and End-Use Based Controls).

[38] Ian J. Stewart, "Export Control and Emerging Technology Control in an Era of Strategic Competition," Nonpro Notes (Washington, DC: James Martin Center for Nonproliferation Studies, March 2022).

[39] Ian J. Stewart, "Export Controls in an Era of Strategic Competition: Implications for the Existing Landscape and the Need for a New Multilateral Trade Review Regime," Strategic Trade Review 9, no. 1 (Winter/Spring 2023).

[40] World Intellectual Property Organization, "Layout Designs (Topographies) of Integrated Circuits," accessed 2026, https://www.wipo.int/en/web/patents/topics/integrated_circuits.

[41] Taiwan Intellectual Property Office, "Integrated Circuit Layout Protection Act," accessed 2026, https://www.tipo.gov.tw/en/tipo2/379-3219.html; Taiwan Intellectual Property Office, "Enforcement Rules of the Integrated Circuit Layout Protection Act," accessed 2026, https://www.tipo.gov.tw/en/tipo2/379-3218.html.

[42] Executive Yuan (Taiwan), "Executive Yuan Guards Core Technologies with Draft Amendments to National Security Act," 2022, https://english.ey.gov.tw/Page/61BF20C3E89B856/7e320e20-2216-4142-91de-7e8ab921f6d3.

[43] Singapore Statutes Online, Layout-Designs of Integrated Circuits Act 1999, https://sso.agc.gov.sg/Act/LDICA1999;

relevant here, Singapore protects trade secrets through the law of confidence, with no registration requirement and no fixed time limit—a model well suited to EDA and PDK workflows where much of the value lies in confidentiality discipline rather than public registration.[44] Philippine universities could adapt this at low cost through information classification, repository governance, and NDAs, without a new registration system.

South Korea combines ordinary IP protection with a distinct additional layer for strategically significant technologies. The Korean Intellectual Property Office (KIPO) lists the Act on the Layout-Designs of Semiconductor Integrated Circuits and the Unfair Competition Prevention and Trade Secret Protection Act among its industrial property laws.[45] Separately, its Act on Prevention of Divulgence and Protection of Industrial Technology aims to prevent undue disclosure of industrial technology and protect national economic competitiveness and security.[46] This two-track structure, with ordinary protection for patents, layouts, and trade secrets plus special safeguards for the most sensitive technologies, offers a model the Philippines could adapt gradually, beginning with technology inventories and escalation triggers for foreign access or proprietary foundry data, well short of Korea's full national security apparatus.

Japan is the most mature comparator for complementary, non-overlapping layers of IP. The Act on the Circuit Layout of a Semiconductor Integrated Circuit creates a system for the proper exploitation of semiconductor circuit layouts. It ties protection directly to manufacturing use and commercial circulation rather than static appearance.[47] It has a Patent Act to protect inventions and an Unfair Competition Prevention Act to separately protect trade secrets and other confidential business information.[48] The transferable lesson is institutional rather than legislative: there should be legal-technical training for university counsel, technology transfer offices, courts, and research administrators so enforcement mechanisms are familiar with semiconductor-specific assets, such as mask works and PDK-derived information.

Across all four comparators, no jurisdiction relies on a single legal instrument: each combines patents, layout rights, trade secret protection, contract governance, and enforcement capacity, with Taiwan and South Korea adding safeguards for strategically sensitive technologies. This supports the Semiconductor Design Governance Stack developed in section 9 and confirms that the inbound-oriented gap IPOPHL officials identified in interview should be addressed through a combination of trade secret governance, contract discipline, access control, and, where appropriate, strategic trade review, not through IP registration reform alone. Table 1 summarizes the comparison.

Intellectual Property Office of Singapore, "Other IP: Layout Designs of Integrated Circuits," accessed 2026, https://www.ipos.gov.sg/about-ip/other-ip/introduction-other-ip/.

[44]Intellectual Property Office of Singapore, "Trade Secrets," accessed 2026, https://www.ipos.gov.sg/about-ip/trade-secret/.

[45]Korean Intellectual Property Office, "Industrial Property Laws," 2023, https://www.kipo.go.kr/en/HtmlApp?c=60201&catmenu=ek07_02_01; Korea Legislation Research Institute, Act on the Layout-Designs of Semiconductor Integrated Circuits, https://elaw.klri.re.kr/eng_service/lawView.do?hseq=33695&lang=ENG.

[46]Korea Legislation Research Institute, Act on Prevention of Divulgence and Protection of Industrial Technology, https://elaw.klri.re.kr/eng_service/lawView.do?hseq=68585&lang=ENG.

[47]Act on the Circuit Layout of a Semiconductor Integrated Circuit (Japan), Act No. 43 of 1985, as amended, https://www.japaneselawtranslation.go.jp/en/laws/view/3835/en.

[48] Patent Act (Japan), https://www.japaneselawtranslation.go.jp/en/laws/view/3118/en; Unfair Competition Prevention Act (Japan), https://www.japaneselawtranslation.go.jp/en/laws/view/3629/en; Ministry of Economy, Trade and Industry (Japan), "Outline of Unfair Competition Prevention Act," accessed 2026, https://www.meti.go.jp/english/policy/economy/chizai/chiteki/index.html.

Table 1. Comparative IP and Trade-Secret Regimes in Taiwan, Singapore, South Korea, and Japan

Jurisdiction	IC Layout / Mask-Work Protection	Trade Secrets	Special Safeguards for Sensitive Technology
Taiwan	Integrated Circuit Layout Protection Act	General civil protection	2022 National Security Act amendments: new offenses for economic espionage involving "national core technologies"
Singapore	Layout-Designs of Integrated Circuits Act 1999 (10–15-year term)	Law of confidence; no registration, no fixed term	None specific; relies on confidentiality discipline
South Korea	Act on Layout-Designs of Semiconductor Integrated Circuits	Unfair Competition Prevention and Trade Secret Protection Act	Act on Prevention of Divulgence and Protection of Industrial Technology
Japan	Act on the Circuit Layout of a Semiconductor Integrated Circuit	Unfair Competition Prevention Act	None specific; relies on general trade-secret and patent law

7. The Philippine IC Layout Protection Gap and Foreign Patent Filing Behavior

7.1 IC Layout Protection: A Filing Practice Ambiguity

The same object receives different labels across jurisdictions: South Korea calls it a "layout design," the United States a "mask work," Japan a "circuit layout," and the European Union a "topography." KIPO's guidance maps these terms across jurisdictions and defines a layout design as a plane or cubic arrangement of circuit elements used to manufacture an integrated circuit. It specifies acceptable technical deposits, including GDS, GDSII, and CIF files, provided the underlying structure remains identifiable.[49] The United States protects semiconductor layouts as "mask works" under a dedicated chapter of its copyright statute, with a 10 year term and built-in reverse engineering and innocent purchaser limitations.[50] Japan and the European Union apply comparable but separately labeled regimes—"circuit layout" and "topography," respectively—that likewise tie protection to manufacturing use rather than external appearance.[51]

The Philippines has its own statutory basis for this protection. Republic Act No. 9150 amended the IP Code to define a layout design, synonymous with topography, as the three-dimensional disposition of active elements and interconnections of an integrated circuit, and to grant the owner of an original, registered layout design the right to reproduce it and to sell or distribute it.[52] IPOPHL announced its first registered IC layout design in 2019, describing RA 9150 as the basis for protecting industrial and IC layout designs.[53]

A practical filing practice ambiguity is worth flagging for stakeholder validation. A publicly available example accessible through WIPO Publish, registered as PH32021050281 and titled "Integrated Circuit Layout Design of Grain Probe Moisture Meter," is classified as an industrial design application whose abstract describes a block diagram of the layout design, a representation that appears

[49] Korean Intellectual Property Office, "Layout Designs," 2023, https://www.kipo.go.kr/en/HtmlApp?c=30105&catmenu=ek03_02_02.

[50] US Copyright Office, "17 U.S.C. Chapter 9: Protection of Semiconductor Chip Products," accessed 2026, https://www.copyright.gov/title17/92chap9.html.

[51] Act on the Circuit Layout of a Semiconductor Integrated Circuit (Japan); Council Directive 87/54/EEC of December 16, 1986, on the Legal Protection of Topographies of Semiconductor Products, 1987 O.J. (L 24) 36, https://eur-lex.europa.eu/eli/dir/1987/54/oj/eng.

[52] Republic Act No. 9150, An Act Providing for the Protection of Layout-Designs (Topographies) of Integrated Circuits, Amending Republic Act No. 8293 (Philippines, 2001), https://lawphil.net/statutes/repacts/ra2001/pdf/ra_9150_2001.pdf.

[53] Intellectual Property Office of the Philippines, "IPOPHL Bats for First PH-Registered Integrated Circuit Layout Design," November 13, 2019, https://www.ipophil.gov.ph/news/ipophl-bats-for-first-ph-registered-integrated-circuit-layout-design/.

closer to a board-level design than to a GDS/GDSII-level layout prepared for IC fabrication.[54] This should be treated as one data point on classification practice, not confirmation of how a true manufacturable IC layout would be deposited. A related but distinct example, a now-withdrawn 2021 patent application for a machine-learning system that classifies IC layout correctness, illustrates the boundary between patentable design automation tools and layout design registration itself.[55]

Following the Korean model, the Philippines should consider a tiered deposit system: a public bibliographic record suitable for publication; a confidential technical deposit like GDS, GDSII, CIF, or a controlled derived representation retained by IPOPHL or an authorized depository; and access limited to examination, cancellation, or authorized enforcement. IPOPHL should issue updated examination and filing guidelines that clearly distinguish IC layout designs from ordinary industrial designs, specify acceptable electronic deposit formats, and provide confidentiality safeguards for non-public technical material.

7.2 PCT National-Phase Entry as an Investor-Behavior Signal

A related, researchable observation is that foreign technology companies seeking Philippine patent protection often do not begin with a stand-alone national filing before IPOPHL; many instead file internationally under the PCT and enter the Philippine national phase later. IPOPHL confirms that the PCT allows applicants from contracting states to seek protection in a number of jurisdictions through a single international application, with entry into the national phase in the Philippines generally required within thirty months of the priority or international filing date.[56] This is treated as a plausible industry practice observation and a useful policy indicator, not as a confirmed statistical finding. A stronger claim about the share of American, European, or other foreign semiconductor filings that use this route would require IPOPHL or WIPO filing route data disaggregated by applicant residence and technology field.

This filing behavior matters for semiconductor policy because large semiconductor companies manage patent rights as global portfolios and use the PCT to preserve options before selecting the markets or manufacturing sites that warrant national phase entry. For the Philippines, this reframes patent administration as investment readiness infrastructure; if foreign firms already rely on PCT national phase entry for Philippine protection, examination quality and procedural alignment with international practice become part of how investors assess the jurisdiction, alongside trade secret protections, layout design rights, and EDA/PDK licensing arrangements.

The PCT covers only patents and utility models; it does not replace protection of the IC layout design or topography, nor management of trade secrets. Separate routes remain necessary for layout rights and confidentiality protection, which supports this paper's governance stack argument: patents, layout rights, trade secrets, contractual licensing, and strategic trade controls are complementary layers, not substitutes. IPOPHL, DTI, and DOST could collaboratively develop analytics under the patent route for semiconductor technologies, differentiating direct national filings from PCT national phase entries and mapping applicant origins and technology fields to see whether foreign portfolios enter the Philippine system as an early signal that precedes, rather than follows, major design or research investment.

[54] WIPO Publish / IPOPHL, Industrial Design Application PH32021050281, "Integrated Circuit Layout Design of Grain Probe Moisture Meter," 2022, https://wipopublish.ipophil.gov.ph/wopublish-search/public/detail/designs?id=PH32021050281.

[55] WIPO Publish / IPOPHL, Patent Application PH12021050278, "Development of a System that Can Determine and Classify the Layout Correctness of Integrated Circuit Layout Blocks Using Machine Learning," 2023, https://wipopublish.ipophil.gov.ph/wopublish-search/public/detail/patents?id=PH12021050278.

[56] Intellectual Property Office of the Philippines, "Patent Cooperation Treaty (PCT) Filing Assistance Program," 2026, https://www.ipophil.gov.ph/news/ipophl-extends-intl-patent-filing-assistance-program/; Intellectual Property Office of the Philippines, "National Phase: Patent Cooperation Treaty FAQs," accessed 2026, https://www.ipophil.gov.ph/help-and-support/national-phase-patent-cooperation-treaty-faq/; World Intellectual Property Organization, "PCT Applicant's Guide: Philippines — National Phase," 2026, https://pctlegal.wipo.int/eGuide/view-doc.xhtml?doc-code=PH&doc-lang=en.

8. Case Studies

The five cases below were selected because each speaks to a governance stack layer developed in this paper: two show how weak controls at the collaboration, infrastructure, or design layer can escalate a corporate dispute into a strategic trade matter; one documents a live gap in Philippine filing practice; and two show that shared or open semiconductor infrastructure becomes trustworthy through explicit rules, not restriction or openness alone.

8.1 UMC-Micron-Fujian Jinhua: When a Trade-Secret Dispute Becomes a Strategic Trade Matter

Between 2015 and 2017, engineers who had left Micron's Taiwan subsidiary joined UMC and later moved on to lead Fujian Jinhua, a Chinese state-owned DRAM manufacturer; US prosecutors alleged that Micron's DRAM trade secrets traveled with them through UMC's development work for Fujian Jinhua.[57] In 2020, UMC pleaded guilty and paid a $60 million fine, while the parallel indictment of Fujian Jinhua triggered a US Entity List designation that nearly halted the company's operations. However, in February 2024, a federal judge acquitted Fujian Jinhua on all charges, finding that prosecutors had failed to prove misappropriation.[58] The case illustrates two lessons: employee movement and weak device controls can turn a private dispute into a strategic trade matter well before any verdict, and the eventual acquittal cautions that trade secret litigation is technically complex, so compliance built on the expectation of easy prosecution risks overstating enforcement's deterrent value relative to access controls built in from the start.

8.2 Brooktree Corp. v. Advanced Micro Devices (AMD): The Evidentiary Value of a Design Paper Trail

In litigation running through the late 1980s and early 1990s, Brooktree accused AMD of infringing the registered mask work for its color palette graphics chip; AMD's defense rested on the Semiconductor Chip Protection Act's reverse engineering privilege, which permits a competitor to study a protected layout to build an independently designed chip. The Federal Circuit upheld a jury verdict for Brooktree, applying a substantial similarity standard under which copying even a materially important layout portion can support infringement; the verdict hinged on whether AMD's own analysis and independently developed layout amounted to a genuine paper trail of independent creation.[59] For this paper, the case supports a low-cost recommendation: preserving schematics, trial layouts, and dated version histories as work proceeds, not only at filing or dispute, is what lets a designer prove independent creation later.

8.3 The Philippine Grain Probe Filing: A Live Test of Domestic Filing Practice

In 2019, IPOPHL publicly encouraged submission of what it described as the first Philippine-registered IC layout design, and a related application later appeared, titled "Integrated Circuit Layout Design of Grain Probe Moisture Meter," through the industrial design publication channel discussed in section 7.1 above. As that section explains, the published abstract's block diagram representation appears closer to a board-level design than to a GDS/GDSII-level layout prepared for IC fabrication. This paper treats the filing cautiously—not as a confirmed misclassification, but as a data point suggesting the pathway needs clearer guidance. It is this paper's only fully domestic case, and it directly motivates the tiered deposit reform proposed in section 7.1.

8.4 Google-SkyWater-GlobalFoundries Open-Silicon Initiative: Openness Bounded by Explicit Rules

Since 2020, Google has sponsored a series of no-cost multi-project wafer shuttles built around foundry-released, fully open PDKs—first SkyWater's 130-nanometer SKY130 process and later GlobalFoundries' 180-nanometer GF180MCU

[57] US Department of Justice, Office of Public Affairs, "Taiwan Company Pleads Guilty to Trade Secret Theft in Criminal Case Involving PRC State-Owned Company," October 28, 2020, https://www.justice.gov/opa/pr/taiwan-company-pleads-guilty-trade-secret-theft-criminal-case-involving-prc-state-owned.

[58] Kanishka Singh, "Chinese Firm Fujian Jinhua Cleared of US Allegations That It Stole Trade Secrets," Reuters, February 27, 2024, https://finance.yahoo.com/news/chinese-firm-fujian-jinhua-cleared-020044104.html.

[59] Brooktree Corp. v. Advanced Micro Devices, Inc., 977 F.2d 1555 (Fed. Cir. 1992), https://law.justia.com/cases/federal/appellate-courts/F2/977/1555/304802/.

process, run through the Efabless design platform.[60] Submission volume grew from 42 designs in the first 2020 shuttle to 418 by 2022, with roughly 60 percent of early submitters new to chip design.[61] The program's defining feature is not openness alone but the explicitness of its boundaries: an identified PDK, a stated open-source license, defined pre-manufacturing checks, and sponsor-funded fabrication that removes cost without removing licensing discipline. For this paper, the initiative is direct evidence supporting the hybrid model proposed in section 9: open educational pathways can coexist with more controlled commercial EDA and PDK environments provided the rules distinguishing the two are made explicit from the outset.

8.5 Europractice: A Shared Facility as a Trusted Intermediary, not a License Warehouse

Operating since 1995 as a consortium of European research organizations, including imec, Fraunhofer, and CMP, Europractice now supports more than 600 universities a year, giving them negotiated access to commercial EDA tools, training, and multi-project-wafer fabrication, with a newly funded phase extending the service through 2028.[62] Its multi-project wafer model shares mask costs across many academic designs on a single wafer, cutting prototyping costs to roughly five to ten percent of a dedicated run, while members separately negotiate terms individual universities would struggle to secure alone.[63] Recent European analysis notes that even within this mature system, NDAs, export control restrictions, and MPW costs at advanced nodes continue to limit access for some researchers, underscoring that shared infrastructure reduces but does not eliminate governance friction. For Philippine policy, the core lesson is structural: a shared design facility of the kind this paper recommends in section 10.2 functions only if it operates as a trusted intermediary, negotiating access, training, and fabrication on behalf of its members and not merely acting as a shared pool of software licenses. Table 2 summarizes the five cases and their core lessons.

Table 2. Summary of Case Studies and Governance Lessons

Case	Type	Core Lesson for Philippine Policy
8.1 UMC–Micron–Fujian Jinhua	Trade-secret prosecution (US)	Employee movement and weak device controls can escalate a private dispute into a strategic-trade matter; such litigation is evidence-intensive and outcomes are not guaranteed
8.2 Brooktree v. AMD	Mask-work litigation (US)	Contemporaneous design records (schematics, logs, version histories) are the strongest defense against reverse-engineering and misappropriation claims
8.3 Grain Probe Filing	Domestic filing gap (Philippines)	Philippine IC layout filing and examination practice needs clearer administrative and technical guidance
8.4 Google–SkyWater–GlobalFoundries	Open-access infrastructure model	Openness works when boundaries, PDK, license, and design checks, are made explicit from the outset
8.5 Europractice	Shared infrastructure model	A shared design facility must function as a trusted intermediary negotiating access and quality, not merely a pool of software licenses

Source: compiled by the author from the sources cited in section 8.

[60] SkyWater Technology, "Google Partners with SkyWater and Efabless to Enable Open Source Manufacturing of Custom ASICs," November 12, 2020, https://www.skywatertechnology.com/google-partners-with-skywater-and-efabless-to-enable-open-source-manufacturing-of-custom-asics/.

[61] Google Open Source Blog, "Open Source PDKs Joining the Linux Foundation's CHIPS Alliance," November 8, 2023, https://opensource.googleblog.com/2023/11/open-source-pdks-joining-linux-foundation-chips-alliance.html.

[62] imec, "Europractice 2.0 Secures EU Funding Until September 2028," accessed 2026, https://www.imec-int.com/en/press/europractice-20-secures-eu-funding-until-september-2028.

[63] Europractice IC, "Europractice: The Access Point for Electronic Circuits and Systems," accessed 2026, https://europractice-ic.com/.

8.6 Legal Remedies for Trade Secret Theft: A US-Philippine Comparison

Beyond UMC-Micron (section 8.1), US federal courts have twice punished semiconductor trade secret theft directly. A former Analog Devices engineer was sentenced to six months' imprisonment, a three-year industry ban, and a $55,000 fine after copying a stolen microchip design, and a Tianjin University professor was sentenced to 18 months' imprisonment and ordered to pay $476,835 in restitution, with forfeiture of patents obtained using stolen technology, for economic espionage involving radio frequency filter designs.[64] These sit within the US dual-track system: criminal prosecution under the Economic Espionage Act and civil recovery, including injunctions and exemplary damages, under the Defend Trade Secrets Act.[65] The Philippines already recognizes trade secrets as privileged against compulsory disclosure,[66] but criminal protection still rests on Revised Penal Code provisions framed around revelation by an employee rather than the broader acquisition-based misappropriation the US statute covers, with a ₱100,000 penalty ceiling difficult to scale to semiconductor R&D value.[67] Table 3 compares the two systems' key instruments; the gap it reveals is institutional modernization, not an absence of protection, and motivates the trade secret law recommendation added to Table 4.

Table 3. US and Philippine Legal Instruments for Trade-Secret and IP Theft

Instrument / Case	Jurisdiction	Key Provision or Outcome
18 U.S.C. § 1832 (Theft of Trade Secrets)	US	10 yrs; orgs fined greater of $5M or 3x value
18 U.S.C. § 1831 (Economic Espionage)	US	15 yrs, $5M fine; orgs fined greater of $10M or 3x value
Defend Trade Secrets Act, 18 U.S.C. § 1836	US	Civil injunctions and damages; ex parte seizure in rare cases
Yu / Analog Devices (2023)	US	6 months' imprisonment, 3-year industry ban, $55,000 fine
Zhang / Avago-Skyworks (2020)	US	18 months' imprisonment, $476,835 restitution, patent forfeiture
Revised Penal Code Arts. 291–292	Philippines	Arresto mayor / prisión correccional; fine up to ₱100,000
Cybercrime Prevention Act (RA 10175)	Philippines	Prisión mayor or fines for unauthorized access; penalty one degree higher via ICT
Strategic Trade Management Act (RA 10697)	Philippines	6 yrs 1 day–12 yrs imprisonment; ₱1M–₱5M fine for willful violations
Air Philippines Corp. v. Pennswell, Inc. (2007)	Philippines	Supreme Court: trade secrets privileged against compulsory disclosure

Source: compiled by the author from the sources cited in section 8.6.

9. Toward a Semiconductor Design Governance Stack

Evidence from Philippine and international stakeholders converge on one organizing idea: a semiconductor design project is not controlled by one IP or compliance status, but by multiple layers of rights, restrictions, and operational controls acting simultaneously. In this paper, we call this the Semiconductor Design Governance Stack, with seven

[64] US Attorney's Office, District of Massachusetts, "Former Engineer Sentenced for Possessing Stolen Semiconductor Trade Secret," 2023, https://www.justice.gov/usao-ma/pr/former-engineer-sentenced-possessing-stolen-semiconductor-trade-secret; US Attorney's Office, Northern District of California, "Chinese Citizen Sentenced for Economic Espionage, Theft of Trade Secrets, and Conspiracy," September 2020, https://www.justice.gov/usao-ndca/pr/chinese-citizen-sentenced-economic-espionage-theft-trade-secrets-and-conspiracy.

[65] 18 U.S.C. §§ 1831–1832, 1836 (Economic Espionage Act and Defend Trade Secrets Act), https://www.law.cornell.edu/uscode/text/18/1832; https://www.law.cornell.edu/uscode/text/18/1836.

[66] Air Philippines Corp. v. Pennswell, Inc., G.R. No. 172835 (Supreme Court of the Philippines, December 13, 2007).

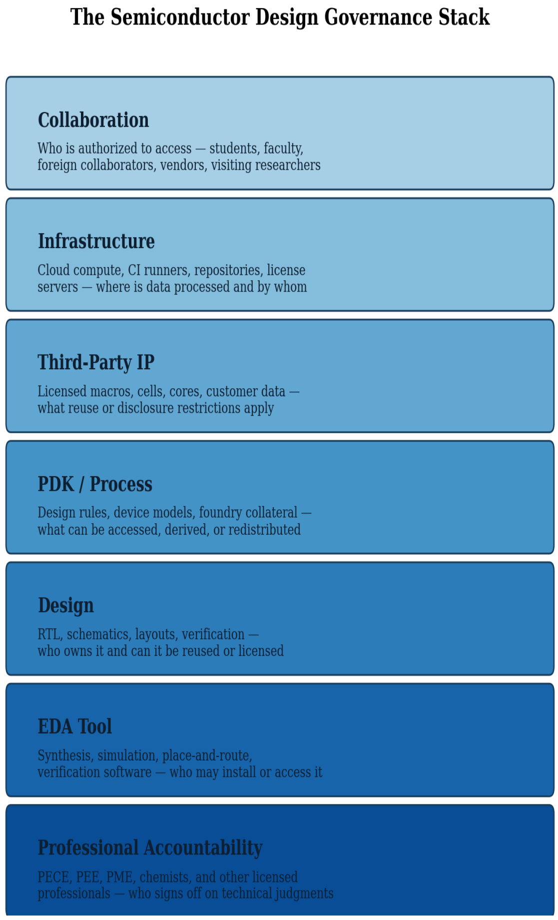
[67] Republic Act No. 10951 (Philippines, 2017), amending penalties under the Revised Penal Code, Arts. 291–292, https://lawphil.net/statutes/repacts/ra2017/ra_10951_2017.html.

components. The EDA tool layer covers synthesis, simulation, and verification software, and who may install or access it. The design layer covers RTL, schematics, and layouts as well as whether the design can be reused, licensed, or released openly. The PDK and process layer covers design rules and foundry collateral and what can be accessed or redistributed. The third-party IP layer covers licensed macros, cores, and customer data, and what disclosure restrictions apply. The infrastructure layer covers cloud compute, repositories, and license servers along withwhere data is processed and who can access it. The collaboration layer covers students, faculty, and foreign collaborators, addressing who is authorized and under what approval.

A seventh layer, professional accountability, cuts across all six and has not been examined elsewhere in this paper. The Philippines already operates a discipline-based professional licensure system under laws such as Republic Act No. 9292 for electronics engineering, Republic Act No. 7920 for electrical engineering, and Republic Act No. 8495 for mechanical engineering, each distinguishing a base licensed practitioner from a higher category with sole statutory authority to consult, sign, and seal professional documents.[68] These statutes were not written with semiconductor design in mind, but they already assign identifiable professional responsibility for the kind of technical judgment this paper's governance stack is concerned with: who is accountable when a fabrication facility's systems fail or when an engineering report is submitted for regulatory or legal use. Comparable US practice, where Professional Engineer (PE) licensure is administered by state boards and reserved chiefly for consulting, sign and seal, and other public-facing functions rather than ordinary industrial employment, reflects a similar logic: day-to-day IC design work does not usually require a PE license, but formal technical certification, forensic investigation, or expert testimony typically does.

For Philippine semiconductor policy, the implication is that professional licensure should be treated as a complementary layer alongside the six technical layers above, not a competing one. A licensed engineer or chemist can supply the accountable signature behind facility design, safety certification, or expert technical opinion in an IP dispute, while non-licensed PhD researchers continue to carry out the IC design and R&D work this paper's other recommendations are built around. This scope-based approach avoids two failure modes: requiring every semiconductor engineer to hold a professional license, which would constrain the talent pipeline in section 10, and treating licensure as irrelevant to strategic technology, which would leave the country without an identifiable chain of accountability once a dispute moves beyond internal company review. Figure 1 illustrates the full seven-layer stack.

Figure 1. The Semiconductor Design Governance Stack



Source: developed by the author from the evidence presented in sections 5 and 9.

Two practical instruments follow directly from this framework. The first is a simple three-tier information classification model. "Public" information, such as released RTL, published papers, and intentionally open teaching materials, may be released once licensing and provenance are clear. "Internal" information, such as pre-publication

[68]Republic Act No. 9292, Electronics Engineering Law of 2004, https://lawphil.net/statutes/repacts/ra2004/ra_9292_2004.html; Republic Act No. 7920, New Electrical Engineering Law (Philippines, 1995); Republic Act No. 8495, Mechanical Engineering Law of 1998 (Philippines, 1998).

student designs, draft layouts, and working repositories, is available to project teams and approved institutional users and requires approval before external release. "Restricted" information, such as PDK-derived files, NDA-covered models, partner data, and proprietary IP blocks, is limited to named users on a role- and project-based footing and is generally prohibited from release unless expressly cleared by the relevant owner or authority.

The second is a three-tier, risk-based review model, designed to avoid subjecting every student project to the same scrutiny as a foreign-funded, dual-use collaboration. Tier 1 covers routine educational work using open tools and PDKs with no restricted third-party IP, requiring only a self-certification checklist, a license file, and faculty approval before public release. Tier 2 covers institutionally controlled research, such as pre-publication university and industry-adjacent projects using commercial EDA and remote collaboration, requiring project-level access approval, activity logs, and a license provenance note. Tier 3 covers enhanced review cases, such as restricted PDKs, partner-provided data, or defense-adjacent content, requiring specialist review by legal, technology transfer, or strategic trade authorities, with a documented decision. This tiered structure directly reflects the proportionate, staged approach that Abad, Hora, Avondo, and the Taiwan comparator independently recommended: avoid over-regulating routine academic work while building a clear escalation path for the minority of projects that carry genuine sensitivity. Avondo's asset hierarchy further refines the classification scheme: foundry information and external reusable IP correspond most closely to the "restricted" tier, customer specifications and internally developed design outputs sit within "internal," and general verification and methodology material is the likeliest candidate for "public" release once cleared. This tiered structure is also designed to accommodate, rather than resolve, this paper's most significant point of stakeholder disagreement: Alarcon warned against gatekeeping policies that could restrict industry access to university-generated technology while Hora, Avondo, and individual IPOPHL officials emphasized stronger protective controls. A proportionate compliance regime should default toward openness at the routine "public" and "internal" tiers, where Alarcon's concern is strongest, while reserving stricter review for the minority of genuinely sensitive, "restricted" projects.

10. Policy Recommendations

10.1 Short-term options

a. Use the public/internal/restricted classification model described above for semiconductor design information in university- and government-funded projects, backed by a license provenance note for each repository.

b. Issue a joint IPOPHL-DTI-STMO advisory on inbound technology transfer compliance and clarify IPOPHL filing practice for layout design applications, including acceptable confidential deposit formats.

c. Establish minimum remote access controls for university EDA and PDK use, adopt a staged PDK-access model reserving customer data for institutions demonstrating governance readiness, and move workforce training toward curriculum-embedded pathways.

d. Require universities receiving government funding to maintain secured, access-limited databases for AI models and research know-how, and embed IP literacy into engineering curricula.

10.2 Medium-term options

a. Establish a shared national or regional semiconductor design infrastructure hub, possibly via a USTDA feasibility study consistent with the Luzon Economic Corridor's digital infrastructure agenda.

b. Adopt model IP clauses for university-industry agreements covering background and foreground IP, publication review, and offboarding, and form a working group on semiconductor IP linked to NCIPR and SEIAC.

c. Build regional innovation hubs around strong public universities like MSU-IIT and develop flexible IP-ownership templates for joint public-private-academe R&D so that IP ownership and publication timing are settled before a project begins rather than left to the DOST Fairness Opinion Board to resolve afterward.

10.3 Long-term options

a. Use SEIAC or a similar mechanism to coordinate semiconductor design policy across investment promotion, R&D support, IP governance, strategic trade, and higher education, building a continuous national pipeline, from design to verification to testing, where compliance readiness is an investment advantage, not a liability.

b. Explore blended public-private finance for secure shared design infrastructure and fund a dedicated PhD-scholarship pipeline for IC design faculty, such as the 500-slot doctoral program under discussion between UP CIDR and government partners, targeting roughly 100 PhD-level faculty to sustain an annual pipeline of about 1,000 MS or PhD-level IC designers.

c. Pursue a mission-oriented, five-year national IC design program loosely modeled on Taiwan's approach, selecting application verticals such as energy, agriculture, and health first, consistent with the applications-first sequencing recommended by the Taiwan comparator and UP CIDR's program leader.

Table 4 presents the full set of recommendations on a single timeline.

Table 4. Policy Recommendations Timeline

Time Horizon	Target Window	Key Actions
Short-term	0–12 months	Adopt public/internal/restricted classification model; issue IPOPHL-DTI-STMO advisory on inbound technology transfer; clarify IC layout-design filing guidance; set minimum EDA/PDK remote-access controls; secure AI/data databases; embed IP literacy in engineering curricula; begin modernizing trade secret law toward a misappropriation-based definition
Medium-term	1–3 years	Establish shared national/regional design infrastructure hub; adopt model IP clauses for university-industry agreements; form NCIPR/SEIAC working group on semiconductor IP; build regional innovation hubs; develop flexible IP-ownership templates
Long-term	3–5+ years	Use SEIAC to coordinate policy across agencies; fund a 500-slot PhD scholarship pipeline for IC design faculty; explore blended public-private finance for shared infrastructure; launch a five-year, applications-first national IC design program

Source: compiled by the author from the recommendations in section 10.1–10.3.

11. Conclusion

Investment incentives and infrastructure alone will not get the Philippines to the next level of higher-value design and R&D. The evidence gathered here from an open-source IC design researcher, engineering deans and program leaders at three universities, IPOPHL officials, an operating IC design firm and industry association president, international comparators, and five case studies spanning a trade secret prosecution, mask work litigation, a domestic filing gap, and two shared or open-access infrastructure models, leads to one conclusion: semiconductor design governance is a stack problem, and access to digital infrastructure is itself a governance event. The country has meaningful legal and institutional building blocks already in place—an IP Code that protects local licensees, a dedicated layout design statute, an active enforcement apparatus, and a government-recognized industry roadmap—but these instruments were not built with intangible, digitally mediated technology transfer in mind. As seen in Taiwan, Singapore, South Korea and Japan, no advanced semiconductor jurisdiction uses a single legal instrument to achieve this work. A layered Philippine approach combining information classification, risk-tiered review, clarified IC layout filing practice, patent route analytics, and staged compliance that ramps up as projects expand offers a proportional and achievable path to compliance-ready innovation, should it be built collaboratively with the government, industry, and academic stakeholders whose thoughts this paper has only begun to incorporate.

ABOUT THE AUTHOR

LEAN KARLO SANTOS TOLENTINO is Dean of the College of Engineering at the Manila Campus of the Technological University of the Philippines (TUP), which traces its origins to the Manila Trade School established in 1901 through Act No. 74 of the United States Philippine Commission. He is also a Professorial Lecturer at Mapua University. He can be reached at leankarlo_tolentino@tup.edu.ph.

ABOUT THE AUTHOR

RAFAELITA MERCADO ALDABA, PhD, is an economist and strategic policy advisor with research leadership at the intersection of industrial policy, global value chains, artificial intelligence, Industry 4.0 technologies, digital transformation, and national skills and qualifications systems supporting education–industry integration. She is an Emeritus Research Fellow at the Philippine Institute for Development Studies and previously served as Undersecretary at the Philippine Department of Trade and Industry, where she led the design and implementation of major innovation- and technology-driven industrial policy reforms. She is the author of influential research on the Philippines' participation in global value chains and on innovation-driven industrial policy, including the design of performance-based, transparent incentive mechanisms to support industrial upgrading, technology adoption, and high-quality investment. Her research portfolio combines rigorous economic analysis, value-chain mapping, and institutional diagnostics to examine how economies move from low-value participation toward higher-value roles in global production networks. Her work informs policy debates on economic security, supply-chain resilience, and workforce transformation for advanced manufacturing and digital transformation. Through her research and advisory roles, she supports effective governance of critical and emerging technologies by aligning industrial policy, skills systems, and institutional readiness.

ANDREA CHRISTINA CAYMO-KAUHANEN is the Managing Partner of AnterBridge, a boutique advisory and market entry firm focused on the Philippines. Andrea's fellowship builds on a distinguished career in Philippine foreign service. She served as Director at the Philippine Department of Foreign Affairs' Office of International Economic Relations, where she shaped national economic and trade policy and represented the Department on four national policy boards, including the National Innovation Council's Executive Technical Board and the Inter-Agency Investment Promotion Coordination Committee. Earlier in her career, she served as Vice Consul and Head of the Economic, Cultural, and Visa Section at the Philippine Consulate General in Honolulu, where she advised more than eighty-five businesses on market entry and regulatory compliance and facilitated eleven trade missions connecting Hawaii and Philippine government agencies and private sector partners. She also held roles as a Foreign Service Officer in the Department's Office of Strategic Planning and Policy Coordination and, prior to her diplomatic career, as an Investment Associate at Metropolitan Bank & Trust Company. The author can be contacted through email: andrea@anterbridge.com.

RHOAN P. ESCARMOSA, LCB is a licensed customs broker with an Executive Diploma in Supply Chain Management from the Ateneo Graduate School of Business. She has built a diverse career across both the public and private sectors, specializing in customs, trade facilitation, and policy development. She previously served as a Policy Advocacy Officer at the Export Development Council and as a Single Window Consultant at the Department of Finance. Currently, she is a Customs Operations Officer III at the Bureau of Customs, assigned to the Office of the Commissioner and the Port of Manila. In this role, she actively supports the BOC's digital transformation initiatives, particularly on cross-border paperless trade. She is also involved in the Authorized Economic Operator Program, National Single Window-Technical Working Group, and the Philippine Trade Facilitation Committee, managing foreign-assisted trade facilitation projects with UN ESCAP, ARISE Plus, ITC, and USAID, and representing the BOC in national and international engagements.

BERNARD ERROL M. ADVINCULA is a policy consultant in Manila working on industry-government relations across manufacturing, defense, artificial intelligence, and semiconductors. He is a non-resident fellow with the Philippines Technology Policy program at Pacific Forum, where his research covers semiconductor governance, export controls, intellectual property protection, and trusted supply chains in Southeast Asia, and an affiliate of Safe AI Philippines. He has served as policy officer at the Lead-Acid Battery Recycling Initiative, leading its regulatory engagement with Philippine environmental agencies, and as advocacy research associate at the European Chamber of Commerce of the Philippines, covering defense, intellectual property, and emerging technology. He holds a degree in diplomacy and international relations from Ateneo de Manila University.

FLORENCE PRINCIPE GAMBOA is the Managing Editor and Coordinator of FACTS Asia, a Philippine Technology Policy Fellow at the Pacific Forum, a Fellow at Verve Research, and a Lecturer at the Far Eastern University Department of International Studies. Her work focuses on the intersection of security and emerging technologies, with research interests spanning great power competition, Philippine foreign policy, maritime security, cybersecurity, and Philippines-China relations.

GERALD GRACIUS Y. PASCUA is an economics lecturer and researcher at the Ateneo de Manila University Department of Economics. He has over a decade of experience in economic research, project monitoring and implementation, and policy evaluation and analysis. He has undertaken consultancy work for various institutions, including the Philippine Department of Trade and Industry, Asian Development Bank, Asian Productivity Organization, Economic Research Institute for ASEAN and East Asia, and the ASEAN Secretariat. His research interests in international trade include the empirical analysis of trade agreements, emerging issues in trade policy, particularly issues related to the digital economy, and regional economic integration in Developing Asia. He holds a Master of Arts in Economics from the University of the Philippines School of Economics.

DR. FRANCIS MARK QUIMBA is an economist and development policy expert whose career spans over two decades of impactful research and public policy contributions. A Senior Fellow at the Philippine Institute for Development Studies (PIDS), Dr. Quimba specializes in international trade, regional integration, innovation, and industrial development policies. His work has significantly informed the policy landscape in the Philippines and the broader ASEAN region, addressing pressing economic and developmental challenges. Dr. Quimba holds a Ph.D. and an M.A. in Development Economics from the National Graduate Institute for Policy Studies in Tokyo, Japan. He also earned a Master's degree in International Development from the International University of Japan. Throughout his tenure at PIDS, Dr. Quimba has undertaken research projects that resonate globally. His recent work includes an in-depth analysis of the Indo-Pacific Economic Framework, examining the Philippines' perspectives and strategies for engagement. He has also led studies on free trade agreement utilization among Philippine micro, small, and medium enterprises (MSMEs), ASEAN-India trade relations, and the interplay between innovation, sustainability, and digital transformation in Southeast Asia. An accomplished author, Dr. Quimba has contributed to numerous peer-reviewed journals, discussion papers, and policy briefs. His research covers diverse topics, including the digital economy, innovation in manufacturing firms, the impact of foreign linkages on industry development, and the implications of trade policies on economic performance. Among his notable works are studies on green and digital transitions, which emphasize sustainable development as a cornerstone of future policy directions.

LEAN KARLO SANTOS TOLENTINO is Dean of the College of Engineering at the Manila Campus of the Technological University of the Philippines (TUP), which traces its origins to the Manila Trade School established in 1901 through Act No. 74 of the United States Philippine Commission. He is also a Professorial Lecturer at Mapua University. He can be reached at leankarlo_tolentino@tup.edu.ph.