CSIS BRIEFS

Latin America's Role in De-Risking Semiconductor Supply Chains

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THE ISSUE

While the semiconductor supply chain currently spans several continents, China has made efforts to develop a self-sufficient semiconductor manufacturing ecosystem through industrial policies such as "Made in China 2025," which presents a direct strategic and economic challenge to the United States. De-risking the semiconductor supply chain, particularly that of "legacy chips," is of paramount importance, particularly at a time in which the Trump administration considers imposing additional sectoral tariffs on semiconductors. Latin America sits at the juncture of possibility and opportunity at a critical time for the expansion of semiconductor manufacturing, providing some of the key elements and capabilities that allow for semiconductor assembly, testing, and packaging as well as final integration into electronics. For companies relying on semiconductor manufacturing, diversifying production sources is key to reducing the risks associated with supply chain disruptions and great power competition.

INTRODUCTION

Latin America is rapidly emerging as a manufacturing and consumption center for electronics and information and communications technology (ICT), including the semiconductors that power them. As the sector requires coordination within a web of complex, segmented, international supply chains, one country alone is unlikely to possess all the elements needed for a full semiconductor ecosystem. Amid heightened geopolitical tensions in East Asia, de-risking this network of inputs and suppliers, particularly those surrounding the "legacy chips" still crucial to many technologies and machines, by creating redundancy in the Western Hemisphere is of paramount importance. In turn, Latin America is making a push to attract specific segments of the semiconductor supply chain, particularly in chip assembly, testing, and packaging (ATP), simultaneously providing the minerals necessary for semiconductor manufacturing. Leaving aside Mexico, which already has a fairly robust semiconductor industry, this brief focuses on five key countries—Costa Rica, Panama, the Dominican Republic, Guatemala, and Paraguay—and highlights the strategic advantages and the challenges they face in the development of subsections of the semiconductor supply chain.

THE SEMICONDUCTOR SUPPLY CHAIN: AN OVERVIEW

In recent decades, Taiwan, South Korea, and Japan have consolidated their leads in semiconductor manufacturing and ATP, as each already has leading domestic industries that produce advanced semiconductors, one of the most complex industrial processes in the world. All three countries need highly specialized minerals to etch and refine the

final chip, cutting-edge machines for fabrication, energy to operate the fabrication facilities (fabs), and some of the most technologically advanced workforces ever established. As of 2023, Taiwan produced over **92 percent** of the world's most advanced semiconductors, with South Korea a **distant** second and Japan an even more distant third.

While researchers have devoted time to studying global supply chains for advanced semiconductors, supply chains for mature-node semiconductors, better known as legacy chips, have received less attention. Legacy semiconductors are essential to day-to-day technology, including automobiles, home appliances, and medical equipment. They are typically larger than advanced semiconductors, as they are built on **28nm or larger** process nodes. The 2020–2023 **semiconductor shortage** revealed the central nature of legacy chips when their scarcity caused massive revenue loss across a range of U.S. industries. A U.S. Department of Commerce survey found that during this period, firms **faced their most acute shortages** in legacy chips—defined as having a 40 nm node or larger—and not in advanced semiconductors. The concentration of cutting-edge chip production will likely remain in East Asia, with China making a significant play to concentrate the world's majority of legacy-chip production within its borders. In the face of this reality, countries including the United States are looking to reduce supply chain vulnerabilities through diversification and redundancy. This is where regions such as Latin America and the Caribbean hold the potential to play a central role.

The supply chain for legacy chips consists of five key segments: (1) extraction of raw materials, (2) design of semiconductors, (3) fabrication, (4) ATP, and (5) final integration and distribution. Currently, the United States leads in design; Asian countries like Taiwan, South Korea, and Japan dominate in ATP and fabrication (the three comprise around **80 percent of the global fabrication capacity**); and China heads the world in final integration of mature-node semiconductors into electronics (with China producing **36 percent** of the world's electronics). A combination of factors such as labor force education, energy availability, and an economic environment that incentivizes movement up the supply chain enables each country to lead specific segments.

While the semiconductor supply chain currently spans several continents, China has made efforts to develop a self-sufficient semiconductor manufacturing ecosystem through industrial policies such as "Made in China 2025," which presents a direct strategic and economic challenge to the United States. In its "Guidelines to Promote National Integrated Circuit Industry Development," the People's Republic of China (PRC) **declared their goal** of establishing "a world-leading semiconductor industry in all areas of the integrated circuit supply chain by 2030." Currently, nearly **95 percent** of installed Chinese capacity is for the creation of mature-node semiconductors (i.e., greater than 28 nm), and as of 2020, the country had **16 percent** of the global fabless semiconductor market (ranking third after the United States and Taiwan). It is expected, however, that as labor costs rise in China, final integration and distribution **may be outsourced** to places like Southeast Asia and India.

As the Trump administration considers imposing additional sectoral tariffs under 232 designations, including those on semiconductors, experts warn of unintended consequences. Semiconductor expert Christopher Miller, for example, **argues** that tariffs could cause semiconductor companies to move the supply chains for chip manufacturing entirely to countries outside the United States in order to decrease manufacturing costs, as opposed to re-shoring them (the stated goal of the administration's proposed tariffs). This is primarily due to the United States no longer having the appropriate infrastructure necessary to process and manufacture semiconductors; moving these capabilities to the United States is not only costly, but also time consuming. Instead of pushing for tariffs, argues Miller, it is more important to work with semiconductor companies operating in China to "eliminate non-trade barriers and continue building diversified supply chains," which can be done in Latin America.

Latin America sits at the juncture of possibility and opportunity at a critical time for the expansion of semiconductor manufacturing, particularly if the United States moves forward with placing targeted tariffs on Chinese chips or products that contain Chinese chips. Just as Taiwan's Semiconductor Manufacturing Company (TSMC) **became** the world's first contract manufacturer (meaning it is entirely dedicated to chip manufacturing and not design) in the 1980s, countries in Latin America could potentially become the new location for outsourcing ATP capabilities or for final integration and distribution of mature-node semiconductors. Companies like TSMC, Samsung, and GlobalFoundries have leverage over supply chains given their size, and they could be the key to unlocking the necessary investment in Latin America. If such companies do not enter the market in Latin America, it is highly likely Chinese companies will do so in order to avoid tariffs. For companies relying on semi-

conductor manufacturing, diversifying production sources is key to reducing the risks associated with supply chain disruptions and great power competition.

REGIONAL CONTEXT: LATIN AMERICA'S GROWING ICT ECOSYSTEM

Latin America's total ICT exports—which include computers and peripheral hardware, communication equipment, consumer electronics, electronic components, and other related goods—reached $81 billion in 2022. The region's young population and its demand for electronics like smartphones, laptops, tablets, and smart TVs drive high demand for semiconductors—for example, the total market demand for semiconductors in Argentina, Brazil, and Mexico combined reached over $8 billion in 2021. Smartphone use in Latin America rose 40 percent between 2018 and 2022, and the internet penetration rate exceeded that of India and China.

Latin America not only benefits from a high demand of mature-node semiconductors, but until recently, it also boasted a series of U.S.-led incentives that made the region an attractive place to invest. Understanding the economic and national security threat that PRC-made chips represent, the Biden administration signed into law the Creating Helpful Incentives to Produce Semiconductors for America Act, better known as the CHIPS and Science Act, with the goals of diminishing the national security risks of dependency on China and, relatedly, improving supply chain resilience. While the legislation sought to move semiconductor production domestically to the United States, it also sought to nearshore some parts of the supply chain. In 2024, the State Department, in collaboration with the Inter-American Development Bank (IDB), announced the Western Hemisphere Semiconductor Initiative, also known as the ITSI fund, to boost semiconductor production in the Americas beginning with Mexico, Panama, and Costa Rica, followed by the Dominican Republic. The future of the ITSI fund is now uncertain given recent government spending cuts under the Trump administration.

Given the unpredictable future of U.S. funding, the ITSI fund, among other projects Latin America, could be greatly affected, if not halted altogether. With a blueprint to catalyze assembling, testing, and packaging semiconductors, it is now dependent upon countries in Latin America to create strategies that capture the moment. Domestic investment will be necessary for these countries to reach their true potential, especially at a time when Southeast Asian countries are vying for similar markets and China is making strides toward market saturation.

COUNTRY CASE STUDIES

COSTA RICA

Sometimes known as the "Silicon Jungle," Costa Rica has established itself as a tech hub in Latin America, offering a strategic advantage in semiconductor manufacturing. It

Comparative Analysis of Select Latin American and Caribbean Countries' Capabilities

Semiconductor Capabilities	Guatemala	Costa Rica	The Dominican Republic	Panama	Paraguay
National Semiconductor Strategy	(under development)	✓	✓	(under development)	
Targeted Economic Incentives		✓	✓	✓	
Human Capital		✓			
Intellectual Property Protections		✓	✓	✓	
Reliable Energy Supply		✓			✓
Established ATP Facilities		✓			
Integration into Electronics			✓		
Distribution & Logistics			✓	✓	✓

Source: authors' analysis.

is home to over a dozen semiconductor-related companies operating within free trade zones (FTZs), which offer competitive tax and business incentives. With a strategic location close to the United States, political stability, a **highly skilled** workforce, strong supplier networks, and a commitment to renewable energy, Costa Rica offers an ideal environment for semiconductor investment. Furthermore, like other Central American nations, Costa Rica benefits tremendously from the Dominican Republic-Central America Free Trade Agreement (CAFTA-DR), which is critical in facilitating trade to and from the United States due to its reduction in tariffs on a wide range of goods.

In March 2024, Costa Rica issued a new **National Semiconductor Roadmap**, a strategic plan to advance semiconductor partnerships globally by streamlining procedures, such as chemical registration processes, and by strengthening its institutional framework for intellectual property (IP) protection. Costa Rica made the necessary reforms to be removed from the 2020 **Office of the U.S. Trade Representative's (USTR) 301 Report**, a move was described by **observers** as the result of the country's policy reforms that sought to improve its legal framework around IP protection and increase institutional capacity to enhance the registration and enforcement of intellectual rights.

Costa Rica has also invested heavily in workforce development, recognizing the importance of human capital to integrating the country into the global semiconductor supply chain. As of 2024, the country had over 11,000 professional and technical **graduates** each year with skills relevant to the industry, a considerable figure for a country of 5 million inhabitants. As part of these efforts, Costa Rica has harnessed investment from semiconductor companies to build several Centers of Excellence (COEs) in the country. According to a **statement from the U.S. Embassy in Costa Rica** in 2023 at the inaugural Americas Partnership for Economic Prosperity leaders' summit, these COEs seek to educate individuals across the Americas "to work in the digital technology sectors of the future—including on semiconductors, cybersecurity, 5G, and artificial intelligence—and work with industry and academia to create a pipeline of talent and employment opportunities in these sectors." The Universidad Latina in San Jose, for example, houses a **COE** offering programs designed in collaboration with ten multinational companies to ensure students acquire practical skills and relevant knowledge in experimental design and advanced programming, ultimately receiving a semiconductor ATP certification. Costa Rican and U.S. companies have committed over **$47 million** in equipment, software, curriculum development, and training programs in support of COEs.

As far back as November 1996, Intel established ATP operations in the country, **opening** the largest microchip factory in Central America. By 1999, the company had **invested** $390 million in operations and employed over 2,200 workers. In 2014, Intel pulled out of Costa Rica and **transitioned its operations** to Malaysia, Vietnam, and China, but in 2022, it inaugurated an **ATP plant** in San Antonio de Belén, Costa Rica. In September 2023, the chip manufacturer **announced** its intention to invest $1.2 billion in its Costa Rican operations over the next two years, giving the Central American country a significant advantage over regional competitors. With the ITSI fund now in limbo, however, Costa Rica must continue to work to attract further investment beyond Intel.

In terms of logistical benefits, Costa Rica's port city of Limon is located less than 1,500 nautical miles from Houston. Major **shipping and logistics** companies, such as Maersk, CMA CGM, and Hapag-Lloyd, navigate the waters between the two countries. However, the state of Costa Rican infrastructure has been noted as a **challenge** by the U.S. Department of Commerce as recently as 2024—an obstacle also faced by other Latin American countries. Continuous investment in infrastructure is crucial to supporting industry growth. A notable logistical attraction is that Costa Rica gets 98 percent of its electricity from renewable sources, though **energy costs are "considerably higher"** than comparable rates in the United States.

Following U.S. Secretary of State Marco Rubio's visit to Costa Rica in February 2025, the U.S. Embassy in San José **stressed** that relocating essential supply chain elements to the Western Hemisphere could spur economic growth in Costa Rica and neighboring countries while safeguarding U.S. interests.

PANAMA

While Panama does not yet host significant semiconductor production, during the Biden administration it was selected to be part of U.S.-driven efforts to diversify semiconductor supply chains alongside Costa Rica and Mexico through the ITSI fund. Panama's major strength comes from its world-class logistics infrastructure which would enable it to serve as a critical node in both the transportation of distribution of semiconductors and electronic goods to the rest of Latin America.

Panama's geostrategic location and its ownership of the Panama Canal endow it with logistical prowess for the centralization of semiconductor raw materials and for the distribution of finalized electronics. This is particularly true due to Panama's recent ascension as an associate state of the Southern Common Market (MERCOSUR). Becoming part of MERCOSUR facilitates the free movement of goods and services between member countries in South America. Sending raw materials to Panama would greatly accelerate production and would allow the country to become a semiconductor manufacturer, beyond just ATP. MERCOSUR members also have free trade agreements with Chile, Colombia, and the EU. In the opposite direction, it is estimated that about **14 percent** of seaborne trade into and out of the United States flows through the Panama Canal. With its unrivaled logistics, Panama could become a critical distribution node for components, printed circuit boards, and final semiconductor products in the Americas.

In addition, Panama has 16 FTZs—and 6 more under development—among them the Colón Free Zone, the **largest FTZ** in the Western Hemisphere and the second largest one in the world. This FTZ is strategically connected to the canal and to key infrastructure such as major highways and a network of international ports servicing not only North, Central, and South America but also Europe and Asia. Another economic advantage of doing business in Panama is its **Special Regime for Multinational Enterprises** (SEM)—a series of incentives that seek to attract multinationals to establish their regional or global operations' centers in Panama. The SEM, established in 2007, provides robust tax incentives and long-term political stability to those operating in the country.

Panama has recently taken steps to seriously develop its semiconductor industry. In April of 2024, then-President Laurentino Cortizo signed an executive order to **create** the Commission for Innovation in Microelectronics and Semiconductors (CIMS) which was tasked with designing Panama's first **National Microelectronics and Semiconductors Strategy**. Though the strategy is currently in draft form, and its release is date unknown, it is expected to include a "modern and flexible regulatory framework that offers legal certainty, [and] adequate incentives" for the semiconductor industry. Panama is also a member of the Information Technology Agreement (ITA) from the World Trade Organization (WTO), through which 82 nations have worked together to eliminate tariffs on trade in a large number of ICT products since 1996. The agreement was further expanded in 2015 (ITA-2).

With proper investment in human capital and a robust industrial and tax policy, Panama could explore ATP operations that rely more on labor, though the country's greatest strength lies in its ability to be a regional hub for final integration and distribution.

THE DOMINICAN REPUBLIC

The Dominican Republic is a leading candidate to capture nearshore investments in **advanced manufacturing activity**, particularly for electronics such as printed circuit boards (PCBs) and the ATP of semiconductors. Among the factors that make the Dominican Republic an attractive investment destination are its FTZs, low labor costs, strong logistics, and existing PCB and electronics manufacturing bases.

The Dominican Republic is Latin America's seventh-largest economy, and since 2010, it has been the **fastest-growing economy** in the region. It has 87 FTZs, situated across 28 of the country's 32 provinces, which support 820 companies. These FTZs exempt exporters from income taxes, making them a very attractive destination for electronics and medical device manufacturing. In addition to the domestic incentives, the Dominican Republic is a member of the CAFTA-DR, which **liberalizes** the Dominican Republic's trade in goods and services with the United States. In fact, as of 2024, **98.8 percent** of the Dominican Republic's electronics exports from FTZs went to the United States. Moreover, the Latin American country's strategic position in the Caribbean and close to the Unites States, along with its **third-best maritime connectivity** in the region, facilitates this trade. The Dominican Republic is also a member of the **WTO's ITA**, though it has not yet ratified the agreement.

The country also enjoys the strongest internet connectivity in the Caribbean and is home to one of the most significant network access points in Latin America. Like Costa Rica, the Dominican Republic also recently launched its **National Strategy for the Promotion of the Semiconductor Industry** in August 2025. The strategy lays out five pillars and a series of policy initiatives for "fostering an enabling [semiconductor] ecosystem," including reforms in industrial development, workforce and human capital, and public-private sector collaboration, among other things. This latest effort follows the National Innovation Policy 2030 (published in 2022), aimed to establish a general framework for the promotion and coordination of innovation, creativity, and scientific and technological research.

In terms of labor costs, the Dominican Republic is a competitive alternative to places like Mexico. According to a **2018 report** by the Organisation for Economic Co-operation and Development (OECD), the Dominican Republic's manufacturing labor cost is $2.50 per hour, which is 6 percent of the rate in the United States and half the rates of Mexico and China. Attracted by the economic benefits of investing in the Dominican Republic, 25 leading **electronics companies** are already active in the country, including Eaton, Rockwell Automation, Jabil, Fenix Manufacturing Solutions, and Cutler Hammer Industries. Some of these companies, such as **Fenix Manufacturing Solutions**, specialize in producing high-quality PCBs that serve as the backbone of electronic devices in a wide range of applications across industries, including telecommunications, automotive, aerospace, and consumer electronics. This existing PCB base would facilitate the Dominican Republic transitioning to more advanced printed circuit boards and potentially mature-node semiconductors' ATP.

On labor force readiness, however, the Dominican Republic is still behind competitors like Costa Rica. The World Bank **notes** that the "labor markets in the country are characterized by unresponsive unemployment rates, high levels of informality, and low wages," which may limit the efficacy of some of the initiatives undertaken by the country to fortify its labor force. However, the country is working to address these shortcomings. The **National Institute of Professional Technical Training** (INFOTEP), for example, already provides the mechanisms needed to train a larger workforce to support advanced electronics manufacturing. Created in 1980 by the national government, INFOTEP works hand-in-hand with companies to understand the specific skillsets that businesses need and then builds technical training programs accordingly. Currently, there are very few institutions specializing in technological education, such as software development, information networks, mechatronics, and automated manufacturing—such as the Technological Institute of the Americas (ITLA), also **founded** by the government of the Dominican Republic. The ITLA has several partnerships with other **universities**, including in the United States, and with the **private sector** that allow it to connect talent with companies for more successful implementation of the training it provides.

In addition to **university partnerships** and the national centers of INFOTEP and the ITLA, the Dominican Republic heavily invests in its domestic research ecosystem. In early 2025, for example, the Dominican Republic's Ministry of Higher Education, Science, and Technology (MESCyT) **invested around $7.73 million** (457.2 million DOP) in over 70 research projects, including in the areas of semiconductors, AI, automation, and robotics, among others. The Dominican Republic also contributes to the National Fund for Innovation and Scientific and Technological Development (FONDOCYT), which supports research related to microelectronics and **semiconductor innovation**.

GUATEMALA

The prospects for manufacturing semiconductors in Guatemala hinge on the success of a dual strategy involving securing international funding and forging vital and strategic international partnerships. Taiwan is a particularly relevant partner, given that Guatemala is the largest country that maintains diplomatic relations with the island instead of with China. Guatemala's central location in the Americas, with its proximity to both North American and South America, makes it an attractive option for companies seeking to establish manufacturing and distribution hubs.

Like Panama and the Dominican Republic, Guatemala is also a member of CAFTA-DR. The country's growing integration into regional and global markets, as well as its remarkably young workforce, **position it well** for foreign direct investment in high-tech industries. However, unlike Panama and the Dominican Republic, Guatemala has not ratified the WTO's information technology agreement (ITA) and thus tariffs on trade in a large number of ICT products still apply.

Given the country's underdeveloped roads and ports and myriad operational inefficiencies, Guatemala's lack of infrastructure poses significant challenges for businesses and investors. According to a **report** by the International Monetary Fund, "inadequate infrastructure has been identified as one of the most important obstacles for doing business in Guatemala." Guatemala's main port of Puerto Quetzal manages more than **45 percent** of the country's exports and 30 percent of its imports, and typically experiences delays of **up to 30 days**. Guatemala has, however, recently signed an **agreement** with the U.S. Army Corps of Engineers to expand the port, aiming to speed up transport through it. Finally, as of 2023, Guatemala **invested only 0.8 percent** of its GDP in infrastructure, compared to Panama's 1.9, Costa Rica's 1.6, and Paraguay's 2.5.

The largest gap in Guatemala's potential is its lack of an educated labor force. While Guatemala has the largest popula-

tion **proportion of youth** in Latin America, there is no significant investment in **education** and technical training to meet the complex requirements of semiconductor production. In fact, the 2019 World Economic Forum report **ranked** Guatemala as 98 out of 141 countries overall on its Human Capital Index, 125 for "digital skills among active population," and 73 in skillset of graduates and "ease of finding skilled employees."

Lastly, and significantly for cutting-edge research and development, Guatemala has not made significant efforts to reduce IP violations in the country. Unlike Costa Rica, as of 2024, Guatemala remained on the watchlist of the USTR's **301 Report**. Given the sensitive nature of IP on semiconductor design among other areas, it is imperative that Guatemala makes a concerted effort to improve its mechanisms to adequately and effectively protect the intellectual property rights of companies operating in the country.

Despite these challenges, Guatemala possesses several key incentives for companies wishing to establish themselves in Latin America. First, Guatemala's energy sector presents great opportunities for semiconductor companies looking to reduce their carbon footprint. In 2022, renewables comprised **76.4 percent** of the country's electricity, with that percentage expected to grow. However, approving new projects has been difficult due to local opposition by indigenous groups. As a result of an investigation into a 2018 complaint by indigenous groups, the IDB **withdrew its financing** for several renewable energy projects in 2022, and in early 2025, Guatemala was ordered by a court to pay $64.5 million to a private energy company for damages to a dam done by local community leaders. Currently, Guatemala's electricity is **more expensive** than Costa Rica's or Panama's.

Perhaps the greatest potential for Guatemala to develop a semiconductor industry rests with its diplomatic ally, Taiwan. In June 2025, Guatemalan President Bernardo Arévalo and Taiwan's President Lai Ching-te signed a letter of intent to **collaborate** in the development of Guatemala's semiconductor industry. The year prior, Taiwan had **signaled** its openness to conducting a study on Guatemala's infrastructure and human capital to see if the country could support semiconductor packaging and eventually expand into testing and assembly. If this partnership leads to investment by Taiwan's semiconductor companies, it could cement Guatemala's place in the global semiconductor supply chain. Beginning with human capital development, Taiwan could advise Guatemala on the creation of a national strategy to develop its human capital over the next decade, focusing in particular on the skills needed for the semiconductor sector, and potentially including a strengthened educational exchange program for engineers who are well positioned to develop research centers in Guatemala.

PARAGUAY

Although Paraguay currently plays no active role in the global semiconductor supply chain, its unique combination of renewable energy abundance, low operating costs, and investment-friendly policies could position it as a strategic site for semiconductor ATP, especially for mature semiconductors. To realize its potential, Paraguay would require science, technology, engineering, and mathematics (STEM) education investment, vocational training programs aligned with electronics manufacturing, partnerships with foreign firms, and infrastructure upgrades, particularly in energy transmission and logistics.

Paraguay is centrally located within South America—bordered by its MERCOSUR partners Argentina, Bolivia, Brazil, and Uruguay—making it a potential strategic player in regional supply chains, particularly in the centralization of raw materials. The country's proximity to Brazil is especially significant given the latter's increasing investments in microelectronics and desire to build its **domestic semiconductor capabilities**. While Paraguay only has two FTZs, it has a flat, relatively modest, **10 percent tax** on corporate income and is internationally recognized for its transparency and investor friendliness by the **OECD**. In addition, inflation has remained relatively stable, hovering around 4 percent, and Moody's 2024 **upgrade** of Paraguay's credit rating from Ba1 (non-investment grade) to Baa3 (investment grade) signals confidence in the country's macroeconomic trajectory.

The country's most compelling asset is its clean energy surplus, enabled primarily by the Itaipú Dam. Operated jointly with Brazil, Itaipú is one of the largest hydroelectric plants in the world. As a result, Paraguay's grid is powered with **99.6 percent** renewable hydroelectricity. A clean and reliable source of electricity provides a unique advantage for energy-intensive industries like semiconductor packaging and testing, especially in an era where **carbon footprint** is often a key metric in procurement decisions. However, Paraguay's lack of high-voltage transmission infrastructure limits its ability to maximize this resource across industrial zones.

Like Guatemala, Paraguay is attempting to lean into its relationship with its diplomatic ally, Taiwan, to develop a semiconductor industry. For instance, Paraguay's strategic ini-

tiatives in specialized education for semiconductor ATP have primarily been spearheaded by Taiwan. Founded in 2018, the Universidad Politecnica Taiwán-Paraguay (UPTP) has **become** one of the top universities specialized in engineering in the country. Instruction is done in collaboration with the National Taiwan University of Science and Technology, bringing technical education in English to the South American country. Given that other countries, including the Dominican Republic and Costa Rica, are investing heavily in workforce development, Paraguay should prioritize private-public partnerships that grant scholarships for students seeking the skills necessary for the semiconductor industry. Taiwan has also provided the financing for the **Taiwan-Paraguay Intelligent Technology Park** in Alto Paraná, designed to enhance industrial, logistics, and industry support activities, with a special focus on smart technology.

In October 2024, Paraguay's minister of information and communication technologies and the country's minister of industry and commerce met with representatives of the Industrial Technology Research Institute of Taiwan to **discuss** the opportunities that Paraguay offers for the installation of semiconductor factories. The Taiwanese experts recognized that Paraguay's abundance of clean energy, the country's strategic location, and the potential for diversification beyond semiconductors into other industries such as the production of solar panels and establishing data centers, made it an attractive investment option. Taiwan's ambassador said they would study Paraguay's potential for investments and international cooperation. This meeting followed on the heels of a **previous visit** by Paraguay's minister of information and communication technologies to Taiwan in March 2024, seeking cooperation from Taipei on semiconductors.

In the medium term, Paraguay could position itself as a site for raw material processing or basic chip assembly and testing, targeting mature-node semiconductors that do not require advanced chemical processing. Given its clean-energy credentials, Paraguay could differentiate itself in environmental, social, and governance (ESG)–conscious markets and attract firms under pressure to decarbonize their supply chains. In September 2025, Paraguay will hold the first **Latin American Forum for Semiconductors**, which will have Taiwanese companies visit the country to further evaluate how Paraguay can enter the semiconductor supply chain.

RECOMMENDATIONS FOR A REGIONAL POLICY AGENDA

Prior to 2025, the United States' priority of restructuring the semiconductor supply chain opened a window of opportunity to Latin American countries. Global tariffs and the unstable future of foreign aid, however, present significant challenges to countries with the potential to develop their ATP capabilities. For this reason, the countries mentioned in this study, along with other significant players such as Mexico, should create a multinational "Legacy Chip Coalition" that would seek to coordinate infrastructure pipelines, skills exchanges, and investor promotion, thus bolstering nearshoring resilience. Furthermore, with the exception of Costa Rica, the rest of the countries mentioned in this brief should create a national strategy to attract investment in semiconductors tailored to industry needs. This strategy should include significant investment in infrastructure, such as customs digitalization, multimodal transport (e.g., rail, roads, and inland ports) for semiconductor inbound/outbound flows, as well greener and more reliable energy.

Countries with established diplomatic relations with Taiwan could also greatly benefit from increased collaboration with Taipei on human capital and technological developments. Should the ITSI funding be disbursed in the coming years, the U.S. government and Taiwan could both work on linking country capacities to private sector giants like TSMC and GlobalFoundries. Creating a supply-demand pipeline between allied companies and Latin American countries will ensure fairer competition with Chinese foundries that are sure to seek exemptions to tariff restrictions in the coming years. Below are specific recommendations for each country studied in this policy brief.

Costa Rica:

- **Continue to upskill technical talent.** Expand COEs in partnership with universities with existing semiconductor programs such as Arizona State University (ASU) and the University of Texas at Austin to develop semiconductor and ATP curricula and increase public funding for vocational training.
- **Enhance incentive structure.** Complement FTZ tax breaks with matching subsidies to support construction of ATP facilities, aligning with Intel-style investment conditions.

- **Upgrade logistics infrastructure.** Accelerate investment under the National Connectivity Plan in rail, roads, and ports to reduce bottlenecks and support sector scalability and reduce electricity costs for semiconductors companies in the country.

Panama:

- **Scale human capital programs.** Expand National Secretariat of Science, Technology and Innovation (SENACYT)–**ASU**–**Purdue University** partnerships to develop the Panamanian semiconductor workforce.
- **Join ITA-2.** Ratify the **WTO's ITA-2** to eliminate tariffs on ICT products enhancing the country's attractiveness to investment.

Dominican Republic:

- **Formalize and scale structured training.** Strengthen INFOTEP/ITLA to reduce informality in electronics workforce and align curricula with ATP/PCB manufacturing needs. Institutional partnerships should have a stronger nexus with the private sector, particularly with semiconductor foundries, in order to align training with ATP-specific skill sets. The goal of additional and more tailored training is for the Dominican workforce to transition from PCB- to ATP-specific skills.
- **Remediate logistical resilience.** Invest in coastal flood defenses and upgrade port systems to shield semiconductor assets from hurricanes and sea-level impacts.
- **Clean energy expansion.** Prioritize renewable energy sources via incentives and public-private programs to support sustainable manufacturing energy demands.
- **Provide FTZ incentives for ATP.** Introduce semiconductor specific tax parity to make ATP and PCB operations more competitive relative to upstream assembly.

Guatemala:

- **Scale infrastructure using public-private partnerships.** Leverage multilateral financing (World Bank/IDB) to modernize roads and ports, starting with Puerto Quetzal and Santo Tomás, to prepare for semiconductor export.
- **Streamline energy and environmental approvals.** Adopt more robust stakeholder-consultative frameworks to greenlight hydropower and grid assets that are in alignment with the goals of local communities without delay.
- **Launch STEM and vocational scholarships.** Partner with foreign universities and Taiwanese firms to fund technical training in ATP, perhaps via bond-financed education facilities.
- **Improve the legal framework for IP protection for integrated circuits and mature-node semiconductor design.**

Paraguay:

- **Build green APT pilot zones.** Establish an industrial park near Itaipú with grid upgrades and green energy certifications to pilot small-scale ATP facilities for legacy chips.
- **Invest in STEM and vocational education.** Collaborate with Taiwan and Taiwanese private sector companies to create semiconductor ATP training programs using scholarships or technical partnerships.
- **Improve transportation corridors.** Coordinate with other South American countries to connect logistical corridors between the Atlantic and Pacific ports, reducing export costs.
- **Structure regional integration strategies.** Align sectoral strategies with other subregional actors such as Brazil's to share ecosystem development and access to buyers.
- **Improve the legal framework for IP protection for integrated circuits and mature-node semiconductor design.** ■

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