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IN WASHINGTON, D.C.

# From legislation to implementation

Building a new  
industrial policy in  
the United States

Raquel Artecona  
Helvia Velloso  
Hoa Vo

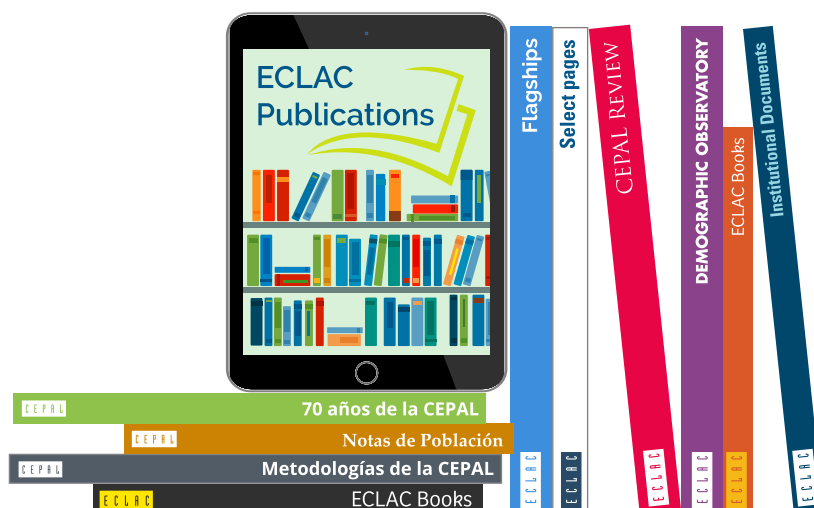


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in the United States**

Raquel Artecona  
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Hoa Vo



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**ECLAC**

This document was prepared by Raquel Artecona and Helvia Velloso, Economic Affairs Officers, and Hoa Vo, Intern, of the Economic Commission for Latin America and the Caribbean (ECLAC) office in Washington, D.C. The authors are grateful to Andrés Valenciano, Acting Chief of the office, for his valuable comments.

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## List of acronyms

ACA	Affordable Care Act
AMPIP	Asociación Mexicana de Parques Industriales Privados (Mexican Association of Private Industrial Parks)
CAMT	Corporate Alternative Minimum Tax
CBO	Congressional Budget Office
CCIA	Clean Communities Investment Accelerator
CCS	Carbon Capture and Sequestration
CEPR	Centre for Economic Policy Research
CHIPS	Creating Helpful Incentives to Produce Semiconductors for America
CMS	Centers for Medicare & Medicaid Services
DAC	Direct Air Capture
DOC	Department of Commerce
DOE	Department of Energy
ECLAC	Economic Commission for Latin America and the Caribbean
EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
EU	European Union
EV	Electric Vehicles
FRA	Fiscal Responsibility Act of 2023
FT	Financial Times
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GGRF	Greenhouse Gas Reduction Fund
IIJA	Infrastructure Investment and Jobs Act
IRA	Inflation Reduction Act
IRS	Internal Revenue Service
ITC	Investment Tax Credits

JCT	Joint Committee on Taxation
kWh	Kilowatt-hour
LAC	Latin America and the Caribbean
MPDG	Multimodal Project Discretionary Grant Program
MSP	Minerals Security Partnership
MSRP	Manufacturers Suggested Retail Price
NCIF	National Clean Investment Fund
NIST	National Institute of Standards and Technology
NPRM	Notice of Proposed Rulemaking
PABs	Private Activity Bonds
PGII	Partnership for Global Infrastructure and Investment
PMO	Project Management Office
PTC	Production Tax Credits
R & D	Research and Development
RMO	Results Management Office
USMCA	United States-Mexico-Canada Agreement
USTR	Office of the United States Trade Representative
WDR	Western Drought Resilience

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## Abstract

This document examines the implementation strategies and execution challenges of three major pieces of legislation that were signed into law in the United States in late 2021 and in 2022. Together they provide more than US\$ 2 trillion in authorized funding and incentives for up to ten years to rebuild the country's infrastructure, accelerate the transition to a green economy, and strengthen the domestic semiconductor industry while promoting job growth, workforce development, and equity. The scale of these laws, given the level of funding required, their complexity, given the multiplicity of goals and the many participants involved, their accountability, and the risk of inequitable implementation, with some local governments and communities not fully positioned to take advantage of the laws' incentives, present significant challenges to their implementation. An additional challenge lies in creating the institutionality required to ensure that the changes are long-term and not subject to the cyclicity of government changes. Although mostly directed to activities within the United States, the laws' execution is expected to influence the policies of countries around the world, including in Latin America and the Caribbean. From a worldwide perspective, these laws may create opportunities but can also leave some smaller players behind.



## Introduction

In late 2021 and in 2022, three major pieces of legislation were signed into law in the United States. The Infrastructure Investment and Jobs Act (IIJA) was signed into law on 15 November 2021, the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act on 9 August 2022, and the Inflation Reduction Act (IRA) on 16 August 2022. Taken together, they authorize more than US\$ 2 trillion in funding and incentives for up to ten years and stand among the most significant investments the United States has ever made in improving its industrial competitiveness. These laws seek to rebuild the country's infrastructure, accelerate the transition to a green economy, and strengthen the domestic semiconductor industry while promoting job growth, workforce development, and equity. They could shape the economy for years to come.

Facing challenges such as the COVID-19 pandemic aftermath, global supply-chain instability, and rising climate and geopolitical risks, there has been a renewed debate worldwide about the role of industrial policy and government support for companies and industries deemed strategically important. The United States IIJA, CHIPS and IRA—which resulted from the economic policy agenda proposed by President Joe Biden and the ensuing debate around its related policies in the United States Congress—were passed in this context. Supported by a change in public attitudes over the past thirty years towards accepting a more active economic role for the U.S. government, the laws seek to address the structural challenges that have long afflicted the United States economy, and the need to achieve a more equitable recovery after the pandemic.<sup>1</sup> Industrial policy is thus no longer a hypothetical subject in the United States, and the debate has shifted from passing legislation to how to implement these laws, and what execution challenges may arise.

They have been received with a mix of optimism from some, who see new economic opportunities for a more sustainable and equitable United States economy, and with skepticism from others, who see industrial subsidies as an inefficient way of spending scarce resources. Rodrik, Juhász

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<sup>1</sup> For a deeper discussion of the changes in attitudes, which have taken place in the context of a secular decline in the manufacturing share of GDP, stagnant wages, and rising inequality in the United States, see Artecona and Velloso (2022).

and Lane (2023) stress that industrial policies are complex and quantifying them for the purposes of analysis can be difficult. They add that the debate over its effectiveness has changed over time, however, owing to new academic research that is “less driven by ideological hostility to government intervention and better grounded in rigorous empirical methods.”

Despite the debate’s evolution over time, it is important to strike a balance between government support and market forces to avoid the mistakes that have led to the stigma industrial policy has carried for many years. In this context, the choices made during the implementation period will be fundamental to whether the benefits of the legislations will outweigh their costs in the long run.

Passing the legislations was only the first step. Since their passage, federal agencies have been working to carry out the mandates within, releasing funding opportunities, setting up grants and rulemaking processes, developing guidance, and trying to distribute resources in a timely and equitable manner. The implementation strategies and execution challenges of these three legislations will be examined in this report, which is organized as follows.

Part I focuses on the resurgence of industrial policy in the economic debate, the overall policy objectives of the three U.S. legislations, and their economic impact since they were signed into law.

Part II examines the overall execution challenges posed by the implementation of such complex and intertwined laws, while Part III examines the specific implementation strategies and execution challenges of the Inflation Reduction Act, including instruments and tools used to achieve its objectives, and its quantifying impact on economic production, market share, output and trade.

Part IV looks at challenges and opportunities for Latin American and Caribbean countries as the United States seeks to reduce its dependence on China and increase the resilience of its supply chains by “reshoring”, “nearshoring” or “friendshoring” production to the United States, its neighbors, and allies.

In the final section some concluding remarks are offered, highlighting the opportunities and risks of the IJA, CHIPS Act and IRA for the United States and the global economy.

## I. Striking a new balance between government support and market forces

The successful passage of three important pieces of legislation in the United States in late 2021 and in 2022 after years of congressional stalemate reflects not only growing alarm over the COVID-19 pandemic aftermath and its socio-economic impact, global supply-chain instability, and rising climate and geopolitical risks, but also notable shifts in strategy. Focusing on the Inflation Reduction Act (IRA), Bordoff (2022) highlights a two-pronged shift in strategy.

First, in order to build political support, “carrots work better than sticks”, thus IRA subsidizes clean energy rather than taxing or restricting carbon pollution, in spite of a large academic literature demonstrating the economic efficiency of a carbon price. The other laws (CHIPS Act and the IIJA) use a similar approach, combining direct spending with grants, tax incentives and loan guarantees.

Second, IRA explicitly favors clean energy manufactured in the United States, part of a broader move toward “industrial policy” —according to Bordoff a “catchall phrase” referring to government intervention to promote and protect firms in targeted and strategic sectors. The challenge for U.S. policymakers, however, is to ensure that the law sparks a “virtuous cycle of competition”, he says, “rather than a vicious cycle of protectionism” (Bordoff, 2022).

Underlying these strategy shifts is a classic debate in economic policy on what is the role of government in the economy and how much it should intervene in private economic activity. According to Agarwal (2023), the renewed interest in industrial policy is due to three developments that have taken place in the last decade.<sup>2</sup> One is the rise of social media, which has made it easier to denounce existing inequities and social injustices to a wider audience. This has led to a renewed interest in what would be considered the role of governments to address some of these inequities, and to the increased relevance of attaining inclusive and sustainable growth.

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<sup>2</sup> See also “Ruchir Agarwal on Industrial Policy,” *IMF Podcasts*, 22 May 2023, <https://www.imf.org/en/News/Podcasts/All-Podcasts/2023/05/22/ruchir-agarwal-on-industrial-policy>.

Another development is the recognition, following the COVID-19 pandemic and the war in Ukraine, that there are critical supply chain vulnerabilities in key sectors of the global economy. Artecona and Velloso (2022) highlight that building resilience in supply chains has become a policy priority in the United States as the benefits and costs of globalized supply chains are assessed, including whether producers and consumers have become overly exposed to a few suppliers. The exposure of such vulnerabilities in the global supply chains and the multiple calls for diversifying them brought an even bigger focus on China's rising role in the world economy. As a result, there has been wide consensus among United States policymakers on the need to design policies and pass legislation with a focus on accelerating innovation and strengthening competitiveness.

This goes beyond the relationship between the United States and China, however. The multilateral order is under strain and requires rebalancing, as many emerging market and developing countries, representing the majority of the world's population, want a bigger voice and better representation, as well as an acknowledgment that there must be a rethinking of how countries cooperate internationally. This is the third development listed by Agarwal and when the three factors are combined—one, the recognition that growth should be more inclusive; two, the recognition that the trade system may not be open and resilient during shocks; and three, the geopolitical tensions— industrial policy is looked at under a new light.

There is now broad recognition that the fruits of the market-economy have been unevenly distributed, concerns that the United States may be losing its innovation edge and that relying on geopolitical adversaries for critical resources such as semiconductors and pharmaceuticals may impact its national security. In this context, the passage of the IIJA, the CHIPS Act and the IRA points to a far-reaching industrial policy. For example, funding recipients under the CHIPS Act face extensive conditions, such as a 10-year ban on expanding advanced chip capacity in China and a commitment to affordable childcare. The United States new industrial policy reflects the government efforts to shape the economy by targeting specific industries, firms, or economic activities, to be achieved through a range of tools such as subsidies, tax incentives, infrastructure development, protective regulations, and research and development support.

Agarwal (2023) emphasizes that policymakers face challenges when attempting to balance the competing demands of achieving economic growth, financial and fiscal stability, and promoting "national champions". The third objective is underpinned by several considerations, including: "(i) enhancing national security by promoting self-sufficiency in key industries, (ii) supporting job-rich and inclusive growth, (iii) revitalizing left-behind communities, and (iv) the voter optics associated with reviving the manufacturing sector".

Officials may award contracts, provide subsidies or tax credits, or invest in infrastructure projects to establish national champions, but this process can also have negative consequences. It can lead to concentration of economic power and misallocation of resources, undermine market competition and innovation, and ultimately neglect long-term considerations, harming growth and social welfare. Striking the right balance between government support and market forces to assure that the long-term effects of the laws are positive is an important challenge for United States policymakers when implementing and executing them. If not carefully managed, industrial policy measures can exacerbate trade tensions, which would ultimately undermine a clean energy transition and the creation of quality jobs, with a living wage, basic benefits, career-building and wealth-building opportunities.

## A. The current industrial policy debate

Industrial policy, in a broad sense, is the set of efforts aimed at promoting specific industries or sectors that the government understands as strategic to achieve certain objectives, such as the resilience of supply chains, the promotion of green technologies, geopolitical advantages or the generation of good jobs that promote complementarity between work and technology. More specifically, the Roosevelt Institute, a think-tank, defines industrial policy as “any government policy that encourages the shift of resources from one industry or sector to another, by modifying input costs, product prices, or other regulatory treatment.” In this sense, the spirit of these policies goes through “modifying the results of market performance to bring them into line with the general economic and social objectives of a country” (Tucker, 2019).

Industrial policy thus goes a step further with respect to public interventions aimed at correcting market failures, which today are relatively broadly accepted. Examples of these kind of interventions would be the defense of competition policies, policies to mitigate information asymmetries, and regulations that focus on negative externalities. Public investment in infrastructure, education and in the scientific and technological base of the economy are not considered industrial policy, nor are those policies that promote complementarities with the private sector to mitigate risks, increase profitability and enhance economic performance through the path of productivity (Council of Foreign Relations (2022), Spence (2023) and Goldberg (2023)).

For example, the CHIPS and Science Act consists of three main components. The first involves increasing investment in science and technology, promoting a leap in human capital that strengthens technological capabilities to rival China. The second involves moving the links of the semiconductor supply chains to the United States or to countries that are considered allies. Finally, the third leg includes restrictions on trade, investment, and technology flows with China.

As economics Nobel laureate Michael Spence points out, the first pillar is not particularly controversial, since “it is not about investments that directly modify the structure of the local or world economy as determined by the market” (Spence, 2023). The most heated discussions at present revolve around the second of these three components, as “critics point out that selective public investment in the productive capacity of any industry is tantamount to picking winners and losers, and they consider that governments are ill-equipped for this task, especially since there is the possibility of vested interests capturing the decision-making process” (Spence, 2023).

The third component is equally controversial and refers to the risk of sparking a “vicious cycle of protectionism” mentioned by Bordoff (2022). Goldberg (2023) argues that “discouraging cheap imports of solar panels from China, currently the world’s lowest-cost solar producer, will slow down the green transition just as U.S. public investment seeks to accelerate it.” And “trade restrictions and preferential treatment of U.S. companies will increase prices, making inflation harder to control and hurting the poorest Americans most. And without expanding immigration, it is not clear that there are enough workers with the appropriate skills to implement the Biden Administration’s ambitious public investment plans.” In addition, retaliatory measures taken by countries adversely affected by trade barriers may further reduce consumer welfare in the United States.

Offering a different view, Rodrik (2023) argues that “what some decry as protectionism and mercantilism is really rebalancing toward addressing important national issues such as labor displacement, left-behind regions, the climate transition and public health.” He adds that this process is necessary both to heal social and environmental damage done under the period he calls “hyper-globalization”, which lasted from the early 1990s until the onset of the COVID-19 pandemic, and to “establish a healthier form of globalization for the future”. He says that President Biden’s industrial policies, green subsidies, and made-in-America provisions are the clearest examples of this reorientation.

Indeed, the Biden Administration's response to these criticisms has been to emphasize the challenges of creating a secure and sustainable economy in the face of the economic and geopolitical realities the country is facing. This is an endeavor that will require international collaboration, officials say. While aiming to pursue an industrial strategy at home, the Administration has reiterated its commitment to work with neighbors, partners and allies to face their shared challenges. Reducing dependence on China's supply of critical minerals and materials is important for the country's national security and is a common goal of many of its foreign partners, U.S. officials add. Notwithstanding the need to reduce dependence, these officials recognize the risks of a hard decoupling between the two largest economies in the world and have attempted to engage with Chinese officials on a broader concerted effort to stabilize the relationship, reduce the risk of misunderstanding, and discuss areas of cooperation.

## **B. Structural challenges, geopolitical and security competition**

President Biden's economic policy agenda and the subsequently passed legislations focused on the United States economy's structural maladies as described in Artecona and Velloso (2022) —the steep decline in the manufacturing sector's share of the United States Gross Domestic Product (GDP), the slow wage growth and rising inequality, and declining participation in the labor force since the 1980s— as well as on geopolitical and security concerns, particularly from China's expanded role in the global economy. The policy proposals and the legislation that were passed sought to promote industrial competitiveness, securing a supply of critical material and products, while developing new technologies to preserve the planet, creating good domestic jobs and promoting equity.

In his remarks at the Hutchins Center on Fiscal and Monetary Policy at the Brookings Institution in April 2023, National Security Advisor Jake Sullivan focused on the United States' broader international economic policy, particularly as it relates to the Biden Administration's commitment to integrate domestic and foreign policies more deeply. His speech offered an outline of the Administration's international economic policy in light of the enacted laws.<sup>3</sup>

He started his remarks by providing historical context to the United States' current international economic policy agenda. After the Second World War, he said, the United States led a fragmented world to build a new international economic order. While it contributed to lift hundreds of millions of people out of poverty and led to shared prosperity and technological innovations, there existed underlying failings that became more visible in the last few decades, as a shifting global economy left many U.S. workers and their communities behind. The 2008 financial crisis shook the foundations of the country's middle class, and the COVID-19 pandemic exposed the fragility of its supply chains, whereas a changing climate poses urgent challenges, and the invasion of Ukraine has underscored the risks of "overdependence".

This moment demands a new consensus, he added, and "that's why the United States, under President Biden, is pursuing a modern industrial and innovation strategy —both at home and with partners around the world. One that invests in the sources of our own economic and technological strength, that promotes diversified and resilient global supply chains, that sets high standards for everything from labor and the environment to trusted technology and good governance, and that deploys capital to deliver public goods like climate and health" (Sullivan, 2023).

Referring to the trade agreements over the past thirty years, Rodrik (2023) said "they were not so much about removing cross-border restrictions on trade and investment as they were about regulatory standards, health and safety rules, investment, banking and finance, intellectual property, labor, the environment, and many other issues that previously lay in the domain of domestic policy." Nor were these

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<sup>3</sup> See Sullivan (2023) and Brookings (2023). Unless otherwise indicated, all quotes in this section are from Sullivan's speech.



rules neutral, and they tended to prioritize big businesses' interests to the detriment of labor concerns. "Governments were pushed to free up capital flows, while labor remained trapped behind borders. Climate change and public health were neglected, partly because the hyper-globalization agenda crowded them out, but also because the creation of public goods in either domain would have undercut business interests" (Rodrik, 2023).

When President Biden came into office in January 2021, the United States faced, from the new Administration's perspective, four fundamental challenges. First, the country's industrial base had been undermined. In the name of "oversimplified market efficiency, entire supply chains of strategic goods—along with the industries and jobs that made them—moved overseas." Second, the U.S. faced a new backdrop defined by geopolitical and security competition, with important economic impacts, while contending with the reality that "a large non-market economy had been integrated into the international economic order in a way that posed considerable challenges." The third challenge was the accelerating climate crisis and the urgent need for a just and efficient energy transition. And finally, the new Administration had to face the challenge of inequality and its damage to democracy. The solution to each of these challenges was to "restore an economic mentality that champions building." And that is, according to Sullivan, the core of their economic approach. "To build capacity, to build resilience, to build inclusiveness, at home and with partners abroad" (Sullivan, 2023).

The response to these challenges encompasses four steps. The first is "laying a new foundation at home—with a modern American industrial strategy" that "identifies specific sectors that are foundational to economic growth, strategic from a national security perspective, and where private industry on its own isn't poised to make the investments needed to secure our national ambitions." For example, more than 80% of critical minerals required to meet current demand for electric vehicles are processed by one country, China, and Sullivan argued that "clean-energy supplies are at risk of being weaponized in the same way as oil in the 1970s, or natural gas in Europe in 2022" (Sullivan, 2023).

The second step of the strategy is working with partners to ensure they are also building capacity, resilience and inclusiveness. Ultimately, the goal is "a strong, resilient, and leading-edge techno-industrial base that the United States and its like-minded partners, established and emerging economies alike, can invest in and rely upon together." Cooperation with partners is not limited to clean energy—it may include coordinating approaches to semiconductor incentives, for example—nor is it limited to advanced industrial democracies, he added.

The third step is "moving beyond traditional trade deals to innovative new international partnerships." He lists the problems that need to be solved as "Creating diversified and resilient supply chains. Mobilizing public and private investment for a just clean energy transition and sustainable economic growth. Creating good jobs along the way, family-supporting jobs. Ensuring trust, safety, and openness in our digital infrastructure. Stopping a race-to-the-bottom in corporate taxation. Enhancing protections for labor and the environment. Tackling corruption. That is a different set of fundamental priorities than simply bringing down tariffs" (Sullivan, 2023).

In this context, he referred to a new ambitious regional economic initiative, the Indo-Pacific Economic Framework, that focus on "hastening the clean-energy transition, implementing tax fairness and fighting corruption, setting high standards for technology, and ensuring more resilient supply chains for critical goods and inputs." The new Americas Partnership for Economic Prosperity is aimed at the same basic set of objectives, he added. Meanwhile, through the U.S.-EU Trade and Technology Council, and through the trilateral coordination with Japan and Korea, the U.S. seeks to coordinate their industrial strategies to complement one another.

The United States Trade Representative Katherine Tai has summed up the U.S. Administration's approach to trade: "Our new approach recognizes people as more than just consumers, but also producers—the workers, wage-earners, providers, and community members that comprise a vibrant

middle class. Our focus has shifted from liberalization and the pursuit of efficiency and low costs —at any cost— to raising standards, building resiliency, driving sustainability, and fostering more inclusive prosperity at home and abroad” (Bivens, 2023).

The fourth and final step of the United States’ strategy is to mobilize financial resources for investment in emerging markets. The Administration has launched an effort to update multilateral development banks’ operating models, the World Bank in particular, in order to address climate change, pandemics, and fragility and conflict, while expanding access to concessional finance for low income and for middle-income countries as they deal with challenges that span beyond their own borders. In this context, the U.S. has launched the Partnership for Global Infrastructure and Investment (PGII) to mobilize resources for energy, physical, and digital infrastructure financing for the next ten years. Sullivan added that “unlike the financing that comes in the Belt and Road Initiative, projects under PGII are transparent and high-standard and in service of long-term, inclusive and sustainable growth” (Sullivan, 2023).

### **C. Three economic impacts of the new laws**

According to the United States Treasury Secretary Janet Yellen, the current United States Administration has been focused on “rescuing the job market from the pandemic downturn and stabilizing the economy after its unprecedented disruptions” (United States Treasury, 2022). The COVID-19 pandemic contributed to expose vulnerabilities in the United States economy, which were underpinned by three important long-term trends: 1. the steep decline in the manufacturing sector’s share of the GDP, 2. slow wage growth and rising inequality, as inflation-adjusted hourly pay for most U.S. workers diverged from economywide productivity, and 3. declining labor force participation rate (Artecona and Velloso, 2022).

Taken together, the Bipartisan Infrastructure Law (IIJA), the CHIPS Act and the Inflation Reduction Act (IRA) authorize among the most significant investments the country has ever made. Together, according to the Administration, the three laws will help the United States achieve stable, sustainable growth, help it move toward a fairer and more resilient economy, and will strengthen the foundations of long-term growth.

Ms. Yellen has described many of these policies as “modern supply-side economics.” While before the pandemic higher inequality was accompanied by slower growth, now with an economy at full employment, the United States is uniquely suited for a supply-side expansion that delivers sustainable growth and reduces inequality. In particular, she lists three economic impacts of the newly approved laws, which are: expanded productive capacity, increased resilience to global shocks and greater fairness for workers and businesses (United States Department of the Treasury, 2022).

#### **1. Expanding the productive capacity of the United States economy**

According to the United States Administration, the three legislations signed into law in the past year and a half will expand the productive capacity of the economy. They will raise the ceiling for what the economy can potentially produce by injecting funding into investments that have been neglected over time.

Public investment in U.S. infrastructure as a share of GDP has fallen by more than 40% since the 1960s. At the time the IIJA was signed into law, the World Economic Forum ranked the United States 13th when it came to the overall quality of infrastructure. Investments included in the legislation seek to address key impediments to economic growth.

An analysis of 68 studies between 1983 and 2008 showed that for each 10% increase in federal government investment in infrastructure, national output grew by 0.8% in the short run and 1.2% in the long run (The White House, 2021b). The law not only provides funds to fix roads, ports, bridges, and

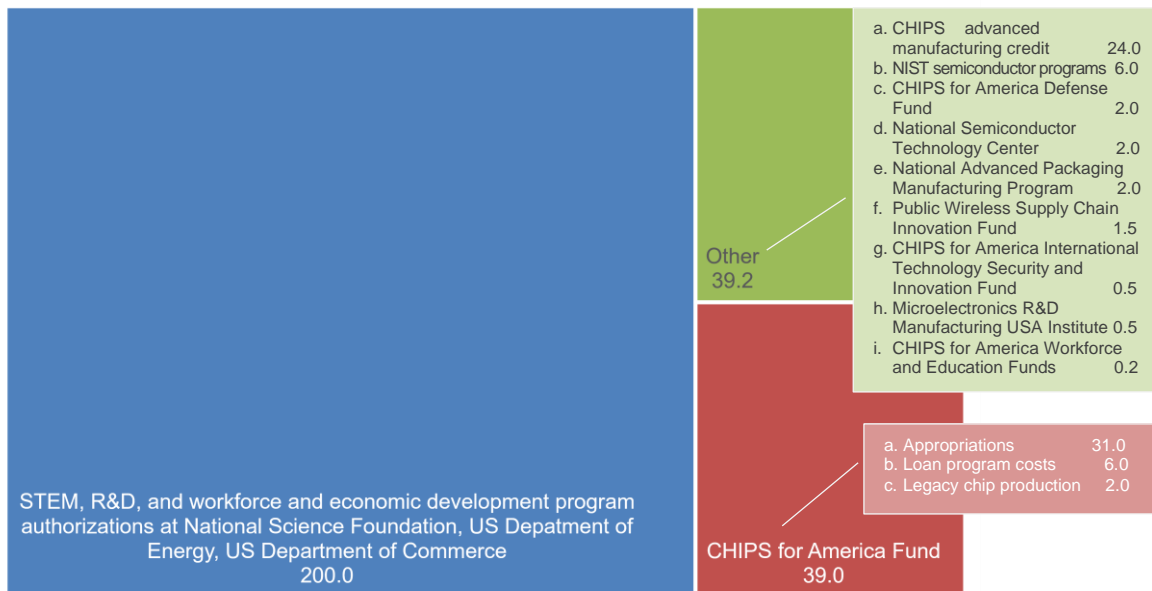
public transit but also to bring high-speed internet to unserved and underserved communities across the country. It seeks to close the digital divide, expand output and enhance productivity.

Investments in research and development (R&D) have long been underscored as an important tool to enhance productivity. At the time the CHIPS Act and the IRA were signed into law, the United States ranked tenth in the world in terms of R&D investments as a share of output. Over half a century ago, the federal government spent 1.9% of GDP on R&D, in part to fuel the race to the moon. In recent years, it has spent a third of that. The estimated cost of the retreat in public R&D is US\$ 200 billion per year in lost economic output (Council of Economic Advisors, 2021).

In this context, the CHIPS Act was designed to bolster U.S. competitiveness in disruptive technologies such as renewable energy, batteries, and electric vehicles (EV), as well as semiconductors. It is likely to encourage build-out of manufacturing capacity, distribution networks, and other domestic supply chain assets.

The CHIPS Act directs US\$ 280 billion in funding for the United States economy over the next ten years. The majority —US\$ 200 billion— is for scientific R&D and commercialization (figure 1). Some US\$ 52.7 billion is for semiconductor manufacturing, R&D, and workforce development, with another US\$ 24 billion worth of tax credits for chip production. There is US\$ 3 billion slated for programs aimed at leading-edge technology and wireless supply chains (McKinsey & Company, 2022). Together with IRA, the two laws are expected to increase demand for infrastructure development in the United States. In the case of IRA, it represents the United States’ largest-ever investment in combating climate change, providing US\$ 370 billion to bolster sustainability efforts, increase energy security, and lower energy costs.

**Figure 1**  
**CHIPS and Science Act funding for 2022-2026. Total=US\$ 278.2 billion**  
*(Billions of U.S. dollars)*



Source: CHIPS and Science Act of 2022, McKinsey & Company (2022). NIST: National Institute of Standards and Technology.

## 2. Building economic resilience

Treasury Secretary Janet Yellen has singled out improving the United States economic resilience as the second critical impact of the Administration's modern supply-side agenda. She argues that "since the private sector does not always optimize their supply chain to consider external risks, government has a critical role to play" (United States Department of the Treasury, 2022). The recent legislations signed into law focus on two important sectors that are at the core of improving resilience in the 21<sup>st</sup> century: semiconductors and energy.

The United States at the time when the CHIPS and Science Act was passed had a share of only 12% of the global production of semiconductors, down from 37% in the 1990s (The White House, 2022). The law provides around US\$ 40 billion in incentives to onshore semiconductor manufacturing in the United States and a number of semiconductor manufacturers have already announced expansion of their United States footprint since its passage last year.

Vulnerability to geopolitical and climate-related shocks have come to the fore in the past three years, with these shocks increasing in both frequency and scale. The IIJA allocates around US\$ 50 billion toward climate resilience and weatherization and the IRA, as noted before, represents the United States' largest investment in fighting climate change. Experts estimate IRA could put the U.S. on track to reduce greenhouse gas emissions by approximately 40% below 2005 levels by 2030 (Artecona and Velloso, 2022). Since the IRA's passage in August 2022, "at least US\$ 45 billion in private-sector investment has been announced across the U.S. clean vehicle and battery supply chain" (United States Department of the Treasury, 2023a).

The United States Treasury has an important role in the implementation of these laws, Ms. Yellen says. By mobilizing private capital, the clean energy tax credits implemented by it will drive the U.S. economy and workers to a leadership position in the fastest growing markets and technologies of today and the future, with positive spillovers to the rest of the world (United States Department of the Treasury, 2022).

Increased construction activity related to manufacturing is already an ongoing, multiyear trend, with the laws providing a supportive policy environment for manufacturing construction. As of June 2023, construction spending on manufacturing was 2.5 times higher than in March 2020 (the beginning of the pandemic) in terms of amount, or 150% above the March 2020 level (figure 2). This pace of growth was about five times the pace of growth in total construction spending. Furthermore, construction spending related to manufacturing reached US\$ 115 billion in 2022 according to the U.S. Census Bureau's Annual Value of Construction Put in Place, an all-time high. This activity could be further boosted by IRA and CHIPS Act-funded supply chain localization (Lucas, 2023).

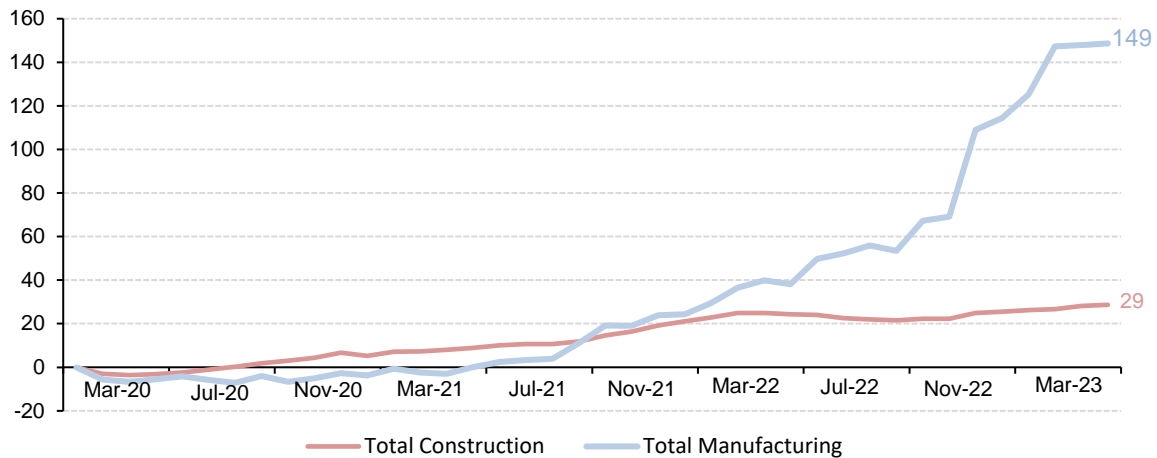
In June 2023, the Office of Economic Policy of the U.S. Treasury Department released an analysis of the surge in construction spending for manufacturing in the United States. According to it, since the end of 2021 and the passage of the three laws —IIJA, CHIPS and Science Act, and IRA— real manufacturing construction spending has doubled (United States Department of the Treasury, 2023b).<sup>4</sup>

The analysis explores the surge along three key trends. First, it highlights that the boom is principally driven by construction for computer, electronic, and electrical manufacturing—a relatively small share of manufacturing construction over the past few decades, but now a dominant component. Second, it shows that manufacturing construction is one element of a broader increase in U.S. non-residential construction spending, alongside new building for public and private infrastructure following the IIJA, and that the manufacturing surge has not crowded out other types of construction spending, which generally continue to strengthen. Finally, putting the trend in international context, it indicates that the surge appears to be uniquely to the United States—not mirrored in other advanced economies.

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<sup>4</sup> According to the analysis, the adjustments for price increases is particularly important, so that nominal spending growth is not misconstrued as increased physical construction. By considering deflated measures in the analysis, the authors show that the surge in construction of manufacturing facilities is a real one.

**Figure 2**  
**United States monthly construction spending growth since the COVID-19 pandemic**  
*(Monthly vs total construction, percentage)*



Source: United States Census Bureau, Construction Spending, Historical Value Put in Place. Monthly at a seasonally adjusted rate. Data extracted on 11 August 2023 [https://www.census.gov/construction/c30/historical\\_data.html](https://www.census.gov/construction/c30/historical_data.html).

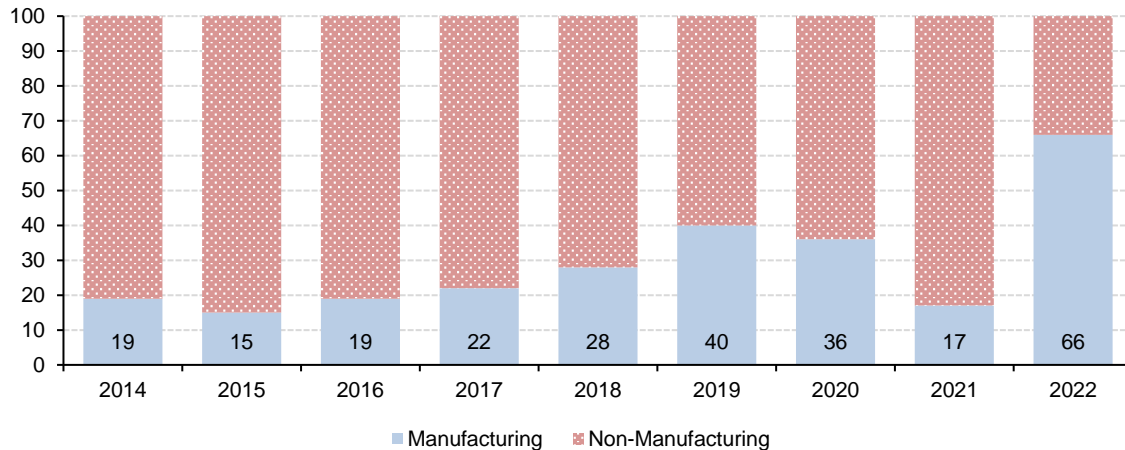
Starting with the first trend, the analysis shows that since the beginning of 2022, real spending on construction for computer, electronics, and electrical manufacturing has nearly quadrupled. Private sector analysts have suggested a connection between the growth in construction for electronic manufacturing and the CHIPS Act. The Semiconductor Industry Association reports that over 50 new semiconductor ecosystem projects have been announced in the wake of the CHIPS Act. According to Deutsche Bank Research, 18 new chipmaking facilities will have started construction between 2021 and 2023 (United States Department of the Treasury (2023b), p.3).

Regarding the second trend, specific components of construction spending beyond manufacturing have also seen substantial increases driven by recent legislation. For example, since the IIJA's passage, public construction spending on the water supply has increased by over 20%. The IIJA delivered more than US\$ 50 billion to the Environmental Protection Agency (EPA) to improve the country's drinking water, wastewater, and stormwater infrastructure. Public spending on highways and streets has also increased by about 13%, as the IIJA funds roads, bridges, and major projects with over US\$ 110 billion over five years. According to the Treasury Department analysis, the legislation does not appear to be crowding out private spending, as real private spending on transportation construction has grown by nearly 14% since IIJA was signed into law. Moreover, the legislation increased the available Private Activity Bonds (PABs) authority from US\$ 15 to US\$ 30 billion. PABs, allocated by the Secretary of Transportation, incentivize private sector investment in U.S. transportation infrastructure.

Finally, exploring international data, the analysis finds that the same surge in manufacturing construction is not apparent in other advanced economies. According to roughly analogous data sets measuring some concept of real construction for manufacturing purposes, other advanced economies have not experienced similar increases (United States Department of the Treasury (2023b), p.4).

In its own recent analysis, the White House Council of Economic Advisors (CEA) focused on foreign direct investment (FDI) in new manufacturing facilities on U.S. soil. FDI in new U.S. manufacturing production capacity increased 247% from 2021 to 2022, reaching US\$ 5.3 billion and reversing a multi-year downward trend that began in 2019. Compared to average expenditures in the pre-pandemic period (2014-2019), 2022 outperformed by a factor of 1.7 —almost double (The White House, 2023). The analysis shows that two-thirds of FDI in 2022, excluding corporate acquisitions, was in manufacturing. That was more than double the average share from 2014 to 2021 (figure 3).

**Figure 3**  
**United States' new FDI investments in establishments and expansions**  
*(First-year expenditures, percentage of total)*



Source: The White House (2023). Based on data from the Bureau of Economic Analysis and CEA calculations.

Note: New FDI refers to transactions that create new U.S. establishments and the building of new facilities by existing U.S. affiliates of foreign-owned firms. First-year expenditures include expenditures in the year in which the transaction occurred. As of 16 August 2023, at 6:00pm.

Looking across all transactions in 2022, over 85% of transactions are associated with European investors (57%, with the United Kingdom accounting for 20% of the total on its own), Canadian investors (21%), and Japan, Singapore, and South Korea (collectively, around 9%). Chinese investors account for less than ½ a percent of the 2022 total.

In sum, while private manufacturing for semiconductors, with funding from the CHIPS Act, expand the United States economy's footprint in a sector that is vital for today and tomorrow's technologies, increased public expenditure on infrastructure from the IIJA enables a more resilient economy. Adding to that, "tax incentives from the IRA address the historically overlooked market failure of climate change, ushering in a green energy transition that steers the country toward sustainable growth. Each of these projects addresses market failures to increase inputs to production which fuels long-run growth" (United States Department of the Treasury (2023b), p.4).

### 3. Economic fairness

Treasury Secretary Janet Yellen has affirmed that the "modern supply-side policies" she has spoken of are not just "pro-growth." They are also "pro-fairness." The IIJA, the CHIPS and Science Act, and the IRA recognize that in the past, providing tax incentives to owners of capital in order to boost private investment have contributed to deepening income and wealth disparities.

Their approach embraces the notion that investing in disadvantaged communities, in people and places that have been overlooked over time, through "a broad range of productivity-boosting investments and with a broad distribution across sectors, people, and places," can result in higher returns on investment (United States Department of the Treasury, 2022). Given the manufacturing sector's reliance on strong infrastructure and supply chains, and the recent laws' manufacturing focus, the expectation is that innovative investments will be catalyzed across cities and towns that haven't seen such investment in years. For example, to spur regional economic development, the Commerce Department will establish at least twenty regional technology and innovation hubs. They will be geographically dispersed with priority for underserved and underrepresented communities, leading to economic progress for local communities that are vital to the socio-economic fabric of the country (United States Department of the Treasury, 2022).

Secretary Yellen also cited the Administration's efforts to build a fairer and more effective tax system. The IRA secured almost US\$ 80 billion in funding for the Internal Revenue Services (IRS). The idea was to send funding toward tangible improvement of its services for taxpayers, as well as "to help correct a two-tiered tax system by ensuring that large corporations and high-income earners cannot avoid paying taxes that they owe. The tax gap—the amount of money that is owed but not paid to the IRS—is substantial. It is estimated at US\$ 7 trillion over the next decade. And it's disproportionately concentrated among high earners, who have more complex and opaque sources of income" (United States Department of the Treasury, 2022). She added that combined with the corporate tax reforms in the IRA, this funding would represent some of the most significant steps taken in recent years towards a fairer and more effective tax system.

However, about US\$ 21 billion of the US\$ 80 billion tranche of funding enacted last year with the IRA passage is set to be cut and repurposed as part of the agreement between President Joe Biden and the Speaker of the House of Representatives Kevin McCarthy to suspend the debt limit and cap federal agency spending. The President signed the debt ceiling bill into law in early June.<sup>5</sup> Given Republican opposition to the IRS funding increase, there is a risk that this amount will be further reduced during the fiscal 2024 appropriations process that is now underway, the first since the US\$ 80 billion cash infusion became law in which the President's Democratic Party is negotiating with a Republican-controlled House.

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<sup>5</sup> The "debt ceiling" or "debt limit" is a cap on how much debt the federal government is allowed to accumulate. The U.S. officially hit its debt limit on 19 January 2023, prompting the Treasury Department to use accounting manoeuvres known as extraordinary measures to continue to pay the government's obligations and avoid default. Disagreement between U.S. lawmakers over budgetary spending cuts was at the heart of the political impasse over increasing the debt limit in the first half of the year. Approaching the debt ceiling often elicits calls by lawmakers to cut back on government spending, but lifting the debt limit does not actually authorize any new spending—in fact, it simply allows the United States to spend money on programs that have already been authorized by Congress. In early June, as the Treasury's ability to use measures to delay default were close to be exhausted, the President and the House reached an agreement on a two-year suspension of the debt ceiling.

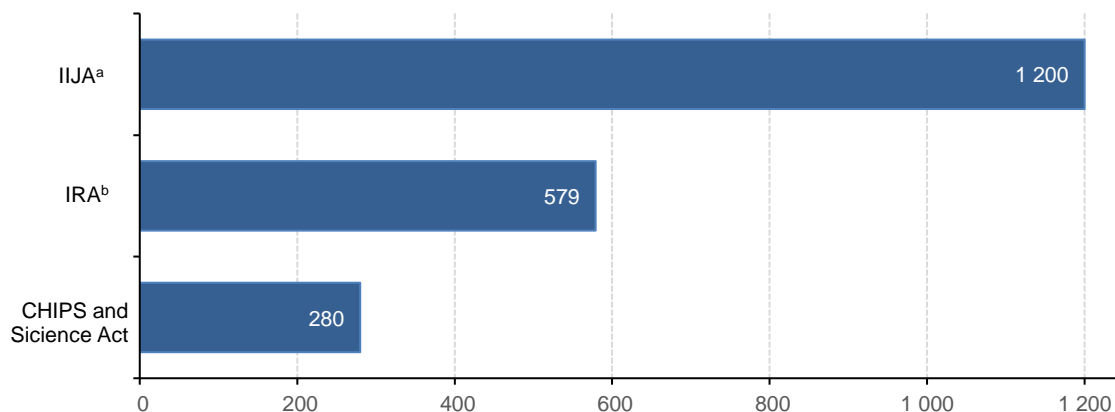




## II. The laws' overall executions challenges

The IIJA, CHIPS Act and IRA use a combination of direct spending coupled with indirect tools such as grants, tax incentives, and loan guarantees, to address in a span of ten years the long-running erosion in the U.S. productive capacity, the climate crisis, and the geopolitical and economic challenges brought by China's rising role in the world economy. The legislations provide significant cost-reduction incentives to rebuild the country's infrastructure, accelerate the transition to a green economy, and strengthen the domestic semiconductor industry while promoting job growth, workforce development, and equity. Together, they provide more than US\$ 2 trillion in authorized federal funding and incentives (figures 4 and 5).

**Figure 4**  
**Authorized funding for the IIJA, CHIPS Act and IRA**  
*(Billions of U.S. dollars)*

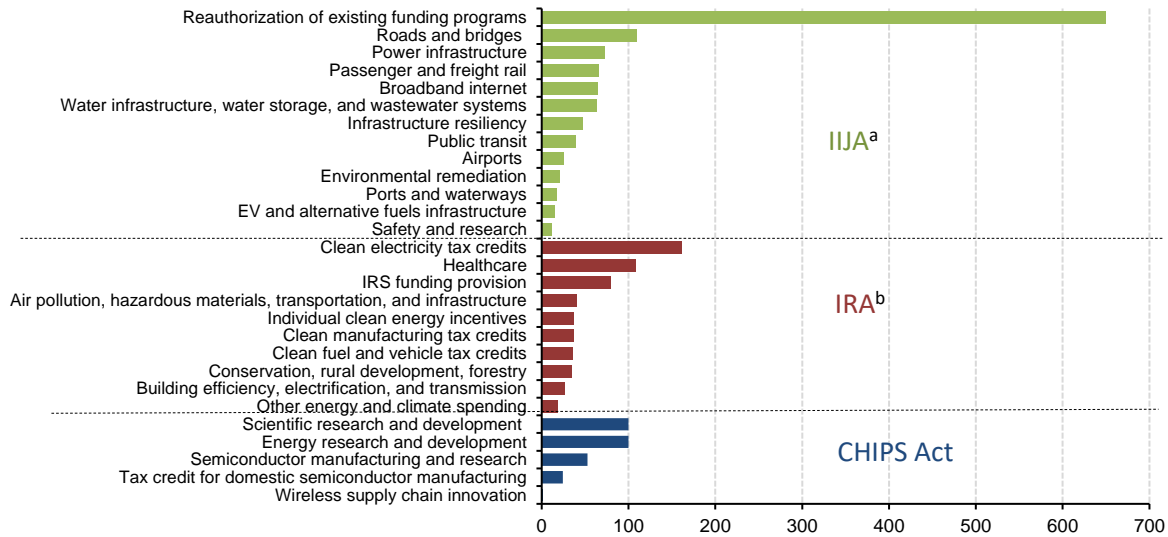


Source: The White House (2021a), Committee for a Responsible Federal Budget (2022), Artecona and Velloso (2022), Eggers, O'Leary and Pollari (2023).

<sup>a</sup> IIJA funding includes reauthorization of over US\$ 650 billion.

<sup>b</sup> IRA funding includes US\$ 79.4 billion for the IRS.

**Figure 5**  
**Breakdown of IIJA, CHIPS Act and IRA funding**  
*(Billions of U.S. dollars)*



Source: The White House (2021a), Committee for a Responsible Federal Budget (2022), Artecona and Velloso (2022), Eggers, O’Leary and Pollari (2023).

<sup>a</sup> IIJA funding includes reauthorization of over US\$ 650 billion.

<sup>b</sup> IRA funding includes US\$ 79.4 billion for the IRS.

Aiming to alter market conditions and ultimately change the behaviors of the private sector, governments, and individuals, these laws pose unique execution challenges. The laws and their new enhanced industrial strategies involve coordination across multiple federal agencies, several levels of government (federal, state, county, municipal), multiple technologies and intense involvement of the private sector. Coordinating the different legislations’ initiatives into a coherent whole and enabling them to succeed is a complex enterprise. Kuttner (2023) highlights that “there is no single industrial-policy czar.” Among top officials, John Podesta, Senior Advisor to the President for Clean Energy Innovation and Implementation, oversees outlays under the Inflation Reduction Act. Commerce Secretary Gina Raimondo oversees the CHIPS and Science’s implementation. Mitch Landrieu is the White House Coordinator for the Infrastructure Investment and Jobs Act. Jack Sullivan, National Security Advisor, “deals with the foreign-policy cross-pressures” of the new laws (Kuttner, 2023).

Overall, there are several challenges associated with the implementation of these new laws. They include making sure different agencies and programs work coherently and cohesively, engaging the private sector without generating windfall profits and gratuitous subsidies, connecting industrial policy to workforce policy, streamlining permitting and environmental reviews, reconciling bold climate goals with the practical environmental disruptions caused by solar farms and power lines, and harmonizing industrial, foreign and trade policies to avoid isolationism. These challenges can be summarized in five major categories, including scale, complexity, accountability, inequitable implementation risks and policy harmonization.

### A. Scale

There are three types of scale-related challenges for the implementation of the three laws enacted in the past year and a half—siloe execution, multiple requirements across multiple agencies, and talent supply concerns—that could lead to execution inefficiencies (Eggers, O’Leary and Pollari, 2023).

The three laws comprise several individual programs and initiatives that reinforce one another and share numerous interdependencies. Tackling each individual program in isolation could lead to inefficiencies. Each of these laws also have a multitude of programs and a myriad of compliance standards, incentivizing a variety of businesses practices such as paying prevailing union wages and offering apprenticeships. Managing these requirements will require extensive documentation and reporting, possibly to multiple federal agencies.

Successful execution of the legislation also brings with it talent supply concerns, both for governments that must oversee the work and their private sector partners. According to the Boston Consulting Group (2023), more than 900,000 new jobs will be created in the United States from clean technologies, requiring at-scale labor training and reskilling. Rewiring America, a nonprofit organization, expects that the country will need one million additional electricians for the clean-energy transition (Wyent et al. (2022), p. 40). The 2021 Deloitte infrastructure survey found that respondents cited talent shortages as the biggest obstacle to implementing infrastructure projects —more than budget constraints or regulatory barriers (O’Leary et al, 2022).

To face the scale-related challenges cited above, Eggers, O’Leary and Pollari (2023) recommend a three-pronged strategy. First, they recommend that public officials establish a central office to oversee the portfolio of projects emanating from the three laws, and to track progress in terms of spending and project milestones. It could be a project management office (PMO) or, taking the idea further, a results management office (RMO). Depending on the portfolio of projects involved, “a PMO or RMO might be at the state or local level or at the level of either a state, local or federal agency.” Second, the authors recommend maintaining a holistic view, identifying linkages between the laws. Finally, during implementation of these laws and their programs, governments should identify the skills shortfalls at the industry level and invest in “innovative partnerships with governments, industry, nonprofits, and educational institutions to close the gaps.”

## **B. Complexity**

There are also at least three types of complexity-related challenges for the implementation of the three laws enacted in the past year and a half —coordinating multiple actors and multiple goals, the learning curve associated with establishing new programs, and avoiding individual pursuits— that also could lead to execution inefficiencies (Eggers, O’Leary and Pollari, 2023).

The laws encompass different participants with different goals as they seek to influence their behavior, a complex task. The CHIPS and Science Act, for example, has earmarked US\$ 10 billion for the Department of Commerce to create regional technology hubs across the United States (Artecona and Velloso (2022), p.41) in partnerships with universities and private businesses.

These laws thus create several new programs and contain numerous initiatives with detailed legislative language that may require clarification and input from several agencies and actors. As Eggers, O’Leary and Pollari (2023) stress, “they establish competitive grants, tax credits, and other indirect payments, with funds flowing not only to state and local governments, but to businesses, non-profits, and academia.” As an example, they highlight that “under the IJA alone more than 45 federal bureaus and 16 federal agencies and commissions are allocated funding for 369 new and existing programs. Grants fund more than 200 programs and represent 78% of the total funding. The multiple programs, levels of government, and goals bring with them complexity challenges.” During the implementation process, government leaders will be required to create the conditions where multiple agencies and actors work together to address a myriad of issues and decisions that affect them.

New programs usually require a learning curve and are often difficult to implement, since there are no precedents or previous processes to rely upon. Eggers, O’Leary and Pollari (2023) indicate that the three new laws establish more than 160 new programs. According to them, IJA alone created

129 new programs with more than US\$ 226 billion in funding, while seven existing programs worth US\$ 275 billion have been substantially revised or expanded. In the IRA, more than US\$ 80 billion (out of a total US\$ 228 billion across 18 federal agencies) was appropriated for 34 new programs.

A significant part of the new laws includes the provision of competitive grants to promote innovation. However, if each community at the local level decides to chase after the available funding individually, they will miss the opportunity to cooperatively pursue those grants. Overseeing these pursuits at the state level may contribute to maximize local opportunities and bring together communities, non-profits, universities, and businesses to develop combined solutions.

The federal government has suggested that states use a strategy from the 2009 Recovery and Reinvestment Act, the “state infrastructure coordinators.” To optimize impact, states should consider coordinating with local governments. The state coordinator can connect applicants to experts in specific areas, from water management to electric vehicles. At the federal level, the Department of Transportation’s new Multimodal Project Discretionary Grant Program (MPDG), for example, combines the application for three programs in one.

The new laws rely heavily on indirect funding tools —nearly 97% of climate spending in IRA is in the form of indirect funding; various types of grants account for 78% of funding in IIJA and another 8% is allocated for loans or loan authority (Eggers, O’Leary and Pollari, 2023). Crucial elements of program execution are often shared between government and nongovernmental representatives as a result; goals are thus designed to be achieved through collaborative relationships. Getting the incentives right and understanding marketplace dynamics are crucial to the successful use of indirect tools. Also important is understanding the diverse objectives of the various stakeholders.

## C. Accountability

The scale and complexity of these legislative packages create accountability challenges. When multiple agencies are involved, governance issues, including decision-making authority, can confound execution. In particular, measuring progress gets more complicated when there are multiple goals, while tracking spending gets more complicated when funding flows to a variety of partners.

There are also three types of accountability-related challenges for the implementation of the three laws —determining who is responsible for the funding received, how to measure the impact of this funding, and how to avoid waste and abuse— that also could lead to execution inefficiencies (Eggers, O’Leary and Pollari, 2023).

Establishing clear authority and decision-making rights among these multiple actors will be key to a successful execution. Prioritizing which goals are more important is also challenging, as well as identifying the right metrics to measure performance. When there are multiple goals for the same project (such as improving economic infrastructure, enhancing work force development and reducing inequality), assessing success becomes more difficult. Finally, when funding levels are large, the problem of waste, fraud, and abuse become real. Governments need to ensure proper compliance, reporting, and transparency—or risk waste of funds or abuse, undermining overall trust in the process.

Strategies to overcome accountability challenge are threefold according to Eggers, O’Leary and Pollari (2023), requiring increased transparency, formal or informal accountability structures, and strengthening the organizational culture against fraud, waste and abuse. The primary question of accountability is whether the funding has achieved the desired outcomes. Clear evaluation criteria are thus important, as is publicly sharing outcomes. Metrics of success can include multiple outcomes. For example, while the focus for IIJA is on building infrastructure and IRA is on climate action, both bills include strong equity provisions that seek to encourage investments in underserved areas. Measures for all these goals should be shared transparently.

## D. Inequitable implementation risks

The IIJA, CHIPS and Science Act, and the IRA stand out for the sheer number of programs they include. Another reason they stand out is because the federal government is also experimenting with large-scale, direct investments in underdeveloped places and regions (Muro et al., 2022). However, there is a risk that local governments may not be fully positioned to take maximal advantage of the legislations' programs, especially smaller, less developed locations, which raises the risk of inequitable implementation.

Place-based industrial policies are consciously directed, deliberately targeting interventions toward particular locations, often to advance wider interests. The Brookings Metro—the Metropolitan Policy Program of the Brookings Institution—count nineteen explicitly place-based industrial policy programs, adding up to some US\$ 80 billion of authorized spending across three of the four pieces of legislations adopted since the current U.S. Administration took office, including the American Rescue Plan of 2021, the IIJA, and the CHIPS and Science Act (Muro, 2023).

The five largest place-based industrial policy programs—the CHIPS for America Fund, Regional Technology and Innovation Hubs, Regional Clean Hydrogen Hubs, the Regional Innovation Engines/Translation Accelerator, and the Regional Clean Direct Air Capture Hubs (whose funding is combined in the CHIPS and Science Act)—account for 82% of the total place-based industrial policy funding across the three laws (Muro et al., 2022).<sup>6</sup>

A common characteristic across the place-based programs is the frequent emphasis on cluster strategies. For example, the CHIPS for America Fund implementation strategy notes that the program “will facilitate the expansion, creation, and coordination of semiconductor manufacturing and innovation clusters that benefit many companies” (Muro et al., 2022). Similarly, Carbon180's primer on the Department of Energy's Direct Air Capture Hubs highlights that “hubs allow projects and industries with common infrastructure needs to co-locate and collaborate in order to cluster employment opportunities, leverage economies of scale, and streamline permitting processes” (Allen et al., 2022).

Regarding the Inflation Reduction Act, local and state governments, together with the private sector, are at the core of its implementation. “Local governments, in particular, are eligible for about a dozen grant programs; they will take on an important new role in renewable energy financing (via changes to the tax code); they will direct resources within their communities; and they have the task of communicating to local residents and businesses and facilitating their access to IRA programs (among other things). To put it plainly, hurdles to local government IRA implementation are hurdles to IRA implementation economy-wide” (Turner, 2023).

A common thread among the challenges and uncertainties associated with the law's implementation is strained local government capacity. The IRA offers several new grant programs for which local governments are eligible and makes a dozen tax incentives available to local governments through “direct pay,” a change to the tax code that allows local governments to access federal tax incentives as a cash payment rather than as a credit to income tax liability, which local governments do not have. Direct pay significantly lowers the barriers to entry for local governments looking to develop or invest in renewable energy projects.<sup>7</sup> There are, however, significant questions remaining about how it will work (Turner, 2023).

For many local governments, understanding the tax benefits and implications of different kinds of clean energy projects may overwhelm local resources. Local governments considering very large utility-scale projects, for example, may need to hire counsel to advise them. Turner (2023) suggests that

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<sup>6</sup> Although such programs may aim to advance wider interests and boost the broader economy, “they do it by directly helping local economies thrive—engaging with the local needs of individuals and industries and leveraging the “bottom-up” energy of local talent, networks, clusters, institutions, and ecosystems” (Muro et al., 2022).

<sup>7</sup> For a more detailed description of “Direct Pay” see monetization options on page 38.

federal agencies, NGOs, industry groups, and other technical assistance providers help local governments take full advantage of direct pay by offering resources that “demystify the tax incentives available for smaller renewable energy projects and other items like commercial vehicles.”

In addition to financing, tax incentives, and grants for which local governments are directly eligible, the IRA aims much of its reach at private individuals and businesses. Local governments are incentivized to communicate to residents and businesses the breadth of programs available to them. These programs are numerous, complicated, and in some instances overlapping or mutually exclusive, however. Some projects may be highly disruptive to neighborhoods and may require anti-displacement strategies. Effective outreach may strain or be beyond local capacity. “Difficulties in outreach and communication can have effects beyond suboptimal IRA uptake at the community level; they can lead to inequitable implementation as well, both within and across communities” (Turner, 2023).

Residents will need guidance on numerous new individual- and business-facing incentives. Many local governments may struggle to monitor grant opportunities, devote adequate staff time to developing grant applications, or find projects that are sufficiently advanced and adequately tailored to the specifics of a grant program. In some instances, local governments may forego certain grant opportunities altogether due to insufficient resources. The need for resources may be even greater in places that operate and maintain ageing (also called “legacy”) procurement systems, which can be more costly to maintain and are more vulnerable to hackers.

Local capacity to attract investment—including land, utility costs, capacity to comply with environmental rules and requirements, supply chain access and logistics— may also be limited. Technical assistance can help overcome some of this gap in capacity, but the scale and agility of the assistance needed is extensive. With the exception of some of the largest, highest-staff cities, most local governments may have less than optimal capacity to respond to the opportunities offered by the recently passed laws (Turner, 2023).

## **E. Harmonizing industrial, foreign and trade policies**

The current United States industrial policy, with a strong geographical orientation and a place-based focus, has extensive foreign-policy implications. Earlier free trade policies did not focus on the location of production and offered free access to U.S. markets, but the IRA, for example, provides a federal subsidy in the form of a tax credit for consumers purchasing an electric vehicle (EV) if the EV and its battery are assembled in North America, and battery minerals are sourced in the United States or U.S. free-trade agreement countries. Some of the U.S. allies called this practice discriminatory.

In response to the complaints, and since there is another provision of the IRA establishing a tax credit for purchase of commercial EVs, both cars and heavier vehicles that sets no conditions on where the vehicle or battery is made, the U.S. Treasury announced that commercial purchasers, buying EVs for the sole purpose of leasing them to consumers, can still get the tax credit, regardless of where the vehicle and the battery is made. It is also suggesting a loose interpretation of the minerals sourcing rules so that the United States and European Union may negotiate a special agreement to allow the use of European minerals in batteries of vehicles in the direct consumer tax credit.<sup>8</sup>

This is part of the effort to harmonize industrial and foreign policies, and the U.S. interests domestically and abroad. Similar challenges will certainly appear as the rulemaking process unfolds, so harmonizing industrial and foreign and trade policies remains an important implementation challenge.

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<sup>8</sup> For a more detailed discussion of this issue see consumer side tax credits for clean vehicles on pages 36-37, and transition to electric vehicles on pages 43-44.

### III. IRA's implementation and execution challenges

The Inflation Reduction Act of 2022 (IRA), which was part of President Biden's Build Back Better agenda and was passed through the budget reconciliation process, was signed into law on 16 August 2022 and has marked its first anniversary. According to Reuters opinion polls, most of the population does not know much about the legislation (Renshaw, 2023).

A spate of investor reports from Wall Street analysts before the anniversary suggested that the legislation was already showing economic power. While the biggest impacts are expected to begin in 2024 and 2025, there have been more than 270 new clean energy projects announced since its passage, with investment totaling some US\$ 132 billion, according to a Bank of America analyst report (Renshaw, 2023). Analysis from the Financial Times suggests that at least US\$ 224 billion in cleantech and semiconductor manufacturing projects have been announced in the U.S. since the passage of the IRA and the CHIPS Act. In total, they promise to create 100,000 jobs (Chu, Roder and Irwin-Hunt, 2023). McCarthy (2023) says that since the IRA was passed, companies have announced or moved forward with projects in 44 states, accounting for more than 170,600 new clean energy jobs and US\$ 278 billion in new investment. The IRA's incentives, it seems, are reaching geographically diverse areas within the United States and promoting job growth, as initially intended.

Moody's (2023) says there is evidence that the IRA, along with the CHIPS and Science Act and the IIJA, has fueled momentum in clean energy investment in the United States, which will likely support U.S. GDP growth, productivity and innovation. Whether the policy ambitions that motivated the laws' passage will be realized depends on how the private sector capitalizes on the incentives they offer. Most of the IRA's climate measures consist of uncapped tax incentives for businesses and individuals. How the private sector and households use these incentives, Moody's says, depends on how macroeconomic, technology and regulatory trends develop. In particular, these include "cost of capital, workforce availability, efficiency and revenue gains offered by new technologies, and regulatory trends, particularly climate related rules" (Moody's, 2023).

## A. What is in the IRA

The IRA includes over US\$ 400 billion in spending on climate change, energy security and health care programs. It also aims to impose taxes on large and profitable corporations to raise revenue, which is expected to contribute to reduce federal budget deficits by over US\$ 300 billion cumulatively over the next 10 years (Artecona and Velloso, 2022).

The legislation addresses three main areas —climate change and clean energy to reduce carbon emissions, improving health care by extending Affordable Care Act (ACA) provisions, and reducing the federal budget deficit. Its provisions provide both tax incentives and direct government expenditures towards reduction of carbon emissions and investments in clean energy, allow Medicare to have the ability to negotiate lower prescription drug prices and extend subsidies for health insurance under the ACA, and finally, allocates about US\$ 79.4 billion to the Internal Revenue Service (Internal Revenue Service, 2023a).

The IRA legislation seeks to utilize both production and consumption side incentives, by providing new incentives for private industry to produce and invest in clean and renewable energy, while also providing other incentives such as tax credits for consumers and households to change their energy use and consumption (Artecona and Velloso, 2022).

From the federal budget perspective, the IRA has three components: raising revenue by an estimated US\$ 739 billion over the next decade, spending on investments of US\$ 433 billion, and achieving an estimated budget surplus of over US\$ 300 billion, which should contribute towards reducing the federal government's future budget deficits (Inflation Reduction Act: Summary, 2022).

### 1. Revenues

Revenues are expected to come from taxes on large corporations, prescription drug pricing reform, improved IRS tax enforcement and collection efficiency, tax on stock repurchases, and loss limitation extension provisions (Artecona and Velloso (2022), p.29-30).

The IRA is expected to impose taxes on large and profitable corporations, through creation of the new Corporate Alternative Minimum Tax (CAMT), which imposes a 15% minimum tax on income of large corporations for taxable years beginning after 31 December 2022. It generally applies to large corporations with average annual income exceeding US\$ 1 billion. However, due to challenges in determining the amount of CAMT liability and whether a corporation is subjected to CAMT, the IRS will be waiving penalties if corporations fail to pay the estimated CAMT amount for the taxable year 2023 (Internal Revenue Service, 2023b).

The reform on prescription drug pricing aims to lower prescription drug costs for Medicare beneficiaries and requires pharmaceutical companies to pay a mandatory rebate if drug prices increase faster than inflation for certain Medicare covered drugs.

The passed legislation also allocated an initial US\$ 79.4 billion to the IRS to improve taxpayer services, modernize its information technology systems, better support operations and strengthen tax compliance efficiently. In its IRS Strategic Operating Plan for fiscal years 2023-2031, the IRS plans to allocate most of its funding towards tax enforcement (US\$ 45.6 billion) and operations support (US\$ 25.3 billion). The rest is allocated towards the taxpayer services, modernizing its business systems, and clean energy (US\$ 8.5 billion). However, the initial funding to the IRS has been negatively affected by the recent bipartisan debt-limit deal, the Fiscal Responsibility Act of 2023 (FRA, Public Law 118-5) signed into law on 6 June 2023, which rescinds some funds from the IRS, cutting up to US\$ 21.4 billion from its initial funding (Rubin, 2023; CBO, 2023).

In addition, the legislation creates a new 1% non-deductible excise tax on corporate stock buybacks by publicly traded corporations after 2022. The IRA also extends the limitation on pass-through business losses, which was enacted in the 2017 Tax Cuts and Jobs Act, for another two years through 2028.



## 2. Spending

IRA's spending on investments is allocated mainly towards energy security and climate change (US\$ 369 billion), ACA health care extensions (US\$ 64 billion) and Western drought resiliency (US\$ 4 billion) (Inflation Reduction Act: Summary, 2022).

The provisions for energy security and fight against climate change mainly take on the form of tax credits or tax breaks, and direct government spending over the 10-year period. About two-thirds of the total IRA investments is in the form of federal tax credits, which are intended as incentives for manufacturers to produce electricity from clean energy sources, corporations to invest in renewable energy technologies, and address climate change through carbon sequestration, renewable fuel production, and clean energy manufacturing. These also include consumer-side tax credits that lower the cost of energy efficient systems and electric vehicles for households and businesses to purchase.

The IRA provisions also extend ACA enhanced subsidies, which were part of the pandemic relief package—the 2021 American Rescue Plan Act (ARPA)—for another three years through 31 December 2025. The ARPA extended the income eligibility to those with income above 400% of federal poverty level. These ACA enhancements provide financial assistance for millions of Americans to benefit from lower health care coverage premiums through purchasing health insurance plans on HealthCare.gov and state-based marketplace plans (Centers for Medicare & Medicaid Services, 2022).

Other provisions also allow Medicare to negotiate drug prices—which will lower prescription drug prices for consumers and enable Medicare beneficiaries to have more access to new, life-saving treatments—and caps annual out-of-pocket prescription drug costs to US\$ 2,000. The law aims to make healthcare more affordable and accessible for Medicare enrollees by lowering spending on prescription drugs and limiting price increases.

In terms of implementation, the Department of Health and Human Services, through the Centers for Medicare & Medicaid Services (CMS) announced on 15 March 2023 the list of 27 drugs subjected to inflation penalties due to price hikes higher than inflation and added another 43 drugs on the list for the third quarter of 2023. They also made a critical step in implementing the IRA provisions with the release of a revised guidance for the Medicare drug price negotiation program on 30 June 2023 (CMS, 2023b).

### B. IRA energy security and climate change provisions

The IRA energy and climate provisions mainly provide incentives in the form of tax credits and direct expenditures. About two-thirds of the climate provisions' US\$ 369 billion fiscal cost allocations initially estimated by the Congressional Budget Office and the Joint Committee on Taxation (CBO/JCT estimates in Inflation Reduction Act: Summary, 2022) will go to tax credits, and the rest goes to direct expenditures on agriculture, forestry, energy loans and other financial investments (Bistline et al., 2023).

The IRA tax credits provisions target both sides of production and consumption to lower the cost of clean energy adoption and accelerate the roll-out of generating clean energy, production and use of electric vehicles, other clean energy technologies like hydrogen, and carbon capture and sequestration. Both the production and consumption tax credits will be examined in this section.

On the production side, the tax credits include the production and investment tax credits (PTC and ITC) for electric and energy storage, production tax credit for carbon capture and sequestration (CCS), nuclear power production tax credit, clean fuel tax credits, and clean energy manufacturing tax credits.

On the consumption side, the IRA provides individual tax credits, including Clean Energy and Efficiency Individual Incentives, and incentives for clean vehicles (Bistline et al., 2023).

## 1. Production side tax credits

Provisions for energy security are aimed towards clean electricity and reduction of carbon emissions.

### (a) Production and Investment Tax Credits (PTC, ITC)

Both the PTC and ITC are corporate tax credits that allow taxable businesses entities (and certain tax-exempt entities eligible for direct payment of tax credits), to deduct a portion of the cost of renewable energy systems from their federal income tax liability. The legislation extends and modifies the PTC that is directed towards production of electricity from certain qualifying renewable resources and extends and modifies the energy credit or the current ITC through the end of 2024. The PTC and ITC take up over a third of the estimated budget costs of IRA's provisions on climate change and energy security (Bistline et al., 2023).

While the ITC amount is based on the percentage of the cost of the qualified renewable energy system with base credit of 6% to 30%, the PTC amount is awarded per kilowatt-hour (kWh) for electricity generated from qualifying low-emitting resources for the first 10 years of operations, with rates per kWh depending on type of energy resource and annually adjusted for inflation.

In terms of implementation, each of these tax credits have two phases. The first phase lasts until 1 January 2025 and assigns the tax credit amounts based on energy resource type. For example, wind and solar technology projects are eligible for either the PTC or the ITC, while hydroelectric projects are only eligible for the PTC. In the second phase, for systems put into service on or after 1 January 2025, the traditional PTC and ITC are replaced with the Clean Electricity Production Tax Credit and the Clean Electricity Investment Tax Credit, which are tech-neutral and apply more broadly to any clean electricity generation facilities with zero greenhouse gas emissions (United States Environmental Protection Agency, 2023).

Unlike the smaller projects below 1 megawatt (MW) that qualify for the full 30% rate for the ITC or 2.75 cents per kWh for the PTC, larger projects above 1 MW qualify for the lower base tax credit of 6% for the ITC or 0.5 cents per kWh for the PTC and they need to meet certain labour requirements on prevailing wages and apprenticeship to qualify for higher tax credit rates for both the PTC and the ITC (table 1).

**Table 1**  
**Tax credits and bonus for ITC/PTC**  
(Percentage and Cents of Dollars per kWh)

Tax credit type	ITC <sup>a</sup>		PTC	
	Small (< 1 MW AC)	Large (> 1MW AC)	Small (< 1 MW AC)	Large (> 1MW AC)
Project cumulative capacity				
Base rate tax credit	30%	6%	2.75 ¢/kWh	0.5 ¢/kWh
Full rate tax credit (Wage & Apprenticeship Requirements)	N/A	24%	N/A	+2.25 ¢/kWh
Bonus for Domestic content minimum requirement (% attributed to U.S. manufactured products)	+10%		+0.3 ¢/kWh	
Bonus for Location: site in Energy Community (ex. Brownfield site, area related to mining operations)	+10%		+0.3 ¢/kWh	
Bonus for Location: site in low-income community or indigenous American Indian land (< 5 MW AC)	+10%		N/A	
Bonus for Qualified low-income residential building or economic benefit project	+20%		N/A	

Source: United States Environmental Protection Agency, 2023.

Note: N/A: not available.

<sup>a</sup> The ITC amount is a percentage of the total qualifying project cost basis. All values assume labor requirements are met.

Additionally, there are bonus tax credits (additional 10-20 percentage points for the ITC, or additional 0.3 cents per kWh) for meeting domestic content requirements for usage of U.S. manufactured products, and for meeting location-based requirements, which includes siting in energy communities, siting in low income communities or Native American land, or qualifying low-income housing or economic development projects (table 1).

The energy system projects can be eligible for the PTC or the ITC but cannot be claimed for both. Moreover, the relative value of the PTC and the ITC for a project depends on location, whether it is eligible for bonus credit, technology used, and assumed capital costs (Bistline et al., 2023).

#### **(b) Production Tax Credit for Carbon Capture and Sequestration (CCS)**

The IRA extends and modifies the production tax credit for carbon capture and sequestration (CCS) (section 45Q of the U.S. Internal Revenue Code) available to facilities capturing carbon dioxide in the 12 years after the facility is placed in service, with up to US\$ 60 per ton of CO<sub>2</sub> reused and US\$ 85 per ton of CO<sub>2</sub> permanently stored if the facilities meet the prevailing wages and apprenticeship requirements.

The legislation also raises the credit amount available for Direct Air Capture (DAC) projects up to US\$ 180 per ton of CO<sub>2</sub> permanently stored and US\$ 130 per ton of reused CO<sub>2</sub>, if they meet labor requirements. Budget-wise, the CBO estimates this CCS tax credit to cost about US\$ 3.2 billion, but some external models estimated it to be a more substantial amount (Bistline et al., 2023; Congressional Budget Office, 2022).

#### **(c) Nuclear Power production tax credit**

The IRA creates a new Zero-Emission Nuclear Power Production tax credit, applicable through the end of 2032 for existing, qualifying zero emission nuclear power plants generating electricity. The tax credits can increase by five times the base credit amount if the facility can meet labor and wage requirements (Congressional Research Service, 2022).

#### **(d) Clean fuel**

The IRA provisions also extend and expand tax credit for clean fuels for transportation and industrial uses, including extending tax credits for biodiesel, renewable diesel, alternative fuels, and second-generation biofuel incentives. Similar to the PTC and ITC above, the clean fuel tax credits are expected to go through two phases, with the first phase extending tax credits for targeted clean fuels for several years, and then replacing them with technology-neutral tax credits starting in 2025.

The legislation also creates new tax credits for the sale or mixture of sustainable aviation fuel, and new tax credits for qualified clean hydrogen production. The sustainable aviation fuel credit is US\$ 1.25 per gallon of qualified fuel mixtures and is available from 2023 until 31 December 2024, and can be claimed as general business credit or as excise tax claim. However, the CBO estimates seem to reflect a lower take up for this credit. On the other hand, the new credit for clean hydrogen production (section 45V of IRA), which can award up to US\$ 3 per kilogram of produced hydrogen over a 10-year period, is projected by the CBO to take up the largest spending in the clean fuels category, as hydrogen has various uses in transportation, industry, and power generation (Bistline et al., 2023; Congressional Budget Office, 2022). The tax credit amount also depends on the carbon emission intensity, and meeting wage and labor requirements.

### **(e) Clean energy manufacturing**

The legislation also incentivizes clean energy manufacturing by extending and expanding clean energy manufacturing credits, including the advanced energy project credit, which is a 30% credit for investing in retrofits or establishing new qualified energy manufacturing facilities, such as manufacturing or industrial facility for production of renewable energy, energy storage systems or electrolyzers. Previously, the American Recovery and Reinvestment Act of 2009 fully allocated US\$ 2.3 billion for this credit, and currently the IRA extends an additional US\$ 10 billion to apply towards clean energy technologies (Congressional Research Service, 2022).

There is also an uncapped provision of advanced manufacturing production credit, awarded per unit of domestic production for certain qualified solar and wind components. In terms of fiscal budget, the CBO estimates that a large portion of tax spending will be through uncapped tax credit provisions (Bistline et al., 2023; Congressional Budget Office, 2022).

## **2. Consumer side tax credits**

There are provisions targeting clean electricity and reduction of carbon emissions from the consumption side, targeting the individual taxpayer.

### **(a) Clean Energy and Efficiency Individual Incentives**

The IRA provides clean energy and efficiency individual incentives, which CBO estimates to cost about US\$ 40 billion in individual tax credits for clean energy and energy efficiency investments (Bistline et al., 2023; Congressional Budget Office, 2022).

It extends, increases and modifies various credits, including non-business energy property credit, residential clean energy credit, energy efficient commercial buildings deduction, and energy efficient home credit. These credits are awarded to individual taxpayers for investments in qualified equipment, including home solar systems, solar water heating, battery storage, small wind energy, energy efficient insulation, electric heat pumps, and home energy audits and electric panel upgrades (Bistline et al., 2023; Congressional Research Service, 2022).

The rebate amounts depend on the energy efficient savings, property type, and household income levels. While there are tax credit caps on the amount that an individual taxpayer can claim for each specific investment and annual credit limits, there is no limit on the total amount of credits and no additional labor requirements.

### **(b) Clean Vehicles (including EVs)**

The legislation also provides incentives to taxpayers for purchasing clean energy vehicles (EV) by allowing them to claim up to US\$ 7,500 in total for the purchase of a qualifying new electric or hydrogen fuel cell vehicle under certain conditions on assembly location, critical mineral requirement and battery component requirement.

In 2021, 38% of the U.S. carbon dioxide emissions came from the transportation sector, 58% came from personal vehicles and 25% from commercial trucks, while air transport contributed 10% (Bown, 2023), so transitioning from internal combustion vehicles to EVs can go a long way in limiting the rise in global temperatures by reducing greenhouse gas emissions, including carbon dioxide.

In addition, 70% of U.S. imports of lithium batteries come from China and, for national security and U.S. competitiveness reasons, another objective of the IRA is to improve the resilience of the EV battery supply chain by developing input sourcing for battery components, as well as lithium, cobalt, graphite, nickel, and other critical materials. Thus, to receive the tax credit, the vehicle must be

assembled in North America, and it must meet the minimum threshold for percentage of battery component, which must also be manufactured or assembled in North America. A certain percentage of critical minerals must be extracted or processed in the United States or a country that has a free trade agreement with it or be recycled in the United States.<sup>9</sup>

The threshold for requirements also increases gradually over time —with critical mineral requirement starting at 40% in 2023 and increasing each year by 10% until 80% in 2027 onwards, and with battery component requirement starting at 50% percent in 2023, and slowly increasing by 10% increments until it reaches 100% percent in 2029 and onwards.

The provision also puts a limit on the vehicle's Manufacturers Suggested Retail Price (MSRP) and requires taxpayer's income to be below specific limits to qualify for the clean vehicle credit. Meeting each battery component and critical mineral requirements qualifies the taxpayer for US\$ 3,750, totaling US\$ 7,500 for meeting both.

The domestic component requirement provoked a tremendous reaction in several trading partners, including Europe, South Korea and Japan as an EV manufactured in any of those countries would not be eligible for the consumer tax offered on EVs manufactured in North America, nor would EVs using batteries produced in them or containing critical minerals mined in them.

One of the challenges of the IRA is that industrial policy is being implemented through the U.S. tax code and the U.S. Treasury Department is the one writing the rules of implementations with no formal participation of the Office of the United States Trade Representative (USTR). On 28 March 2023, the U.S. and Japan signed a Critical Minerals Agreement that qualifies Japan as a "free trade agreement" partner. And on 31 March 2023, the U.S. Treasury proposed a rule for content requirements in the IRA's Section 30D, including general criteria for "free trade agreement" partners. Interestingly, for leasing vehicles (as compared to purchases), the IRA waives stringent requirements on battery component requirements or the caps on MSRP or income eligibility. U.S. Treasury department guidance in December 2022 states that companies leasing these vehicles can claim US\$ 7,500 in commercial clean vehicle credits for vehicles under 14,000 pounds in weight, and for larger vehicles either US\$ 40,000 or 30% of the purchase price, whichever is lower.

Furthermore, the IRA makes a US\$ 4,000 credit (or 30% of the vehicle price, whichever is smaller) available for individual purchase of previously owned EVs with certain conditions, including that the vehicle is not more than 2 years old, under certain buyer income requirements, and sales price is below US\$ 25,000). These thresholds are lower compared to those for purchase of new EVs mentioned above.

### 3. The main characteristics of IRA tax credits

In general, IRA tax credits are uncapped, which leads to some uncertainty around the budgetary impact or CBO/JCT estimates. If the tax credits' take-up rates are higher than expected, then the initial fiscal cost estimates may be underestimated. According to a New York Times article that is part of a series on the future of clean energy, the IRA tax breaks "originally estimated to cost roughly US\$ 391 billion between 2022 and 2031, are proving so popular with manufacturers and consumers that estimates now put the cost as high as US\$ 1.2 trillion over the next decade" (The New York Times, 2023).

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<sup>9</sup> As of 31 March 2023, the U.S. Treasury released proposed guidance —Notice of Proposed Rulemaking (NPRM)— on the IRA's new clean vehicle implementation. Regarding the critical mineral requirement, the following countries could qualify as a source and are included in the NPRM: Australia, Bahrain, Canada, Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Israel, Japan, Jordan, Korea, Mexico, Morocco, Nicaragua, Oman, Panama, Peru, and Singapore. The proposed countries' list may be subject to revision until an official published guidance is made (United States Department of the Treasury, 2023a).

On the other hand, the fiscal costs may be overestimated if the take up of tax credit with bonus requirements (such as labor and wage requirements) is lower than expected, or if there is lower clean energy production and lower take up of tax credits for carbon capture, clean hydrogen, and low carbon electricity; or if there are lower investment costs due to costs of renewable and storage technology decreasing at faster rate than anticipated (Bistline et al., 2023; Congressional Budget Office, 2022).<sup>10</sup>

#### (a) Monetization options

In terms of credit monetization, for some eligible tax credits, IRA introduces new *direct pay and/or transfer options*, which makes it easier for certain organizations to apply these tax credits. The PTC and ITC for renewable electricity are eligible for both options, while personal EV credit is only transferable, commercial clean vehicle credit is eligible only for direct pay, and some credits such as for alternative fuels are not eligible for either option.

The *direct pay option* essentially transforms the tax credit into a grant and is available to eligible non-taxable organizations such as state, local, tribal governments, rural electric cooperatives. It is available for some renewable energy credits including the ITC and PTC. Eligible organizations can choose to apply tax credits as refundable tax payment and obtain direct payment from the IRS for the amount that is in excess of their tax liability.

The *transfer option* allows eligible taxpayers to transfer the entire or partial amount of certain tax credits, such as ITC and PTC, to an unrelated party to use. For example, a clean energy provider may have a small tax bill and can transfer the excess tax credits to another taxpayer whose tax bill is greater than the tax credit value. Starting in 2024, the IRA also allows the taxpayer to have the option to transfer the EV tax credit, which is transferable but not eligible for direct pay, to the dealership, and this essentially makes the credit similar to a point-of-sale rebate (Bistline et al., 2023).

#### (b) Bonus/Added tax credit provisions

The IRA also adds bonus credit provisions that provide additional tax credits if the taxpayer can also meet certain domestic content, location based, and labor requirements, as mentioned earlier.

The *domestic content provisions* are meant as a boost to the manufacturing sector in the United States, mainly domestic iron and steel industries. The IRS recently issued Notice 2023-38 to provide guidance on this requirement, which is mainly derived from the “Buy American” rules previously developed by the Federal Transit Administration for contractors providing transportation infrastructure for the federal government.<sup>11</sup>

The domestic content bonus tax credit can be claimed for building renewable energy projects using required quantities of domestically produced steel, iron and other manufactured products. In particular, all of the steel and iron used in the project has to be manufactured in the United States, and there is a minimum required percentage of costs of manufactured products and components used in a project that has to be mined, produced or manufactured in the United States. In terms of the bonus credit, meeting this domestic content requirement allows the project to claim up to 10% bonus under the PTC, and up to 10 percentage points bonuses under the ITC. The minimum threshold required for domestic content is also raised over time, in order to allow domestic manufacturers to develop and scale up their production capacity.

The IRA provisions also allow taxpayers to increase tax benefits by meeting the *prevailing wage and apprenticeship requirements*, which should help raise job quality in clean energy industries and provide incentives to train and increase the workforce in these positions. The IRS and Treasury have

<sup>10</sup> According to reporting from the New York Times, “since 2009 the cost of solar power has plunged by 83%, while the cost of producing wind power has fallen by more than half. The price of lithium-ion battery cells fell 97% over the past three decades” (The New York Times, 2023).

<sup>11</sup> For more details about the “Buy American” rule see Artecona and Velloso (2022).

published the guidance on these labor requirements on 30 November 2022 with Notice 2022-61. In general, qualifying clean energy projects can receive additional bonus credits by paying prevailing wages, as determined by the Secretary of Labor, to workers during project construction and repairs, and ensuring that qualified, registered apprentices make up a certain threshold share of labor hours, with this threshold gradually increasing over time. These prevailing wage and apprenticeship requirements are applicable to these credits: PTC, ITC, Alternative Fuel Refueling Property Credit, Carbon Sequestration credit, credit for Production of Clean Hydrogen, Clean Fuel Production Credit, Advanced Energy Project Credit, and Energy Efficient Commercial Buildings Deduction. The prevailing wages provisions are also applicable to New Energy Efficient Home Credit and Zero-Emission Nuclear Power Production Credit. The bonus credit for complying with these labor requirements can be up to five times compared to the base tax credit rate for PTC and ITC eligible projects.

Additionally, the IRA also places importance on *renewable energy investments reaching disadvantaged or low-income communities and siting in energy communities*, which are generally defined as communities that have historically resided near fossil fuel related industries. Clean energy projects siting in low-income communities or Indian land can be eligible for up to 10 percentage points bonus credits and qualified low-income residential building projects are eligible for up to 20 percentage points increase in credit under the ITC.

Qualified projects siting in energy communities are eligible for a bonus credit of 0.3 cents per kWh for the PTC or 10 percentage points for the ITC. An energy community is defined to include: (i) a brownfield site, (ii) areas that meet a certain threshold of employment or tax revenue coming from fossil fuels and has an unemployment rate higher than national average rate, or (iii) census tract areas with coal fired electric generating unit retired after 2009 or with coal mines closures after 31 December 1999.

Depending on the interpretation, this definition of energy communities can vary and may cover broad geographical areas, which implies that large areas might be eligible for the clean energy bonus credits, with initially estimated coverage of about 42-50% of the U.S. land areas. This implies potential eligibility issues, with geographic regions further away from fossil fuels also unintentionally qualifying for the bonus, or the unemployment requirement excluding areas with high fossil fuel dependence such as Wyoming, West Texas, Colorado, and North Dakota (Raimi and Pesek, 2022).

The timing and availability of tax credits also varies. The IRA introduces a new feature of using the emissions thresholds to determine availability of credits. The PTC and ITC are implemented in two phases. First, both the PTC and ITC will phase out after the later of year 2032, or when the U.S. electricity production's greenhouse gas emissions reach 25% of the 2022 emission rate. The PTC for hydrogen and electricity projects is available for projects placed in service through 2032, and this credit continues for a decade after the initial credit claim. The credit for carbon dioxide capture goes on for 12 years after the initial claim, and the EV tax credit is available until 2032.

#### **4. IRA direct expenditures**

Besides a large budget allocation towards tax credits, the IRA also provides incentives through direct expenditures towards environmental conservation and renewable energy. This includes US\$ 121 billion of spending on agricultural and forestry conservation projects, energy loans, energy efficiency programs, industrial carbon management and some other programs towards renewable energy (Bistline et al., 2023).

The IRA provides US\$ 21 billion for *agricultural and forestry conservation and sequestration programs*. Much of the agricultural funding significantly expands existing conservation programs. For instance, US\$ 8.45 billion is directed to the Environmental Quality Incentives Program (EQIP) for practices that improve carbon storage in soil or decrease greenhouse gas emissions (Bistline et al., 2023).

For the *energy loans* (about US\$ 17 billion), the IRA provisions raise the current loan program authority of the Loan Program Office of the Department of Energy by about US\$ 100 billion and creates a new loan program called Energy and Infrastructure Reinvestment Program to assist in retooling, repurposing, replacing, and improving existing energy infrastructure. The law provides additional funding for programs incentivizing rural farmers and landowners to invest in clean energy systems and allocates about US\$ 10 billion for rural electric cooperatives to do the same.

The IRA also provides US\$ 10 billion in *direct spending on programs improving residential energy efficiency*, including a new program by the Department of Energy that allocates grants for state energy offices to run a rebates program for whole-house energy saving retrofits, and more funding towards energy efficiency of affordable housing programs of the Department of Housing and Urban Development (Bistline et al., 2023).

The legislation provides *funding for industrial carbon management*, including a new Department of Energy's program that incentivizes investments in projects reducing emissions at facilities operating in emission intensive industries.

In addition, the IRA allocates significant expenditures to other projects, including the US\$ 27 billion allocation for the Greenhouse Gas Reduction Fund, also called "Green Bank", which is implemented by the Environmental Protection Agency (EPA) to award grants towards clean energy and climate projects that help low-income and disadvantaged communities. It aims to engage private capital and financing in helping green and climate change projects while promoting economic competitiveness (United States Environmental Protection Agency, 2023b). It is implemented through three grant competitions by the EPA: the US\$ 14 billion National Clean Investment Fund, the US\$ 6 billion Clean Communities Investment Accelerator, and the US\$ 7 billion Solar for All.

Other notable program covered by the IRA is the Methane emissions reduction program that aims to cut down on air pollution by providing US\$ 1 billion in financial and technical assistance to reduce methane emissions from the petroleum and natural gas sectors and establishing waste emission charges—with charges of US\$ 900 to US\$ 1500 per ton of methane emissions from certain sources (United States Environmental Protection Agency, 2023c).

## C. IRA implementation and impact

The IRA provisions on climate change are mainly implemented through tax credits with bonuses on labor, domestic content and location requirements, and some direct expenditures. On the macroeconomic level, these provisions can have significant trade and relocation impacts. In terms of trade, the IRA tax credits and expenditures help to subsidize the U.S. domestic manufacturing industries and improve their global competitiveness, and requirements such as the domestic content requirements imply import restrictions from certain countries to the United States. The IRA provisions also aim to address the global supply chain instability and increase the United States' own supply chain resilience by providing incentives for reshoring or nearshoring manufacturing to the United States and its neighboring partners.

One caveat of the IRA implementation is the uncertainty in its expected costs, and its final impact on the U.S. federal budget deficit. While one of the main goals of IRA was to reduce the federal budget deficit gap, recent model estimates indicate that the CBO/JCT initial US\$ 369 billion estimate for IRA's climate and energy provisions (Inflation Reduction Act: Summary, 2022) may have underestimated the actual costs. The fiscal costs over the period 2022–2031 could grow to over US\$ 1,045 billion or three times more than the initial estimate of US\$ 384 billion, according to the Penn Wharton Budget Model (Penn Wharton Budget Model, 2023), or even to US\$ 1.2 trillion according to Goldman Sachs Research (Goldman Sachs, 2023).



One reason lies with the uncapped feature of many tax credits in the IRA, where higher fiscal costs may be driven by higher-than-expected number of electric vehicles qualifying for EV tax credit and mineral and battery component requirements bonus, or tweaks on interpretation of these tax credit provisions. However, these higher costs would also reflect higher uptake of EVs, more investment in renewable energy capital, which, depending on the returns, could not only bring more revenues but also help reduce carbon emissions and move the U.S. forward on its way to reach renewable energy goals. While there is uncertainty regarding the legislation's costs, the revenues that these investments may bring are also hard to predict.

## **1. Trade impact**

The IRA's trade impact is so far estimated to be small. According to the Centre for Economic Policy Research (CEPR), the global trade loss is estimated to be quite small, from 0.2% under a conservative scenario (based on policies as of 2022) to 0.9% under a net zero carbon emission scenario (based on policies aimed at net zero carbon emissions by 2050 with more radical implementation measures). However, since one of IRA main objectives is to address climate change and renewable energy, the impact on targeted sectors—such as the electrical and optical equipment sector—can be significant, with an estimated global trade loss between 1% to 6% (Attinasi et al., 2023).

The IRA subsidies to domestic industries, including the tax credits for electric vehicles, help to lower the prices of EV produced in the USMCA (United States-Mexico-Canada Agreement) region and increase the competitiveness of U.S. produced goods. In addition, the IRA's domestic content requirements for intermediate inputs, including iron, steel and manufactured products requirements, incentivize the USMCA producers to use domestic components in their products—electric vehicles, battery, and clean energy equipment. On the other hand, these requirements also acted as trade barriers that discouraged imports of batteries, critical minerals, steel, iron and power components from non-USMCA suppliers.

U.S. trade partners have reacted to these IRA domestic content requirements with apprehension. The European Union (EU) raised concerns about their 'discriminatory' nature against their exports to the United States. Concerns include losing access to the U.S. market and the limited options to divert production to other countries. The CEPR estimates large trade losses for some countries in the electrical and optical equipment sector, which includes EV batteries and renewable energy equipment. The EU estimated loss is around 10% to 45% of exports to the USMCA region, and China's estimated loss is 10% to 50% of exports into the region. There are also second round effects, as the exports to USMCA are lower, the exports to other countries are also negatively impacted due to glut and decreased demand for upstream goods in the sector (Attains et al., 2023).

## **2. Relocation of production and supply chain**

One of the objectives of the IRA climate provisions was to also relocate by reshoring, nearshoring or friendshoring the production and supply chain of key manufacturing sectors. As discussed, the IRA provisions offered tax credits and incentives for manufacturers to re-locate their production facilities in the United States. For the EV producers, the incentives are mainly through tying the tax credits to the domestic content requirement. According to the United States Department of Treasury and IRS proposed guidance on 31 March 2023, the IRA clean vehicle provisions have two main parts to domestic content requirement: the critical mineral requirement and battery component requirement. The critical mineral requirement states that certain percentage of value of critical minerals in a battery must be extracted or processed in the United States or in a country with which the United States has a free trade agreement, or be recycled in North America, with the initial threshold of 40% in 2023 and gradually increasing by 10% increments annually, up to 80% in 2027 and after.

For the battery component requirement, a certain percentage of value of battery components must be manufactured or assembled in North America, also with initial 50% required in 2023, and gradually increasing by 10% increments annually, until it reaches 100% requirement for 2029 and after.

The IRA provisions aim to make the United States an attractive and preferred location for investments in renewable energy, and help to boost manufacturing jobs in the U.S., as well as increase productivity driven by technology investment. The gains in productivity will favor U.S. located producers, increase their comparative advantage compared to those located in the other countries, while giving them direct access to the U.S. market. However, it also means widening the productivity gap between the U.S. and other regions, including the EU. This will further magnify the relocation and trade impact of the IRA provisions.

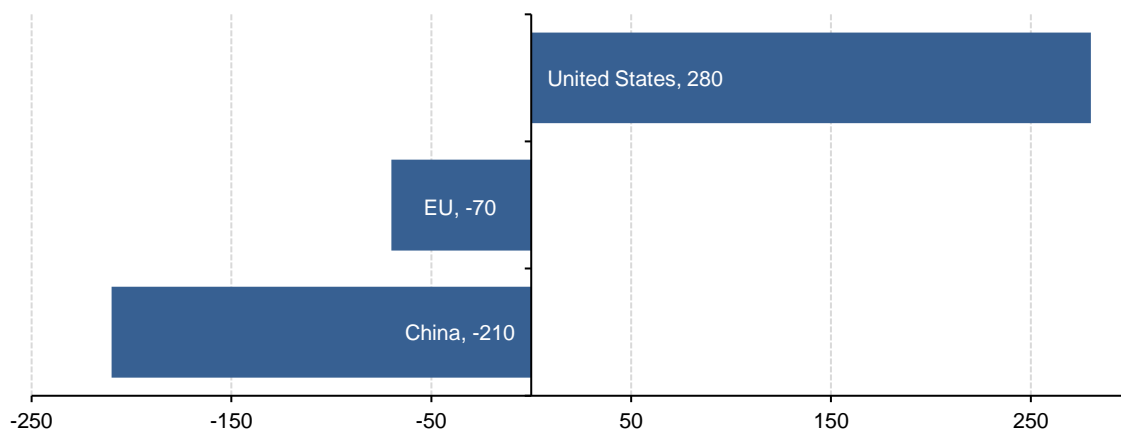
Broadly, the IRA incentives for manufacturing relocation to the U.S. and North America are estimated to have positive impacts on production, market share gains, and output gains for the United States, mainly at the expense of other countries from which manufacturers move away.

Quantitatively, the North America region including the U.S., Canada and Mexico all reap gains from relocation. For the electrical and optical equipment sector, production rises by an estimated increase between 6% to 30% for the U.S. and between 3% to 19% for Mexico and Canada. On the other hand, the EU, China and the other countries are predicted to suffer production losses, with the EU losing about 0.5% to 3% in production, China losing about 1% to 5%, and some other countries with more trade exposure to U.S. such as Malaysia can suffer losses up to 18% (Attinasi et al., 2023).

The IRA legislation not only induces changes in production, but also changes in market share, mostly in the United States. For example, the producers in the U.S. are predicted to gain 9 percentage points in the market share of the electrical and optical equipment sector, while China would lose 6 percentage points in the market.

The IRA incentives for relocation can also lead to a shift towards more output production in the U.S. at the expense of other countries and reduce U.S. dependence on China. The IRA is estimated to draw into the United States about US\$ 280 billion of annual output by 2030, at the cost of US\$ 210 billion to China and US\$ 70 billion to the EU (figure 6).

**Figure 6**  
Estimated impact of IRA on overall output changes for the U.S., EU and China by 2030  
(Billions of U.S. dollars)



Source: Data from Attinasi et al. (2023).

To put into perspective, this represents only a small change in total output for each country and region, with a corresponding 0.7% raise in total U.S. output, 0.4% decline in China's output, and 0.2% decline in EU output. However, at the sectoral level for the electric and optimal equipment, the impact may be much larger, with a 15% increase in U.S. production, at the expense of about a 1.6% decrease for EU and 2.4% decline for China. However, at the total global output level, there are estimates that the IRA may lead to a net annual output loss, especially in the renewable energy sector, which implies an unintended consequence of slowing down the green energy transition agenda (Attinasi et al., 2023).

Overall, the combination of the IRA's goals of accelerating renewable energy transition with the relocation of manufacturing to the U.S. through tax credit and subsidies also implies the creation of trade barriers with some strategic partners, and thus raises concerns about the distortion in the trade flow and supply chains, and the inefficient re-allocation of renewable energy productions that is not based on the region's comparative advantages. U.S. strategic partners such as the EU have raised these concerns, and their potential response with retaliatory means may cause further harm to the renewable energy transition.

Tax credits for American-built electric vehicles, export controls targeting China and subsidies for U.S.-based semiconductor plants—have also become critical tension points in the trilateral relationship between the United States, Japan and South Korea. The United States Administration has stepped up its efforts on economic security in part to limit China's fast-growing ambitions to dominate the market for key technologies that power the world's supercomputers, artificial intelligence, military assets and everyday products like cars. Japan and South Korea, the world's third-largest economy and the top producer of memory chips, respectively, have become pivotal if at times reluctant partners in this effort.

On 18 August 2023, President Biden hosted the Japanese and South Korean leaders at Camp David, a major step towards the establishment of a new trilateral alliance. It was also a celebration of the recent rapprochement between the two Asian countries, which took cautious steps on 16 March 2023 to repair their years-long difficult relationship when their leaders met in Tokyo for their first summit in 12 years.

But the sense of amenability, particularly evident on issues of national security, has faced more turbulence on the economic front as President Biden has pursued "Made in America" policies that have sometimes caused global allies to object. The President has faced calls from allies to consider the collateral damage his agenda may be causing for global partners.

President Biden said last year he would consider adjusts to his signature climate law after allies in Asia and Europe publicly criticized a provision limiting tax credits for electric vehicles assembled outside North America. Over the past nine months, the Administration has released new regulatory guidance and signed a limited trade deal with Japan, opening up more tax credits for carmakers in Japan, South Korea and Europe. The moves were especially critical for South Korean firms like Hyundai, who feared their cars would not be eligible for lucrative tax credits under the original law (Olorunnipa, 2023). A regulation released by the United States Treasury Department in December 2022 clarified that electric cars assembled outside North America could still qualify for the US\$ 7,500 consumer tax credits if they were leased rather than purchased, as shown in Section B. In response, South Korea carmakers immediately increased the number of electric vehicles available for lease in the United States (Bown, 2023a).

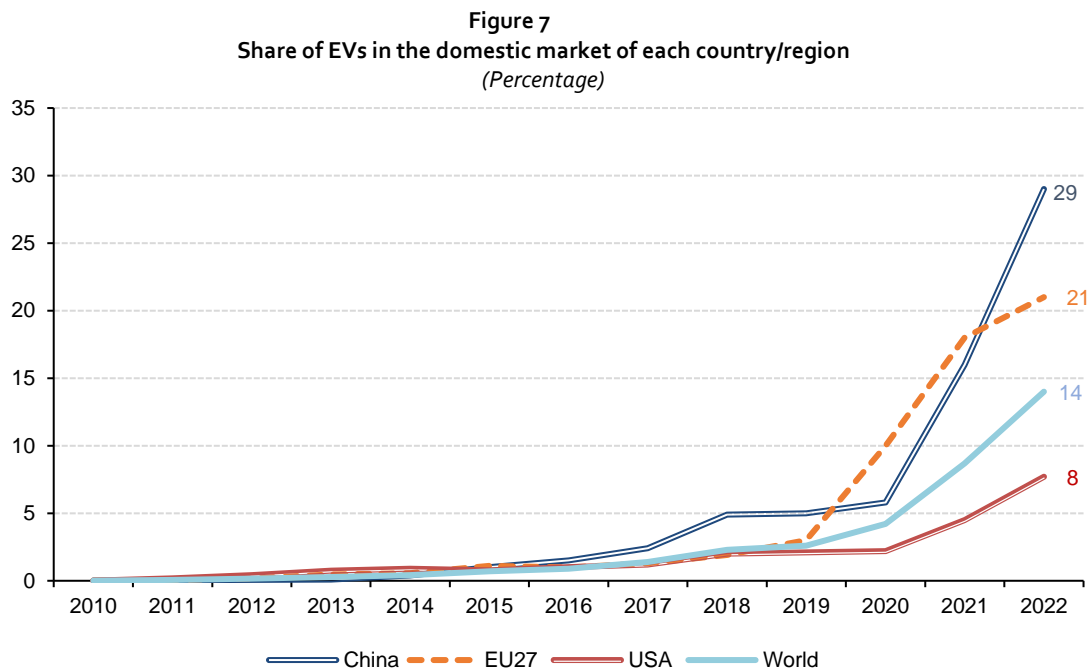
### **3. Transition to electric vehicles**

One of the main goals of the IRA is to reduce carbon emissions, including emission through transportation, which accounted for over one third of U.S. carbon emissions in 2021 (Bown, 2023b).

However, the United States has been slow in its transition from cars with internal combustion engines running on gasoline to EVs, lagging behind China and the European Union, according to the

International Energy Agency's Global EV Outlook 2022 (figure 7). Besides U.S. consumers' preference for large vehicles capable of running long distances, higher prices of EVs is an important reason for this lag, which the U.S. attempted to address with consumer EV tax credits that started with the American Recovery and Reinvestment Act of 2009 (Bown, 2023b). However, these tax credits were capped at 200,000 units that manufacturers sold in the U.S. The IRA provides incentives for consumers to switch to EVs by modifying these EV consumer tax credits and removing the cap on manufacturer's sales.

As mentioned, the IRA's clean vehicle consumer tax credit was attached to the domestic sourcing requirements. In order to qualify for the full amount US\$ 7,500 in consumer EV tax credit, the vehicle had to be assembled in North America, and a certain percentage of battery components and critical minerals had to come from the U.S. or its free trade partners. These domestic sourcing requirements limited the number of EV models eligible for at least part of EV credit to only 11 (as of August 2023) from the 26 eligible models before the IRA took effect on 16 August 2022 (Buckberg, 2023).



Source: Bown (2023b), data from International Energy Agency. Note: the global EV fleet is expected to grow at least tenfold by 2030 according to the International Energy Agency.

The restrictive criteria for the tax credit proved to be controversial for U.S. allies that exported EVs to the U.S., including the EU and South Korea (Bown, 2023a and b) since many of these vehicles were assembled outside of North America. Faced with these complaints, in December 2022, the United States Treasury Department tweaked the implementation guidance on IRA provisions to accommodate some of the concerns (Bown, 2023b). In particular, the U.S. Treasury extended the IRA's leasing commercial vehicles provision, which did not impose final assembly location and domestic content sourcing criteria, to cover all leased EVs. In practice, leasing companies can buy EVs and claim Commercial Clean Vehicle Credit, bypassing IRA stringent requirements on domestic component sourcing, MSRP caps and income eligibility, then lease the EV to consumers and pass down some of the credit through lower lease payments (Buckberg, 2023).

In terms of IRA impact on EV imports from EU and South Korea, there appears to be no negative impact based on the data for the last quarter of 2022 (Bown 2023b). However, after the U.S. Treasury's announcement on extending credit to leasing commercial vehicles in December 2022, the EV leasing

rates as a portion of all new vehicles entering the market in the U.S. jumped significantly in the first quarter of 2023, from about 9% in December 2022 to over 34% in March 2023 (Bown 2023b).

In addition, IRA also creates a new credit worth US\$ 4,000 or 30% of the EV price, whichever is smaller, for consumers to buy previously owned EVs under certain conditions on vehicle's age, buyer income requirements, and sales price below US\$ 25,000 (Bistline et al., 2023). These conditions on income and vehicle price are at lower thresholds than those for new EVs credits, which can make this option attractive to consumers as well.

#### **4. Project commitments**

According to most reports on the impact of the IRA and the CHIPS Act since they were passed one year ago, the largest project commitments have come from semiconductor groups. According to the Financial Times (FT), which over the past year has identified more than 110 large-scale manufacturing announcements—including in semiconductors, electric vehicles, batteries and solar and wind parts—spurred by the landmark legislation, Intel will expand a campus in Arizona and Taiwan Semiconductor Manufacturing Company will build a second fabrication plant in the same state; IBM will invest in New York's Hudson Valley region and Micron will build the U.S.'s largest semiconductor plant in Clay, New York (Chu, Roder and Irwin-Hunt, 2023).

New manufacturing hubs are thus appearing. Georgia and South Carolina have secured the most projects, with 14 and 11, respectively, according to the FT analysis. Michigan and Ohio are next, and Arizona follows. The FT found that more than 80% of cleantech and semiconductor investments announced in the past year are heading to Republican districts, although there were no votes from Congressional Republicans for the IRA and only lukewarm support for the CHIPS Act.

In terms of foreign capital, South Korean and European companies have led the way, announcing 20 and 19 projects, respectively, since last year's big legislation (Chu, Roder and Irwin-Hunt, 2023). The flurry of projects comes as U.S. allies roll out their own policies to compete with IRA subsidies that they say have created an uneven playing field. In February 2023, the EU announced a rival industrial plan—the European Union's Green Deal Industrial Policy—including subsidies to keep developers in the bloc. In March, Canada's budget included IRA-inspired tax credits to spark production of minerals and EV components while strengthening labor conditions. France's new climate framework was unveiled in May. And Germany plans to expand its battery cell production, create a new hydrogen center, and initiate investments in chip manufacturing (McCarthy, 2023). Japan has also announced plans for US\$ 150 billion of borrowing to finance a wave of investment in green technology (Ballard, Douglas and Emont, 2023).

However, the lack of skilled workers and raw material constraints are potential hurdles to the implementation and execution of the law. According to a July report from the Semiconductor Industry Association and Oxford Economics, more than 1 million U.S. jobs for computer scientists and engineers risk going unfilled by the end of the decade. Associated Builders and Contractors, a construction lobbying group, says the U.S. faces a shortfall of 500,000 construction workers this year alone as it tries to meet demand fueled by the new factory announcements (Chu, Roder and Irwin-Hunt, 2023).

Overall, the historic IRA legislation encompasses a wide range of policies, with ambitious objectives in terms of advancing clean energy adoption, ensuring energy security and relocating the manufacturing sector to the U.S., improving U.S. health care, and reducing budget deficit. However, the path from legislation to its actual implementation is still an ongoing process with various challenges brought by the changing macro and geopolitical environment.



## IV. Opportunities and challenges for Latin America and the Caribbean

The United States' legislations passed in the past year and a half are mostly directed to activities within the country but are expected to influence the policies of countries around the world, including in Latin America and the Caribbean (LAC). The region could benefit from the technological advances resulting from the legislations' heavy investments in clean fuels, vehicles and clean electricity. As the United States seeks to reduce its dependence on China and to secure and stabilize its supply chains, centering them around the United States and its allies, new opportunities may arise for LAC countries.

The IRA is expected to make the United States a very attractive destination for clean energy projects. The law provides future project owners with considerable economic incentives in the form of either Production Tax Credits (PTC), or Investment Tax Credits (ITC) as described in the previous section. In the near-term, the IRA will spur many U.S. investment projects into moving from the "Memorandum of Understanding (MoU)" to the "Final Investment Decision (FID)" stage. With a steadier backlog of customer orders, equipment manufacturers will be able to finance and build more factories over the next several years. As economies of scale are achieved and competition increases, costs should decrease from today's price levels, and this is one of the aspects where the IRA will come into play outside of the United States.

Latin America and Caribbean have some of the most abundant and inexpensive resources of renewable energy in the world. Two forces are working in the region's favor regarding the supply of the minerals and materials that will be vital to the goals of the three United States laws, increasing demand emanating from the green transition effort worldwide, and geopolitical trends, as United States and its allies focus on securing supply chains and reducing their dependence on China.

### A. The green transition

The green transition is increasing demand for metals and minerals that Latin America has in large supply, as well as the renewable energy to process them. Demand supported by the green transition is likely to be more durable than the oil, coal and steel boom of the 2000s that was fueled by China's industrial push. By contrast, the energy transition is global and requires investment over decades (The Economist, 2023a).

In the race to fill the green transition demand, the region stands out. It holds vast deposits of critical minerals and metals. For example, an electric car contains three to four times more copper than a gasoline-fueled one, and installing one megawatt of capacity in an offshore-wind farm requires six times more scarce metal than a gas-fired plant (The Economist, 2023a). Chile and Peru together retain 30% of the world's exploitable reserves of copper. Latin America is also home to almost 60% of known lithium reserves. Both copper and lithium underpin the expansion of renewables and electricity networks. According to a recent ECLAC report on lithium extraction and industrialization in the region, as of 2021, Chile (41%), Argentina (9.8%) and Brazil (0.4%) together accounted for more than 50% of the global share of lithium reserves) (Economic Commission for Latin America and the Caribbean (2023b), p.14).

It is also cheaper to extract lithium by evaporation, as it is done in the region, than to drill it from rocks, as is done in Australia and China. Moreover, mining and processing minerals are energy-intensive, but many Latin American countries can tap cheap green electricity for it. Renewables make up 45% of Brazil's energy use, for example, one of the highest rates in the world, and the infrastructure to transmit this clean energy is growing in the region (The Economist, 2023a).

In sum, Latin America is a major producer of critical mineral for clean energy transitions, with considerable potential to expand it. The region already produces large quantities of lithium (needed for batteries), copper (used in wiring and wind turbines) and silver (a component of solar panels). The region could expand into a range of other raw materials such as rare earth elements (Brazil's magnetic rare earths lie close to the surface and are thus easier to extract) that are required for EV motors and wind turbines, and nickel, a key component in batteries. Countries with a Free Trade Agreement (FTA) with the United States will have an advantage to seize this opportunity. They will also be required to meet high environmental, social and governance (ESG) standards, and to generate tangible benefits for local communities.

## **B. Geopolitics trends**

Geopolitical trends are favoring the region. As the rivalry between the United States and China intensifies, countries are diversifying where they import from and invest in. The incentives included in the IRA seek to help the United States move towards a cleaner energy matrix. However, moving from fossil fuels to wind and solar power means moving from dependence on United States-produced resources to dependence on imported resources. For many of those critical minerals (lithium, nickel, copper, cobalt), China is a key world producer, processor, or both. The United States is seeking a strategy to secure global supply chains for critical minerals independent of China, and this can offer opportunities for Latin America and the Caribbean.

The LAC region is naturally close to manufacturing sites in North America. As seen in the previous chapter, the United States' IRA mandates that, from 2027, 80% of the market value of the critical minerals used to make EV batteries must be extracted or processed in the United States or one of the countries with which it has a FTA, as many countries in the LAC region do. In addition, the following LAC countries are included in the U.S. Treasury Department's Notice of Proposed Rulemaking (NPRM) on the IRA's new clean vehicle implementation, regarding the provision of critical mineral content: Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, and Peru (United States Department of the Treasury, 2023a). This presents a huge opportunity for these countries, which can reap the benefits of their eligibility.

China's market share in mining and processing is so substantial that the United States could not replace it with domestic production, even with heavy subsidies or changes in regulations. Moreover, it would not necessarily be optimal to get all the critical minerals produced in the country. A protected and subsidized domestic supply chain could also break down, forcing a costly scramble for new sources abroad. Resilience through interdependence is preferable and feasible and this is where some of the



Latin American and Caribbean countries could benefit: Chile and Peru produce or process copper, Argentina, Bolivia, Brazil and Chile produce lithium. Both Chile and Peru have a free trade agreement with the United States, which makes electric vehicle inputs from these countries eligible for IRA incentives. Other nearshoring agreements could create and coordinate a flow of critical minerals between other countries and the United States.

The region's resource and mineral rich countries could also explore and advocate for the possibility of partaking on the Minerals Security Partnership (MSP). The MSP, officially announced in June 2022, is a collaboration of thirteen countries (Australia, Canada, Finland, France, Germany, India, Italy, Japan, the Republic of Korea, Norway, Sweden, the United Kingdom, the United States) and the EU to bolster responsible critical mineral supply chains and catalyze global public and private investment in them. It aims to accelerate the development of diverse and sustainable critical energy minerals supply chains through working with host governments and industry to facilitate targeted financial and diplomatic support for strategic projects along the value chain.

The MSP considers projects along the full clean energy value chain, from mining, extraction, and secondary recovery, to processing and refining, and ultimately to recycling. It focuses on the minerals and metals supply chains most relevant for clean energy technologies. These include—but are not limited to—lithium, cobalt, nickel, manganese, graphite, rare earth elements, and copper.<sup>12</sup>

Sergio Argüelles, president of the Mexican Association of Private Industrial Parks (Asociación Mexicana de Parques Industriales Privados (AMPIP)), reported that in 2022, 97% of Mexico's industrial parks were occupied, a third more than in 2021. Argüelles said: "The development is a consequence of the fact that international companies are increasingly relocating their production facilities to Mexico." Nearly half of the settlements were at U.S. production facilities. Not only are U.S. companies relocating their production capacities to Mexico, companies in China and Europe also want to make their supply chains more efficient and shorter (Notiulti, 2023).

The expansion is being driven mainly by the automotive sector and its suppliers, and increasingly by the construction of electric cars. Tesla is planning a gigafactory near Monterrey, in the north of the country. German companies are also expanding their production facilities in Mexico. "Nearshoring" refers to this new development of globalization, in which regional networks are valued more. Production is much closer to the markets of the most important trading partners.

In an article for the Korea Institute for international Economic Policy, Sungwoo Hong underscored the importance of potential Latin American candidates for nearshoring for Korean companies aiming to enter or expand their market share in North America. If nearshoring takes place in these LAC countries, they can be regarded as "favorable locations for establishing a foothold to access North America or securing key minerals." He recommends that particular attention be paid to the countries that have either signed an FTA with the U.S. or are classified as "like-minded" countries that share common values. Additionally, Latin American countries with substantial backward linkages, such as Mexico and Brazil, should be prioritized in trade with the United States, the author says. These two countries, which exhibit relatively high levels of backward linkage<sup>13</sup> within Latin America, are considered "suitable hubs due to their capacity for generating significant foreign added value to their exports to the United States" (Hong, 2023).

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<sup>12</sup> The MSP commits to consult frequently and transparently with countries that are not MSP partners, particularly those with significant mineral reserves and those that aspire to move up the critical minerals value chain, to evaluate how best to support responsible commercialization of mineral resources.

<sup>13</sup> Backward linkages characterize the relationship of an industry or institution with its supply chain. An industry has significant backward linkages when its production of output requires substantial intermediate inputs from many other industries within the same study area (see <https://support.implan.com/hc/en-us/articles/115009497627-Backward-Linkage>).

## C. Seizing new opportunities and the challenges ahead

In the near-term the IRA has given a clear path towards producing economically competitive clean energy in the United States. In the long-term, the IRA is expected to contribute to a successful global clean energy transition. The countries in Latin America and the Caribbean may begin taking steps to be well positioned to reap the benefits offered by these laws and their impact on the clean energy transition. Establishing regulations and guidelines (for things such as defining what constitutes “clean hydrogen”, for example), streamlining permitting processes, and creating safety standards are among many key issues that LAC governments can begin addressing today. Investors also need legal certainty. Capital invested in new mines or wells is recouped only years into the project.

To fully leverage the opportunity offered by the U.S. enacted laws, it may be necessary that countries take specific actions, such as providing incentives and guarantees for foreign investment, improving macroeconomic stability, increasing transparency, and ensuring benefits for local communities. Bolivia’s vast lithium resources remain largely untapped because of technical challenges, limited local expertise, and a challenging investment climate. The experience of the U.S. Southern states, for example, could provide some insights on how to prepare ahead of time to create the right conditions for reaping the benefits from the enacted U.S. laws (see box 1 and box 2).

### Box 1

#### Lessons from the United States’ southern states

As the region reflects on how to prepare to take full advantage of the benefits of the United States’ recent laws, it may be helpful to look at the experience of the U.S. southern states. The Center for Automotive Research informed that auto companies have announced more than US\$ 110 billion in EV-related investments in the U.S. since 2018. About half of those are destined for southern states and S&P Global Market Intelligence estimates that about two thirds of planned EV jobs will be in the south.

Car companies are investing significant amounts in new factories in the U.S. southern states of Georgia, Kentucky and Tennessee. The migration from the Midwest has been gradually increasing for decades, but the IRA has aided in the expansion of the industry, particularly in the EV factories and battery factories. Taking advantage of existing incentives to build EV assembly plants and battery-making facilities in the South, the legislation is accelerating this transition but is not the only factor, as most of this investment has predated it (see box 2). Stakeholders have mentioned the following as factors of attraction:

- Generous subsidies from the federal government as well as state and local governments.
- Abundant labor—the south has been attracting new residents at larger rates than other regions in the United States— and lower labor costs (relative lack of unions). “The six states that gained the most through domestic migration (Florida, Texas, North Carolina, South Carolina, Tennessee, and Georgia) are all in the South ...” and among the sixteen southern states, only four (Louisiana, Mississippi, Virginia, and Maryland), experienced net domestic out-migration (Frey, 2023).
- Investment in worker training: Georgia, Virginia, South Carolina, Alabama, and Louisiana all have programs to expand local workforce education, especially in STEM and technical skills. Alabama offers free specialized technical training to both firms and jobseekers.
- Inexpensive power, critical to battery factories that use vast amounts of energy. Of the ten regions monitored by the Energy Information Administration, the “east south central”, including Kentucky and Tennessee, has the least expensive power in the United States, at about six cents per kilowatt hour, nearly 20% cheaper than power in the Midwest.<sup>9a</sup>
- Geographical advantages: for electric vehicles many companies aim to be near the I-75 interstate highway, which runs from Ontario through the Midwest and the South, and down Florida’s Gulf coast. It puts most suppliers and many customers within a day’s drive.
- Inexpensive land and stable geology: the Southwest, and specifically Arizona, has become the preferred destination for semiconductor manufacturers, thanks to its cheap land and stable geology.

State governments have also been very proactive in identifying land plots, pre-certifying industrial sites, making them well connected and working with the private sector in preparing the workforce:

- Kentucky, Hardin County: in 2002, Hardin County made the decision to make a 1500-acre supersite lot (roughly the size of 1,140 football fields) well connected to highways, railways, power, and water supplies and waited for the right buyer. In 2021 the site was given to Ford and SK for an EV battery joint venture (BlueOval SK) that is expected to invest US\$ 6 billion and employ 5,000 people.
- Georgia: in 2008 started a program to pre-certify industrial sites, setting them up for fast-track construction. In May 2022, Hyundai Motor announced it had selected the land for a US\$ 5.5 billion manufacturing site that would include both an EV assembly plant and a battery factory. 8,100 jobs are expected to be created. Hyundai highlighted Georgia's efforts to prepare the local workforce. One program, run by the state, sent leaders to Asia to learn the machinery used in Hyundai plants and will set up an employee training center, including mock assembly line equipment, at a facility near the plant (Eckert, 2023).
- Tennessee launched an initiative similar to that of Georgia in 2012.
- In the Midwest, Ohio was similarly proactive, but others have been slower: Michigan passed site-readiness legislation in 2021; Illinois founded a megasite-investment program in 2023.

Nathan Niese of BCG consultants says the region's officials were ahead of the curve. "They have been focused from the beginning on the ease of doing business. They have well-prepared megasites, and within 24 hours of a request can get full details about them into your hands," he adds (The Economist, 2023b).

Finally, one of the lessons from these experiences is that governments should invest in expanding training for working adults and in helping local firms to master new technologies such as machine learning, augmented reality, additive manufacturing and so on. The better understood a new technology is, the less important it is for those wishing to use it to be near the people and firms where it originates. Post-secondary education could expand its focus from equipping individuals with skills to speeding the flow of knowledge from those who generate it to everyone else, companies included.

Source: Prepared by authors based on Frey (2023), Eckert (2023) and The Economist (2023b).

<sup>a</sup> That cost advantage is based on the south-east's reliance on coal: Kentucky, for example, generates about 70% of its electricity from coal, the fourth-highest share of any state. It is adding more renewables to its mix, though progress is slow. "The fundamental reality is that today, coal-fired facilities are delivering reliable, efficient electricity," says Jeff Noel, secretary of Kentucky's cabinet for economic development (The Economist, 2023b).

### **Box 2** **The South Carolina Experience**

In the early 1990s South Carolina's leaders learned that BMW had plans to open a factory in the United States. a US\$ 1-per-year lease for the four-square investments in infrastructure, including investment at State universities and local community colleges to develop training programs that could be coordinated with the carmaker and its suppliers.

BMW asked three baseline questions of businesses, state and local agencies, and high schools and colleges in South Carolina:

- How do we build up the local base of suppliers we can do business with, so we innovate together?
- How can we work with you to make sure local workers, not just people who migrate in, get the best-possible shot at good jobs, and better yet careers, in our industry?
- How about we launch R&D partnerships with your universities?

The plant BMW has built there is now the firm's largest in the world and the network of firms that supplies BMW has attracted other companies to the region, as have improved transport links to cities in North Carolina and Georgia.

Source: The Economist (2017).

If the region manages to take advantage of the increased demand for raw materials brought about by the three signed laws in the United States and by the green transition at the global level, it may struggle to manage the risks associated with a sudden influx of capital, as seen in the past. “One risk is the appreciation of domestic currencies, buoyed by current-account surpluses, making non-commodity exports less competitive. Another is that, with labor and capital flowing to extractive industries, other industries would be deprived of scarce resources, with the domestic economy becoming more dependent on a volatile sector” (The Economist, 2023a). Following the end of the most recent commodities boom in 2013, regional economies grew at an average annual rate of only around 1% compared with 4.1% in the decade before. According to ECLAC’s most recent estimates, the average rate of growth in the last ten years (from 2014 through 2023, considering the projection of 1.3% growth for this year) is just 0.9%, or less than half the growth the region had in the “lost decade” of the 1980s (Economic Commission for Latin America and the Caribbean, 2023a).

To mitigate such threats, the region’s central banks can intervene in foreign-exchange markets to keep a lid on the currency. Looking to be proactive, exporters can hedge against price fluctuations by buying futures and options on derivatives markets. And governments can employ smart fiscal rules, such as establishing that a share of proceeds should be saved when prices are high (The Economist, 2023a).

Another important risk for some countries in the region is the threat of being left behind by these shifts in policy and strategy. In trying to address some of globalization’s failings —such as the disappearance of U.S. middle-class manufacturing jobs and spending power— or whether for reasons of national security, geopolitical competition or supply-chain concerns, the United States new industrial policy and international economic policy agenda may lead to an unwinding of global integration. Especially at risk are smaller, developing economies that need access to global markets to achieve economic prosperity. Smaller economies that were booming during the globalization period may now be at a disadvantage, as they lack the scale to compete against the largest economies in offering subsidies and incentives. One solution for countries that cannot compete is to build new alliances. For example, Indonesia’s government is participating in the U.S.-led Indo-Pacific Economic Framework for Prosperity, an economic pact that it hopes will improve market access for its minerals. Countries may also draw trade partners closer and seek to benefit from their industrial policies (Ballard et al., 2023).

## V. Conclusion

The economic policy agenda of the current United States Administration has resulted in the passage of three new laws that stress large-scale public investment towards infrastructure, improved industrial competitiveness and a green transformation. They seek to address a wide array of challenges, including expanding productive capacity, building resilience and shoring up supply chains, and addressing economic fairness. In the process, their goal is to spur innovation, fight climate change and create new jobs. The United States new industrial policy has two key components: public investment to help the United States economy with the green transition and to become more inclusive, and a revival of a “Buy American” policy that includes funding provisions that favor U.S. companies and workers.

As the Inflation Reduction Act, the third of the major legislations passed in the United States in the past year and a half completed its first anniversary on 16 August 2023, it has become clear that it can be a game changer not only for the United States but also for the world. There is much criticism of this U.S. foray into industrial policy. According to critics, “Buy American” will worsen inequality instead of improving it. Trade restrictions and preferential treatment of U.S. companies will increase prices, which could worsen inflation and hurt the poorest. Others ask why the government would do a better job than the markets allocating scarce resources. According to them, one of the reasons why industrial policies have failed in the past was that the allocated public funds were frequently used to also advance unrelated goals.

However, there seems to be a consensus, especially after the COVID-19 pandemic, that the world economy today is different from what it was in the past thirty years. There is the recognition that growth should be more inclusive, that the trade system may not be open and resilient during shocks, and that there are important geopolitical tensions. In this context, industrial policy is looked upon more favorably.

There are immense challenges to implement and execute these laws in a way that benefits outweigh costs. For their passage, the three legislations offered mostly “carrots” and no “sticks”. They contain no restrictions on greenhouse gas emissions and offer a basket of incentives for corporations and households, big cities and rural towns, nonprofit organizations and utility companies. The goal is to

create a coalition that will support the transformation of the way energy is produced and consumed in the United States. That places the onus on businesses and individuals to organize themselves to take advantage of the laws, which recent polls suggest the general public does not understand very well. Rulemaking and messaging should work to dissipate uncertainty, as businesses and households respond better when the rules, benefits, and costs are clearly stated.

From a U.S. domestic perspective, the laws' scale and complexity (their provisions can be intertwined and overlap) make accountability difficult. In general, the IRA tax credits are uncapped, which leads to some uncertainty around the budgetary impact of the law. It is important that these risks are addressed as the laws' implementation effort rolls out, by finding ways to increase transparency and by establishing clear authority and decision-making rights among multiple actors and stakeholders. The federal government has suggested that states use a strategy from the 2009 Recovery and Reinvestment Act, the "state infrastructure coordinators". To optimize impact, states should consider coordinating with local governments during the implementation process. Public officials could establish a project management office, or taking the idea further, a results management office so that waste and abuse is minimized during the execution of these laws.

From a worldwide perspective, these laws may create opportunities but can also leave some smaller players behind. As new tax credits for manufacturing batteries, solar-equipment and other green technology attract private capital to the United States, other advanced economies are following suit. The European Union, Canada, and Japan have implemented policies to support their own green-energy support package. All of them are seeking to become less depended on China, which has a big lead in areas including batteries' production and the minerals to make them.

For Latin America and the Caribbean, the green transition and the geopolitical tensions that have motivated the passage of these laws may work in its favor, as demand for the raw materials that support a green transition—which the region has in abundance—goes up and the nearshoring impetus plays out. Some smaller players may be threatened by this policy shift, however. Smaller economies that were on the rise during the decades of free trade may be at a disadvantage in a new era of aggressive industrial policy, as they lack the scale to compete against the largest economies in offering subsidies and incentives. Countries that cannot compete could draw trade partners closer and benefit from their industrial policies, as Canada and Mexico have done through their free-trade deal with the United States. For the United States industrial policy to achieve its full potential and ambition, therefore, public investment should be carefully targeted and whenever possible internationally coordinated.

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