



# U.S. Industrial Transformation and the “How” of 21st Century Industrial Strategy

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## Abstract

The U.S. policy paradigm has shifted in the first years of the Biden Administration toward a more robust industrial strategy. Over the next decade, trillions of public and private-sector dollars will be invested in technologies and industries deemed critical to national and economic security. This sets the U.S. on a new trajectory, one that accelerates the development and growth of innovative technologies and key industries while also attempting to rebuild U.S. manufacturing capabilities and the middle class more broadly. This shift in U.S. policy is generating significant debate about the merits of industrial policies and their efficacy. This paper outlines the promises and pitfalls of industrial strategy and the key provisions in the three pieces of recent legislation including “guardrails” and “conditionalities” that are meant to put the country on a path toward successful implementation. While there has been significant focus on the “what” of the Biden industrial strategy, less attention has been paid to the “how.” This paper reviews the criteria by which to judge the how, the key provisions of the new legislation, and broader challenges and limitations to meeting all of the Biden Administration industrial strategy objectives.

**Keywords** Industrial policy · Political economy · U.S. policy

**JEL Classification** H1 · L5 · L6 · P1

## 1 Introduction

In its first two years in office, the Biden Administration in both words and deeds laid out a “Modern American Industrial Strategy.” The strategy articulates the goals and rationale in both domestic and foreign policy to increase U.S. global competitiveness and address gaps and vulnerabilities in U.S. national and economic security (Deese 2022; Sullivan 2023). A confluence of changes in the global and domestic landscape—supply chain vulnerabilities laid bare by the pandemic, geopolitical conflicts including rising competition with China, concerns about the U.S. industrial base as well as growing inequality, and extreme weather

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events related to the existential threat of climate change—have led to profound changes in U.S. policy. Recent federal legislation has put into place a new industrial strategy that will lead to trillions of public and private-sector dollars invested over the next decade. This sets the U.S. on a new trajectory, one that accelerates the development and growth of innovative technologies and key industries while also attempting to rebuild U.S. manufacturing capabilities and the middle class more broadly.

This agenda is a significant shift in direction from the past several decades in terms of its scope, scale, and public advocacy. It directly challenges the neoliberal free market paradigm by using the tools of the federal government to actively steer investment and development in areas deemed critical national priorities. This paradigm shift in U.S. policy is generating significant debate about the merits of industrial policies and their efficacy.<sup>1</sup> Classic concerns center around governments “picking winners” along with rent-seeking and political capture of benefits by a few, favored firms. As MIT Professor of Economics Daron Acemoglu writes, the Biden Administration’s strategy must be “much more broad-based and pro-competitive, rather than getting mired in attempts to pick winners and falling prey to mission creep” (Acemoglu 2023).

How does this latest wave of new industrial policies build on lessons learned and avoid the worst potential outcomes? This paper outlines the promises and pitfalls of industrial strategy writ large and the key provisions in the three pieces of legislation—the Infrastructure Investments and Jobs Act (IIJA) passed in November, 2021, and the CHIPS and Science Act and the Inflation Reduction Action (IRA) both passed in August of 2022—that are meant to put the country on a path toward successful implementation. While there has been significant focus on the “what” of the Biden industrial strategy, less attention has been paid to the “how.” As implementation gets underway, the how will become more critical to ensuring successful translation from the theory to the practice of industrial policy. This paper outlines criteria by which to judge the how, the key provisions of the new legislation, and broader challenges and limitations to meeting all of the Biden Administration industrial strategy objectives.

## 1.1 Industrial Strategy Redux

Industrial policies (which, as a whole, make up a broader industrial *strategy*) have always existed in the U.S., at least since the publication by Alexander Hamilton of the *Report on Manufactures* (Hamilton 1791). In recent decades, industrial policy has been derided publicly but deployed nonetheless in practice to varying degrees whether through trade measures, subsidies or R&D investments in particular industries (autos, textiles, steel, semiconductors), or more mission-driven areas (clean energy, vaccine production) (Hufbauer and Young 2021).

The tools of industrial policy have not changed significantly over time—subsidies, loans, tax incentives, tariffs, infrastructure development, R&D investments, regulation—but the rationale for industrial policy and how these tools are applied has evolved. The

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<sup>1</sup> The following are representative of a range of articles published in 2023: Eichengreen, B. “The New Industrial Politics.” Project Syndicate; Juhasz, R., Nathan Lane and Dani Rodrik (2023). “The New Economics of Industrial Policy.” NBER; Ip, Greg (2023). “This Part of Bidenomics Needs More Economics.” Wall Street Journal; Smith Noah (2023a, b), “The New Industrial Policy, Explained” and “The Push Back Against Industrial Policy Has Begun.” Noahpinion; Tyson, L. and John Zysman (2023). “The New Industrial Policy and its Critics.” Project Syndicate.

Biden Administration's approach, which integrates domestic and foreign policy, is focused on both national and economic security. It supports investment in domestic production capacity but also builds partnerships with allies to secure global supply chains in critical products. It invests in innovation in frontier technologies that will help shape economic growth and security in the future. This new framing combines traditional sector-based and mission-based industrial policy focused on key industries and/or technologies with values-based policies that emphasize the means not just the ends of the country's industrial strategy. It also pursues such measures in the context of a robust capitalist system, albeit one that needs modification and management to avoid the worst excesses. The Biden Administration has underscored its support of capitalism, but at the same time, points out the ways in which free markets are not always free and capitalism without guardrails tends to concentrate benefits at the top of the income distribution ladder as well as among large firms (LaPierre 2020; White House 2021a, b).

Today's industrial policies use significant incentives to "crowd in" private sector investment to accelerate the growth and, in some cases, creation of markets in the U.S. Each law leans on a different set of tools and, as a whole, should be seen as a portfolio approach to industrial policy. The IJA distributes the majority of its funds to states through formula funding, typical of infrastructure funding. The CHIPS and Science Act is primarily funding semiconductor manufacturing through discretionary funding, appropriate for the most targeted industrial strategy of the three laws focused on national security. It also introduces export controls, among other more aggressive tools in the industrial policy toolkit. The IRA largely uses tax credits to incentivize private investment in clean energy. Across all three pieces of legislation, a number of carrots and sticks are used to support values-based policies that encourage the creation of quality jobs as well as to drive investment toward places that have been "left behind" economically in the past few decades.

### 1.1.1 Designing Successful Industrial Policy

The classic critiques of industrial policy center on two core issues. The first is the concern that governments cannot "pick winners" and lack the information and insights that free market competition can provide in terms of understanding the promise of a particular technology or industry. The second is that industrial policy inevitably leads to rent-seeking by firms. By choosing some firms or sectors over others, government support leads to corporate welfare, politically favored firms, and poorly chosen sectors. Subsidized firms become less efficient, productive, and competitive, not more so. In general, economists worry about market distortion and costs to the economy in terms of both inefficiency and higher costs that outweigh any benefits to the public.

Indeed, it is hard to engage in industrial policies in purely economic terms given the political processes involved in passing legislation and setting "the rules of the game." Climate change mitigation policies provide a good example of both the justification for industrial policy (the negative externalities generated by global warming) as well as the way it is shaped by political economy (Jenkins and Karplus 2017). For example, price signals to the market—such as a carbon tax—are highly efficient and could have a large macroeconomic effect on reducing energy consumption and thus driving a significant reduction in emissions. However, carbon taxes visibly raise the cost of energy in the near term while the benefits accrue to others in the long term, making adoption of such taxes politically challenging. Tax credits, on the other hand, can encourage investment in renewables and lower energy prices, while the costs largely take the form of increased fiscal burdens to the

federal deficit, which are less visible to the public and spread out over time (Bistline et al. 2023). As Jenkins and Karplus write, “political economy constraints motivate a search for climate policies that are politically feasible, environmentally effective, and economically efficient.”

Today’s “modern” approach has taken steps to avoid to the extent possible the slippery slope of industrial policy and researchers point to a number of ways to mitigate the inevitable risks that exist. First and foremost, industrial policies are most effective when they are inducing *greater competition* within a sector. As Aghion et al. (2015) show, to the extent industrial subsidies are “competition friendly,” they can lead to increased productivity through firm investment in innovation and growth. This requires policies that do not focus on a single firm but are dispersed or available across a sector. As the authors write, “targeting can have beneficial effects depending on both the degree of competition in the targeted sector and on how the targeting is done.”

In terms of how the targeting is done, many emphasize the importance of *process over outcomes* (Rodrik 2004). Through a well-designed process, strategic collaboration between the public and private sectors can be structured for problem solving over time as both sides work toward shared goals. Importantly, a solid, institutionalized process can also help stop the implementation of policies when there is a need to change or reverse course.

A review across the three pieces of recent legislation and their initial implementation suggests the following criteria as part of a well-designed process to keep industrial policies on track:

- *Competition*: as stated above, a central aspect of industrial policy, competition can be incorporated into policy through direct or indirect subsidies to firms within a sector, as well as a competitive process by which many firms, consortia, and/or regions compete for funding based on criteria that are transparent and quantifiable.
- *Crowding in private sector investment*: creating incentives that induce the private sector to invest alongside public investment which provides a level of validation by the market.
- *Portfolio approach*: rather than picking individual firms to subsidize, approaching investment through a portfolio approach at the industry level or with several companies rather than just a few helps de-risk favoritism or investing in one “national champion.”
- *Flexibility through “learning by doing”*: ability to pivot and revise policies based on real-time learning as the policies are being implemented and new information is incorporated into the policy implementation process.<sup>2</sup>
- *Transparency*: open process for applying for and receiving funding with clear criteria by which applications are judged.
- *Monitoring and evaluation*: requirements at each milestone of a grant that evaluate progress against objective criteria determined up front.
- *Accountability*: claw backs to grants if firms do not deliver on obligations that are tied to receiving funding.

All of these criteria are part of the current implementation process of the new legislation, but it will take time to see if they are followed. For example, whether there is flexibility in implementation through “learning by doing” remains to be seen. One could interpret

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<sup>2</sup> This is discussed in some detail in Rodrik, Dani. “An Industrial Policy for Good Job.” 2022. The Hamilton Project, Brookings.

recent rule changes at the federal and state level to streamline local permitting and land use regulation to facilitate the roll out of clean energy industrial policies as an example of pivoting and revising policy.

A final additional aspect of a “modern” approach to industrial policies involves shaping markets and the role of *conditionalities* (Mazzucato 2022; Mazzucato and Rodrik, 2023). In this case, government policy should go beyond the minimal requirements of addressing market failures to “shape markets,” so they better reflect the values and societal goals that governments have prioritized. The crowding in of private sector investment as listed above is one approach that helps accelerate the creation of new markets. But there are valid concerns that these investments will perpetuate some of the ills that markets have generated historically. “...Too often the state socialises the risks and privatizes the rewards when partnering with the private sector,” writes Mazzucato. Conditionalities, where government places obligations on recipients of government subsidies (such as the provision of child care or the sharing of windfall profits) should be used, it is argued, to support goals such as quality jobs, sustainable growth, and more broadly shared prosperity.

While these types of provisions clearly wade into more political debates, the idea of tying strings to the public funding companies receive (often in the millions or billions of dollars) is not unreasonable and has a long history across varying countries and political economies (Ibid; Evans 1995). Such requirements do place obligations on firms and can potentially distort markets (Smith et al. 2023). However, firms have a choice whether to accept government funding, and if the conditionalities or the process is deemed too onerous, they can choose not participate, which may trigger a response from the government to iterate on their policy. To date, the CHIPS Act, despite the significant conditionalities attached to it, has had a very high participation rate among semiconductor firms.

## 2 US Industrial Policy and the New Legislation

Each of the three laws has both “guardrails,” which look to limit the risks of picking winners and political capture by firms, as well as some level of “conditionalities,” which look for returns on public investment that speak to broader societal goals such as domestic production or quality jobs. After two years since the passage of the IJA and over 18 months since the passage of the CHIPS and Science Act and the IRA, the general contours of the policies are taking shape and a few overarching goals emerge:

**Resilience** For a range of reasons made apparent in the past few years, critical U.S. supply chains are vulnerable to disruption, putting U.S. national and economic security at risk in cases ranging from personal protective equipment (PPE) to semiconductors. To begin to address these weaknesses, the legislation encourages investment in areas deemed critical to the country such as semiconductor production of both frontier and legacy chips, clean energy capacity as well as critical minerals that are essential to both supply chains. Creating domestic production capacity is one strategy the administration is pursuing along with coordinating with partners and allies to ensure more resilient global supply chains that are less dependent on one company and/or region.

**Reindustrialization** Through tax incentives and grants, a significant amount of funding is de facto rebuilding U.S. manufacturing capacity. Loss of manufacturing capacity after decades of international competition, offshoring, and unfair trade practices has contributed

to the decline of manufacturing jobs which have historically been good paying, the deindustrialization of many urban and rural communities, and importantly, innovation capacity (Berger 2013; Bayard et al. 2022). However, whether through the investment in semiconductor fabrication facilities or clean energy production (e.g., solar, wind, batteries, EVs), there is now a level of investment going into the U.S. industrial base not seen since WWII. Over \$500 billion in new manufacturing investments have been announced since 2021 (roughly half in clean energy).<sup>3</sup> In addition, Made in America (MIA) provisions exist in IIJA-funded construction projects for manufactured products as well as in some of the IRA battery sourcing requirements. These are considered some of the most “protectionist” aspects of the Biden industrial strategy and have raised the most concern with conservative critics and allied countries. Supporters of the provisions point out that US MIA policies with respect to federally funded infrastructure projects are in line and potentially even more conservative than what exists in other countries and that in all cases, waivers or work arounds exist where MIA provisions are impractical.

**Job Quality** The challenge for the U.S. labor market in recent decades has not been a lack of jobs but a lack of *quality* jobs. Until the last few years, the median U.S. worker saw little to no growth in compensation over four decades despite productivity growth and gains for more highly educated workers (Autor et al. 2022). The lack of good benefits and strong labor market institutions (e.g., minimum wage, unemployment insurance, labor laws, unions) has created particularly poor, low-paying jobs primarily in the service sector. The Biden Administration, deemed the most pro-labor administration since Franklin Delano Roosevelt in the 1930s, has used both carrots and sticks to encourage the creation of quality jobs through its industrial policies. This includes requirements for larger-scale federally funded construction projects (over \$35m) to use Project Labor Agreements. There are also both carrots (IRA) and sticks (IIJA, CHIPS) to ensure that construction workers on projects are paid prevailing wages (JonesDay 2023). Significant funds are also going toward investing in new training programs for high skilled jobs in key sectors such as semiconductors and clean energy. At the same time, critics point out that there are no sticks per se to ensure new clean energy manufacturing jobs lead to quality jobs.

**Place-Based Strategies** Far from being location-agnostic, the new legislation deploys a range of tools and resources to direct investments toward specific places in the country that either foster the creation of new centers of global industrial competitiveness or invest in economically disadvantaged communities. For the former, provisions in the new legislation focus on regional industrial clusters and create competitive processes for building centers of excellence in multiple locations in key technologies and industries such as semiconductors and hydrogen. Place-based strategies that increase specialization through regional clusters and agglomeration economies drive higher wages, skills, product value-add, and GDP (Delgado et al. 2016). The new legislation leans into driving regional specialization and global competitiveness through a number of high-profile competitive grant programs that also require more inclusive regional coalitions (e.g., IIJA Hydrogen Hubs, CHIPS Act semiconductor regional clusters as well as Regional Technology and Innovation Hubs and National Science Foundation Engine grants). One of the goals with the cluster-based investments is to provide more significant funding at scale than has been provided in the

<sup>3</sup> For updated numbers, see Invest in America website by the White House (2023): <https://www.whitehouse.gov/invest/> and Rhodium/MIT (2023) analysis: <https://www.cleaninvestmentmonitor.org>.

past with the hope that more resources will help create a “tipping point” for regions with assets to build upon and create more globally competitive locations away from traditional, coastal locations. In the CHIPS Act, for example, the explicit goal was to create at least two regional semiconductor ecosystems of excellence in the country. Funding is specifically provided for building out the cluster through workforce training and supply chain investment. Carrots and sticks also ensure federal funding reaches the many places that have seen economic decline over the past several decades. Growing regional disparities and divergence in economic growth require specific strategies to address the high social costs that come with regional decline (Austin et al. 2018). For example, IRA tax credits provide a bonus if investments target economically disadvantaged communities as well as “energy communities,” those that have been historically sited near environmentally harmful industries like coal mining or oil extraction. Discretionary grant programs in both the IJIA and IRA have specific programs that target at-risk communities such as coal communities or tribal communities more narrowly (Rewiring America 2023).

Policies to support these broad goals are woven throughout the three pieces of legislation. Viewed as a whole, they can be seen as a combination of traditional, mission-driven, and values-driven industrial policies. Some of the goals of the legislation are traditional industrial policy in their focus on a sector such as building frontier semiconductor chip fabrication capacity. Reducing greenhouse gas emission by 40% by 2050 is more mission-driven, with a range of policies that touch wide ranges of the economy. Other goals are broader and support values around equity and inclusion as outlined above. Of course, the more political priorities are woven into industrial policies, the more they are at risk of being reversed and replaced by different political priorities with a change in administration. However, industrial policies need time to play out which provides an incentive to the party in power to hew toward policies that both sides can live with over time. In the case of the recent legislation, two of the three pieces of legislation had bipartisan support, and the third (IRA) is crowding in high levels of private sector investment in states whose leadership did not support the original legislation. This bodes well for reducing the risk of repealing the legislation.

The following highlights the core elements of the different pieces of legislation and parameters around their implementation. With thousands of pages of legislation and over 100 new programs, these summaries are not meant to cover all of the new policies but instead highlight some of the key areas in each law where there is both opportunity and risk for implementing a modern industrial strategy.

## 2.1 The CHIPS and Science Act

The bipartisan CHIPS and Science Act, the most narrowly targeted use of industrial policy among the three bills, allocates \$52 billion for investment in both the manufacturing of semiconductor chips (both frontier and legacy) as well as investment in R&D (\$11 billion). It also includes a 25% Investment Tax Credit for semiconductor manufacturers that represents an additional \$24 billion (Rubin and Hayashi 2023). The CHIPS Act is most vulnerable to concerns regarding corporate welfare or “picking winners” because unlike the IJIA, which is predominantly distributed through formula funding, or the IRA, which is primarily accessed through tax credits, the CHIPS Act is largely distributed through discretionary programs. It specifically targets expansion of semiconductor manufacturing, in which there are a relatively few, large companies, and also requires billions of dollars to build

foundries which can increase the risk of abuse and waste. To avoid these risks, the CHIPS rules that guide implementation include a number of guardrails as well as conditionalities outlined below.

### 2.1.1 Guardrails

While individual companies will benefit directly from federal government grants, the CHIPS Act takes a portfolio approach, in which all companies are invited to apply regardless of where they are domiciled (which avoids choosing a “national champion”). Competition is also central to the way the discretionary programs were designed, both with an eye on what it takes to build globally competitive semiconductor clusters, as well as in the grant making process itself. Discretionary funding is not just focused on the few leads OEMs that make cutting edge chips but also on the broader supply chain, providing competitive funding for building out the entire supply chain and regional “ecosystems.” Successful semiconductor clusters succeed because of their economies of scale and the depth and breadth of the entire cluster being *in situ*, thus the policy design is much broader than just funding the building of a new foundry. And in an effort to level the playing field for large and small companies, the uniform tax credit is also open to all companies investing in semiconductor production as are other financial programs such as loans and loan guarantees.

An important element of the CHIPS policies is the role of states. Companies applying for funding must apply with state contributions and incentives in hand, which indicate commitment and partnerships at the local level toward investments in the broader cluster. Applications are judged in part on the quality of the incentives states are providing, and as the CHIPS office has emphasized, the size of incentive is not necessarily the most important criteria. The quality or duration of the contribution or criticality to the supply chain or cluster—energy provisions, infrastructure, shared facilities—could all be considered as valuable if not more valuable than tax breaks or property abatements.

There are 40 plus criteria by which applications are judged in the largest grants program, and applicants are awarded points for each criteria. Ultimately, however, the Commerce Dept has significant discretion in making the awards to steer investments toward priorities related to national security, economic security, and other goals. If applicants fail to live up to the conditions they agree to as part of the grant, applicants will be required to return the full amount of an award.

### 2.1.2 Conditionalities

The CHIPS act laid out a number of requirements or “conditionalities” required of recipients of the funds that reflect many of the administration’s societal values and broader goals for the legislation regarding the creation of quality jobs, investment in skills, and restrictions on corporate benefits. These include (1) provision of day care for construction and laborers, (2) use of union workers and payment of prevailing wages in construction of facilities, as well as use of U.S.-made iron and steel (a typical requirement for federal construction projects), (3) a workforce development plan including provision of apprenticeships, (4) a limit on stock buybacks and dividends over five years



from the receipt of federal funding, (5) a sharing of profits with the government in the case of any windfall profits, and (6) limits on the expansion of companies' operations in China for a decade.<sup>4</sup>

Several companies expressed concerns about these provisions, particularly profit sharing, which would require disclosure of sensitive company information with the government (Jie 2023). However, this provision occurs only if a recipient's cash flow "significantly exceeds projections," and the Commerce Department states the requirement could be waived in exceptional circumstances, the terms set on a case-by-case basis. In truth, it is hard to imagine a scenario in which any of the companies building foundries will experience "windfall" profits in a highly competitive industry with increasing supply coming on line globally. Regardless, this provides an example in which there is some flexibility and discretion in the application of the rules—an opportunity for "learning by doing." The other aggressive condition regarding expansion in China, while challenging, is time limited and likely not a major disrupter to companies, many of which are already operating in China.

As of the end of 2023, semiconductor firms had announced over \$200 billion in commitments to invest in semiconductor production in the USA. Clearly, the conditionalities imposed in the CHIPS rules have not been so onerous as to deter semiconductor companies from investing.

## 2.2 The Inflation Reduction Act (IRA)

The climate provisions of the IRA represent the largest investment the USA has made toward transitioning the economy to clean energy and targets a reduction of U.S. greenhouse gas emissions of 32–42% below 2005 levels in 2030, which is 6 to 11% points lower than without the IRA (Bistline et al. 2023). The \$370 billion provided in the law over 10 years is largely delivered through tax incentives (approximately three-quarters which translates into approximately \$270 billion). Most of the tax credits are uncapped and rely on individual firm and household decisions in terms of usage. The other roughly \$100 billion is divided across competitive subsidy and loan programs including across some relatively large programs such as the Greenhouse Gas Reduction Fund—a "green bank" (\$27 billion) and the Loan Program Office (an additional \$12 billion plus additional \$40 billion in loan authority).<sup>5</sup>

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<sup>4</sup> These provisions refer to "significant transactions involving the material expansion" of manufacturing capacity for leading-edge and advanced semiconductors in "foreign countries of concern" for 10 years by constructing new facilities or expanding existing ones. "Significant transactions" are those costing at least \$100,000 and "material expansion" as increasing a facility's capacity by 5%. Under the Chips Act, the funds' recipients are also restricted expanding their capacity in less advanced or legacy chips. With respect to legacy chips, the proposed rule prohibits the companies from adding new production lines or expanding a facility's production capacity beyond 10%. The recipients will also be allowed to build a new legacy facility only if it predominantly serves the local market, with at least 85% of the output incorporated in the final products consumed in the foreign country of concern. See Hayashi, Yuka. "Semiconductor Firms Asked to Submit Financial Projections to Get CHIP Act Funds." *Wall Street Journal*, 2023 and Rubin and Hayashi 2023.

<sup>5</sup> For a comprehensive review of the provisions of the IRA, see Bipartisan Policy Center. "Inflation Reduction Act Summary." 2022.

### 2.2.1 Guardrails

Unlike previous tax credits, the primary tax credits in the IRA (Clean Energy Production Tax Credit (PTC) and the Clean Electricity Investment Tax Credit (ITC) are designed to be technology-neutral and flexible between clean energy technologies that generate zero greenhouse gas emissions. While there are other tax credits (a total of 18) and funding programs that pick specific technologies for additional subsidies (e.g., hydrogen, nuclear, solar, wind, clean fuels), the broader shift toward technology-neutral tax credits encourages the private sector to determine where best to invest its resources in clean energy (BLS 2023). The PTC and ITC provide a base tax credit of between 6 and 30% of the investment cost of a project when prevailing wages and apprenticeship requirements are met. In addition, unlike previous tax credits, the credits can be accessed through “direct pay” or transferability, which means entities that do not pay taxes such as government, tribal communities, and places of worship can access the tax credits through offsets, and taxpayers that are generally ineligible for direct payment of credits may transfer all or a portion of certain credits to an unrelated party in exchange for cash. This provision supports the equity goals of the administration to ensure that benefits from the law go beyond just for-profit companies.

In theory, the Treasury Department can revoke the use of the credits if conditions are not met, but there is no additional enforcement mechanism built into the legislation—the IRS, as with all tax policy, is responsible for enforcement. Beyond annual reporting by companies who use the tax credits, grants through discretionary spending provide more opportunities for negotiating accountability in the contracts including the use of community benefit plans and project labor agreements. The 10-year time frame also allows for planning and investing beyond short-term political cycles which should lead to greater impact.

### 2.2.2 Conditionalities

There are several areas where conditions have been placed on the use of tax credits as well as with some of the discretionary programs. Three of the more prominent tools used speak to concerns with equity as well as domestic production:

*Bonus Tax Credits:* Additional “bonus tax credits” beyond the base credits are available. More so than the IJA or the CHIPS Act, the IRA deploys more carrots than sticks to incent companies to make investments in areas that speak to broader societal goals. Additional tax credits can be obtained by any company that (1) uses domestic content (U.S. produced iron and steel, and at least 40% of the manufactured components are mined, produced, or manufactured in the USA); (2) invests in brownfields, retired coal communities, or significant fossil-fuel related investments; and (3) invests solar or wind in a low-income community. All in, base and bonus tax credits can cover up to 70% of a project’s costs. Companies can claim the credit and then must be prepared to verify their adherence to the criteria above.

*Community Benefits Plans:* Every recipient of a Department of Energy IRA competitive grant needs to provide a Community Benefits Plan (CBP) that outlines how the project may affect marginalized communities and how it will address any adverse impacts. The plans are an outgrowth of the Administration’s Justice 40 efforts, which speak to redressing the environmental damage that has been perpetrated on lower income, marginalized communities over decades. These were outlined in the Administration’s first Executive Order in 2021 (White House 2021a,

b) which set as a goal (unenforced) that at least 40% of the benefits from grants, programs, and initiatives flow to disadvantaged communities. CBPs are meant to go beyond just job creation and look more holistically at issues of job quality, access and broader metrics of community well-being. CBPs score at 20% of the technical merit review of proposals and are posted on the DOE's website. There is broad latitude and flexibility to determine what is part of a CBP which will no doubt generate innovation, experimentation, and some uncertainty as CBPs are created.

*Electric Vehicle Tax Credit to Consumers:* Consumers are eligible for a \$7,500 tax credit for the purchase of an EV if the EV has final assembly in the USA and if at least 50% of the battery components and 40% of the critical minerals for the battery are sourced in the USA (Houser et al. 2023). This provision was aspirational and aggressive given the paucity of battery manufacturing and critical minerals such as lithium currently in the USA. But the rules provide flexibility and a gradual escalation of percentage domestically sourced since the critical minerals can also be sourced from one of the 21 countries with which the USA has a Free Trade Agreement as well as Japan. This provides an immediate "release valve" to the sticks of the legislation. These provisions have generated the most concern from U.S. allies in Europe as well as in Asia. However, recent research by the Rhodium group suggests that on the whole, roughly 10% of total funding of the IRA provides direct fiscal support to US domestic manufacturing. The legislation broadly focuses on acceleration of deployment and adoption in the USA, and tax incentives are available to all companies, regardless of where the company is domiciled. As the authors underscore, this is a "relay race, not an arms race" (Ibid).

Like in the case of the CHIPS act, despite some of the conditionalities, the private sector has responded positively to the IRA incentives with announcements as of the summer of 2023 of over \$240 billion in investments in EVs, batteries, and clean energy more broadly.

### 2.3 Infrastructure Investment and Jobs Act (IIJA)

The Infrastructure and Investment and Jobs Act (IIJA) passed with bipartisan support in November of 2021. It represents approximately \$900 billion in investment primarily in transportation to support typical infrastructure investments in roads, bridges, rail, ports, and airports but also provides close to \$100 billion for investments in clean energy infrastructure as well as over \$60 billion for broadband build out. Approximately 80% of all IIJA funds flow through state offices based on formula funding with the rest distributed through competitive grants, largely distributed over the first five years of a 10-year period. There are over 100 distinct programs or sub-programs. A few of the more important ones include a focus on highways and bridges (\$350 billion), drinking and clean water (\$54 billion), and a number of clean energy-related programs that speak to energy transmission and distribution resiliency (\$29 billion), energy demonstration projects (\$20 billion), and investments in several renewable energy areas including hydrogen, nuclear, and EV batteries.

Investments in transportation or communications infrastructure do not necessarily represent industrial policies per se. Such investments are fundamental to the production of goods and services and provide benefits over the long term that are foundational to the country's economic growth.<sup>6</sup> While the IJA expanded the traditional view of infrastructure to include access to broadband as well as renewable energy, these investments could be viewed as standard investments that governments make to ensure the fundamental workings of a national economy.

However, there are provisions within the IJA that are clearly part of the administration's broader industrial strategy. The additional investments in clean energy are complements to the IRA and focus in particular on clean energy innovation and infrastructure with investments in a new Office of Energy Demonstration (\$20 billion), clean hydrogen hubs (\$8 billion), nuclear (\$6 billion), EV charging infrastructure (\$5 billion), and several other priorities (Bipartisan Policy Center 2022).

The part of IJA that is most prominent (and most controversial) from an industrial strategy perspective is the domestic content provisions. The Build America, Buy America (BABA) provisions attached to IJA are some of the most robust the USA has put in place since the federal government introduced Buy America provisions in federal procurement in the 1930s (OMB 2022). To underscore the renewed interest and use of this tool, the Biden Administration created the Made in America Office (MIAO) to bring greater transparency and robustness to Buy America and BABA regulations that are in the new legislation as well as part of federal procurement more broadly. These provisions apply to all federally-funded infrastructure projects, whether part of IJA or not, and require the use of domestically sourced inputs for federally funded projects or make the case why that is not possible.

### 2.3.1 Guardrails

The guardrails in IJA largely ensure funds are used to support the creation of quality jobs and provide workers more voice. Discretionary funding, for example, requires applicants for competitive grants to show how their project creates good paying jobs, allows for the free and fair choice to join a union, uses project labor agreements as well as creates registered apprenticeships. For DOE-related funding, applicants must provide a Community Benefits Plan (described above) that outlines exactly how communities impacted by the new funding will benefit from it or at least not be harmed by it. While the latter has no real teeth for enforcement, it at least requires an assessment by applicants of the impact of projects on disadvantaged communities that has rarely been taken into account in the past. Applications are judged in part by these criteria.

### 2.3.2 Conditionality

The primary and most significant conditionality in the IJA is the Build America, Buy America (BABA) Act which goes beyond previous domestic content requirements in several ways. IJA-funded projects must use 100% iron and steel produced in the USA as well as meet BABA provisions for manufactured products and nonferrous construction materials (plastic, polymer, glass, lumber, drywall, etc.). A total of at least 55% of the value of

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<sup>6</sup> Physical infrastructure is an essential input to the production of goods and services and public investments generate economic multipliers estimated at 1.5 times greater than the initial investment within 2 to 5 years. See the Vagliasindi 2022 and Global Infrastructure Hub 2021.

the product (excluding labor) used in a project must be manufactured in the USA. Obviously, the ability to transition global supply chains to a majority US-manufactured product takes time and also can be economically unviable, particularly for low-value added products. To address these realities, agencies may grant waivers to funding recipients (which are reviewed by the MIAO) and put in place for a negotiated period of time with periodic reviews. This new process does a number of things simultaneously. It first requires firms to make a concrete case for why making the majority of a product in the USA is not feasible providing important insights into the strengths and weaknesses of the US manufacturing supply chain. Second, it brings transparency to the waiver process so that those building products and those supplying to those builders can understand demand signals and supply constraints better. Finally, it offers another “release valve” in the case of products that cannot be made in the USA in a timely fashion or do not make sense to manufacture in the USA and provides companies as well as the public with solid arguments against the use of BABA as well as road maps toward majority-U.S. production over time.<sup>7</sup>

The Made in America thrust of IJA is one of the most significant “sticks” of the Biden industrial strategy. Its rules are applied across the board on iron, steel, manufactured and construction products, some of which are likely low-value added products that are not economic to make in the USA. These types of provisions for federally funded infrastructure projects are common across countries and become more popular in recent years, though economists point out evidence that suggests they reduce competitiveness and economic growth in the longer term (OECD 2023). Such provisions, however, are more common with federally funded infrastructure projects that primarily affect the construction and manufacturing industries and are important politically with organized labor.

### 3 Conclusion

Regarded as a whole, the three pieces of legislation represent a remarkable shift in policy and a full embrace of industrial strategy leading to the largest investment in the US industrial base since post WWII. Analysts estimate that the IRA alone will lead to a combined public and private-sector investment in clean energy of over \$3 trillion over the next decade (Goldman Sachs 2023). If crowding in private sector capital were the only criteria for judging these new industrial policies, they could already be considered a great success. But, of course, that is not the only criteria by which to judge these policies. The Biden administration’s modern industrial strategies have other criteria that speak to process (e.g., competitive, transparent), guardrails (e.g., tech neutrality, expanded access to tax credits), conditionalities (e.g., quality jobs, domestic production), and ultimate outcomes (a globally competitive semiconductor industry, robust domestic renewable energy industries). Reaching these goals will require aggressive

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<sup>7</sup> The case of EV charging infrastructure is a useful example of how BABA is addressing the needed transitional time to build domestic production capacity. The USA has had little to no capacity in EV charging infrastructure manufacturing due to the lack of demand. As states receive funding for EV charging infrastructure build out, that demand is increasing. There is no ready supply from other countries to import so building this capacity in the US makes sense, particularly in a growing industry. The Department of Transportation issued a temporary waiver in February, 2023 that will be phased out by July, 2024 to allow the domestic industry to take root and create a pathway forward to ultimately meet the BABA requirements in which final assembly occurs in the USA and the cost of components manufactured in the USA is at least 55% of the cost of all components. See the Federal Register, 2023.

monitoring, evaluation, and an ability to flexibly adapt when policies are not playing out as intended or new challenges arise, which they inevitably will. This is already happening, for example, with additional rulemaking introduced by the Federal Energy Regulatory Commission (FERC) in July 2023 around energy transmission reform to expedite expansion of grid capacity and construction of transmission lines which are impeded by permitting processes at the state level (FERC 2023).

Federal government agencies will need to increase their capacity and expertise to not only disperse funds but also maintain communication with stakeholders to ensure the guidelines and processes that have been put in place are adhered to and do not devolve into the worst aspects of industrial policy. There is no doubt more risk and pitfalls with policies that reach beyond just addressing market failures and look to help shape and create markets. The current slate of policies and programs build on lessons learned and incorporate new voices and coalitions<sup>8</sup> to strengthen US national and economic security through industrial strategy. Hopefully, this coalition continues to hold as the country embarks on implementation.

It is also important to be realistic about what can and cannot be achieved with new US industrial policies. There are limitations to the transformation that can occur and its impact on US global competitiveness. The CHIPS act funding is relatively small in terms of building globally competitive semiconductor manufacturing capacity. Even in the best case scenario, US production will have a small dent on Taiwan's dominant global position (the country produces over 60% of all semiconductors and over 90% of the most advanced). The IRA will move the needle on US greenhouse gas emissions by 6–11% from current trends moving the country toward its net zero goals but still not quite closing the gap. And even with all of the guardrails and conditionalities and trillions of dollars of investment, it will be hard to achieve broader goals related to reducing income inequality or increasing job quality and worker voice outside of the narrowly defined areas of the legislation. Transformational change in these domains will require more institutional and structural reforms, some of which the Biden Administration is pursuing. In the end, these major values-based missions will require a sea change that goes beyond the role of the federal government.

However, using the tools at its disposal, the Biden Administration has set a new bar in scope and scale for industrial policy in the 21st century that will have significant ripple effects across the entire US economy as well as in other countries and regions (witness the evolution of the European Union's Green Deal). With appropriate attention to the "how" of industrial strategy, the U.S. has a chance to achieve many of the bold goals set out across these laws over the next decade. This will require rigorous monitoring and evaluation, as well as feedback and iteration, to ensure a fair process that leads to longer-term desired outcomes. It also provides an opportunity to engage in much needed research on industrial strategy. This next chapter in U.S. policymaking will generate rich data, case studies and opportunities for longitudinal studies on the impact of industrial strategies at multiple levels. This next chapter ultimately ushers in a new chapter of positive transformation in the U.S. if the "how" of industrial strategy is taken seriously.

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<sup>8</sup> The concept of "shaping markets" is at the heart of a new center at the University of Chicago (2023), historically a stalwart proponent of free-market, neoclassical economics. See <https://marketshaping.uchicago.edu>.

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## Declarations

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