

Industrial Policy 2025: Bringing the State Back In (Again)

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Foreword

By Todd N. Tucker

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1. Introduction

This collection of essays is a first-of-its-kind interdisciplinary analysis by a diverse group of scholars from around the world that aims to answer the question: What institutions and strategies are missing from US industrial policy that could help it be more successful? The collection looks at the potential tools of economic statecraft that could complement the tax credits and grants that have formed the core of the Biden administration's first-term industrial agenda.



What institutions and strategies are missing from US industrial policy that could help it be more successful?

The ideas in this collection have two things in common. First, the cases described in each essay involve a more active role for the state in the economy than neoliberal scholars or policymakers in the United States have embraced in recent decades. Second, they have been practiced somewhere in the world at some point in time (including right now). In other words, they are not merely theoretical; they are real-world precedents that scholars, policymakers, and the broader public can study and learn from—assuaging potential concerns about an expanded role for the American state. The case studies do not revel in “statism” for its own sake. Rather, each of this collection's contributors analyzes a toolkit or strategy that would address concrete problems that currently bedevil US industrial strategy.

This foreword starts by taking stock of the last three years of industrial policy developments, and the criticisms these have generated from certain observers about what has been seen as excessive levels of state intervention. A second section looks to how comparative politics research can provide further context as to whether and how higher levels of intervention could be justified. A third section introduces the reader to the essays that make up this compilation, and how they push both theory and practice forward.

2. The New Industrial Policy and Its Critics

After decades of policymakers attempting to minimize the actual or perceived role of the state in the economy, the state is undeniably back as a key actor. State-dominated countries like Russia and China make daily headlines. States are waging wars against one another and against non-state actors around the globe. Closer to home, Presidents Trump and Biden have used emergency powers from the FDR era to tackle everything from manufacturing vaccines to the baby formula shortage to deploying heat pumps. The US has also deployed tax credits, loans, and grants on a scale not seen in generations.

Indeed, statecraft is at the center of the current US policy agenda. The Biden administration came into office pledging to tackle four interrelated crises: the COVID-19 pandemic, the shuttered economy, inequality (racial, income, and otherwise), and the climate crisis ([Linskey et al. 2022](#)). Upon becoming president, Biden himself expanded on these goals in a press conference early in his term, insisting that “we start to reward work, not just wealth. I want to change the paradigm.” He saw lifting up the middle class and unions as core to “restoring the soul of the nation” ([Biden 2021](#)). While “Build Back Better” was the original and evocative frame for how Biden planned to respond to these interwoven crises, the press, and in particular Biden’s critics, began using the term Bidenomics ([Politi 2020](#)). After the passage of four major bills through a razor-thin congressional margin,¹ and one of the most successful midterm election performances by an incumbent party in US history, Biden himself embraced the term.

Bidenomics is both a theory of economic growth and a theory of economic power, and it is meant to replace Reaganomics ([Blumenthal and Marans 2023](#)). In lieu of the latter’s “trickle-down” emphasis on shrinking the public sector and reducing its burden on the rich (in the thinking that this would spur economic growth) ([Niskanen 1993](#)), the former “is rooted in the recognition that the best way to grow the economy is from the middle out and the bottom up” ([White House 2023a](#)). This vision in turn centers on three pillars:

1. Making public investments in America;
2. Empowering workers to grow the middle class; and
3. Promoting competition and challenging corporate concentration ([White House 2023a](#)).

The first plank was operationalized through the Inflation Reduction Act (IRA), the Infrastructure Investment and Jobs Act (IIJA), and the CHIPS and Science Act—each a major piece of (green) industrial policy that could add up to trillions of dollars in new spending ([Carey and Ukita Shepard 2022](#); [Goldman Sachs 2023](#)). Former National Economic Council Director Brian Deese has explained that these investments are motivated by the desire to not only correct discrete market failures but also to provide a public backbone to a self-reinforcing growth dynamic that balances resilience and price stability, speed and resilience, and international and domestic considerations ([Deese 2022](#)).

The second plank, worker empowerment, is advanced through the promotion of tight (or “hot”) labor markets through the spending of the American Rescue Plan Act (ARPA) ([Khattar and Vela 2022](#)), use of the presidency’s bully pulpit, changes in labor law interpretation by presidential appointees at independent agencies ([Meyerson 2023](#)), weakening monopsony power in labor markets ([Kaplan 2023](#)), and the corollary benefits of the public investments under the first plank ([Harvey 2022](#)).²

The third plank (competition) is operationalized primarily through a new (or old) approach to antitrust and monopoly policy that seeks to constrain not only business concentration that leads to increases in prices for consumers but also concentration per se (which is seen as ruinous to democracy and innovation). This agenda is executed largely through independent agencies and the courts, but also through select attacks on problematic pricing and “junk fee” practices ([Popp Berman 2022](#); [Ramamurti 2023](#)).³

The economic data suggests that state intervention has been productive and effective. The contribution of manufacturing construction to GDP is at the highest levels on record ([Raimondo 2023](#)). Employment in construction has reached highs not seen since the advent of modern record-keeping in 1939 ([Boushey 2023](#)). Academic estimates suggest that US-made solar and wind energy are now cost competitive with imports for the first time in a generation ([DePillis 2023](#)). According to the Rhodium Group and MIT’s Clean Investment Monitor, total investment in the clean energy economy reached \$176 billion in late 2023, up 40 percent post-IRA and CHIPS ([Bermel et al. 2023](#)).

1 This included the rechristening by Senator Joe Manchin (D-WV) of the House-passed Build Back Better Act into the Inflation Reduction Act.

2 Labor power can also help improve the quality of public subsidies to private firms, by having “whistleblowers” that can make sure that the funds are used well ([Tucker et al. 2023](#)).

3 It is also integrated into the public investment plank through limits on stock buybacks and corporate extraction ([Palladino and Estevez 2022](#)).

Despite this record, US policymakers' launch of their new approach was sometimes overly defensive about the extent of the state's footprint in the economy. In 2021, former National Economic Council Director Brian Deese made a major speech calling for a “*one-time* capital investment in this country” of hundreds of billions of dollars, noting, “Now these may sound like large numbers, but, in fact, these are among the most prudent *and modest* investments that this country could make, a capital investment in ourselves” ([Atlantic Council 2021](#), emphasis added). A July 2023 administration report stated that, “President Biden’s approach is to collaborate with the private sector, with a strategy that is government-enabled and private sector-led” ([CEA 2023](#)). In Biden’s major speech inaugurating his approach to economics, he almost apologetically offered, “I’m a capitalist. If you guys go out here and you can make a billion dollars, go get it. Just pay a little more in taxes” ([Biden 2023](#)).⁴

This defensiveness has been alongside a rising chorus of critiques of the new industrial strategy from the right and left. These have come in a few varieties: critiques of what, where, who, and how. These perspectives question the role of the state, the nation, the private sector, and the demos (respectively) in industrial policy. The *what* critique questions whether states anywhere are even able to conduct industrial policy (and whether they have been at any time in history), and posits that industrial policy is essentially impossible, given the state’s supposedly inferior knowledge base and its inability to operate in the public interest ([Lincicome and Zhu 2021](#)). The *where* critique allows that industrial policy may be useful, but that it should be agnostic as to the national location of production (or even affirmatively seek out lowest cost locations) ([Posen 2023](#)). The *who* critique comes from the opposite side of the ideological spectrum, and questions whether the private sector should have any role whatsoever in the green transition ([Gabor 2023](#)). Finally, the *how* critique accepts the desirability of investment to increase the supply of clean energy, but takes issue with what it sees as the tendency of the public sector to do too many things at once. Sometimes called the “everything bagel” critique ([Klein 2023](#)), it faults the Biden administration for being insufficiently attentive to the supposed trade-offs between its policy priorities ([Yglesias 2023](#)).

There are elements within each that deserve respectful contemplation. The state *will* confront informational problems that will make it harder to enact the best policies. Excessive nationalism *can* make international cooperation harder. Relying too much on private actors *can* put public goals at the mercy of short-termist corporations that may suffer from their own information asymmetries, as shown by Danish wind company Orsted’s late 2023 cancellation of its offshore wind projects due to failure to add inflation adjustments into its contracts ([McGeehan 2023](#)). And unquestioning adherence to current regulatory processes *can* lead to missing out on the chance to innovate new and smarter ways of governing.⁵ Yet the practical upshot remains the same: There is no shortcut to more state capacity, as the market on its own cannot resolve the climate crisis. Indeed, careful studies have concluded that, even with the highly imperfect system of US statecraft, government entities with more capacity can help shepherd better outcomes ([Liscow, Nober, and Slattery 2023](#); [Wang, Yuan, and Rogers 2023](#)).

3. Bringing the State Back In

The debates around the new industrial strategy can sometimes feel like they are taking place in a vacuum. Is US industrial policy too condition-heavy? Are permitting processes too slow? Is the government doing too much second guessing of private actors, or not enough? Fortunately, there is a robust comparative politics scholarship on the theory of the state that can shine light on these debates. In particular, social science can help evaluate whether and how the new directions for US statecraft are surprising and/or likely to be successful.

4 In the speech, Biden conflated “trickle-down economics” and “MAGA-nomics” in ways that flatten important political economy differences. Reagan and Bush I, for instance, paved the way for multilateral neoliberal institutions like the World Trade Organization (WTO), which Trump sought to weaken through unilateral state-led actions.

5 See [Bagley 2019](#) and Pahlka 2023 for discussion.

A particularly useful contribution to this inquiry is *Bringing the State Back In*, a landmark 1985 volume edited by sociologists Peter B. Evans, Dietrich Rueschemeyer, and Theda Skocpol. This book explored why so much research at the time appeared to minimize the actual or potential role of the state in economic life (Evans, Rueschemeyer, and Skocpol 1985). From liberal pluralists to neo-Marxists, many scholars treated the state as a relatively neutral arena of social conflict, with little appetite or capacity for independently shaping income growth or distribution. Rather, non-state social actors like business and labor groups had policy preferences determined exogenously by their “objective” economic interests or the ideas that attracted them, and they would then duke it out in political parties and government institutions. Whichever group was stronger would see their economic program prevail and carry the day. While state actors may appeal to notions of the national or public interest, in this view, such rhetoric is merely providing empty cover for delivering for the group or class that dominates the state as much as the rest of society.

The *Bringing* authors questioned these premises, finding many instances in which states were both willing and able to not only independently shape economic outcomes but also shape the very preferences and strategies of actors in the rest of society. The very growth of European states from the 16th century relied on a complex interplay between states’ capacity for war-making, extraction (revenue), and protection services (spending) (Tilly 1985).⁶ In the 19th century, the British state centralized the provision of key social services that in the US remained decentralized, racialized, and used for patronage purposes, thereby creating a stronger and more uniform sense of working-class identity in the United Kingdom than in the US (Katznelson 1985). And in the 20th century, the Taiwanese state was able to develop the island from a poor, agriculture-dominated economy to a manufacturing-dominated one through a sequence of interventions ranging from trade protection to monopolizing credit to relatively lighter-touch licensing regimes (Amsden 1985).

One case study is particularly instructive for this collection. What explains why some countries develop industrial policy and others do not? This chapter of *Bringing* looks at the differential responses of countries to the similar shock of the Great Depression. The UK, thanks in part to the aforementioned working-class mobilization, developed a national system of unemployment benefits in the early 20th century. Sweden did not, and in turn around the same time helped alleviate job market pains through paying the unemployed to labor on public works projects. When the Great Depression hit, social democratic interests in each country leaned into the policy mix that each state had already developed. In the UK, this meant opening up the spigot of benefits payments, while in Sweden, the social demands centered around making public works pay closer to union wages. The former was dependent on the revival of economic growth (to in turn increase tax collection), while the latter helped endogenously generate growth through making infrastructure that helped productivity. Success beget success (both economically and politically), enabling Swedish Social Democrats to win a string of elections and institute more of their economic program (discussed in this collection’s essay by César Rosado Marzán) than UK Labour was able to (Weir and Skocpol 1985).⁷

All of this is not to say that states are always (or even often) benevolent, efficiency-promoting, or effective. Rather, in cases in which states are able to establish some degree of autonomy from the classes that otherwise dominate the economy; develop a suite of administrative, legal, bureaucratic, and coercive powers; and then use those powers to reinforce the state’s own authority, legitimacy, and political longevity, they may be able to effectuate economic outcomes that reductive analyses would fail to predict.

6 In contrast, states that never had to invest in their own capacities and relied on external military and other protection often failed to develop such a balance that roughly corresponds to constitutional checks and balances.

7 The United States under Franklin D. Roosevelt traversed a third way, responding in the early New Deal with industrial and infrastructure policy meant to help labor. America ultimately failed to institutionalize a robust version of that agenda due to state structures like a relatively powerful Supreme Court and Congress, leaving instead what the authors call “commercial Keynesianism”—a type of lower common denominator countercyclical policy that some share of the Republican Party and business interests could abide.

While not a central reference point of the *Bringing* volume, present-day readers interested in questions of political economy might ask: How does all of this relate to neoliberalism and the search for alternatives to it? The answer: Quite a lot. The notions that bureaucrats lack sufficient information to engage in thoughtful planning, that government is invariably captured by the companies it seeks to regulate, or that government lacks the dynamism of private markets—each of these propositions found adherents among the political actors of the 1970s that modern historians credit (or fault) with making neoliberalism a reality (Slobodian 2018; Sabin 2021; Gerstle 2022). Furthermore, these notions are alive and well across the political spectrum today, hampering our ability to truly move beyond neoliberal policymaking tools.

Indeed, almost 40 years after the initial publication, the *Bringing* project seems more relevant than ever. This scholarship would inspire numerous offshoots, such as American Political Development, historical institutionalism, and policy feedback theory (Hacker et al. 2022; Fioretos 2017). In the subfields of climate politics and industrial policy, the state is seen as the indispensable actor in accompanying economic transitions (Meckling and Nahm 2022; Juhász, Lane, and Rodrik 2023; Armitage, Bakhtian, and Jaffe 2023).

4. Toward a Synthesis: Learning from What Works

The authors in this *Industrial Policy 2025* collection provide rich comparative politics studies that have the potential to help answer questions and critiques sparked during Biden's first term by “bringing the state back in.”

Kyunghoon Kim's essay begins the collection with a thousand-foot view, exploring the question: Just how much state involvement is there out there? Much more than one might think, it turns out, and in unexpected places. By one indicator, France has more state involvement in the economy than Russia, and is not far behind centrally planned economies like China and Vietnam. Other major European economies like Switzerland and Germany have greater state involvement in the economy than countries with more recent avowedly “developmentalist” histories like South Africa, Argentina, and Chile. Some of the most recognizable multinational companies (such as Volkswagen) have state ownership, and indeed 20 percent of the planet's largest companies (including numerous major players in finance) are state enterprises. Indonesia, a resource-rich emerging economy, has a wide range of state tools to manage resource rents. In short, as US policymakers and companies look at the competitive global landscape, they will encounter a “market” shaped indelibly by states at every level.

Saule Omarova's essay establishes a rich taxonomy of state financial institutions. The first type, sovereign wealth funds, have long been associated with China and Middle Eastern countries. In fact, one of the largest such funds has been operational in Norway since 1969, is the single largest owner of stocks in the world, and is self-financed (and thus able to make social mission-oriented investments without the need to satisfy private bondholders). National development banking comprises a second type. One of the leading examples dates to 1948 in Germany, where the KfW provides loans and other supports for pandemic response, green transitions, and more. Singapore's state holding company is exemplary of a third model, an institution that can exercise even more direct industrial policy state control over invested companies than the other types. Omarova then uncovers a US precedent that is not widely appreciated—the Reconstruction Finance Corporation, which financed the New Deal and World War II mobilization under the Franklin D. Roosevelt administration. She ends by discussing how her proposal for a National Investment Authority could flexibly combine the best of these models in the years ahead.

Jonas Algers's essay looks at how a variety of state institutions are remaking and decarbonizing the steel industry in Sweden. The world's leading “green steel” project is HYBRIT, a joint venture between utility, steel, and mining companies that are wholly or partly owned by governments, including [public institutions](#) in Sweden, Finland, and Canada. This project, as well as privately owned competitor H2 Green Steel, is receiving a wide range of public supports from both Swedish and EU public institutions. These projects stand out as particularly high value from a climate perspective, since primary steel production is one the most emissions-

intensive industries and demand for low-carbon steel is on the rise from auto companies and others. The engineering of two competitor projects stands out as a model for how anti-monopoly and industrial policies can go hand in hand.

Instead of exploring how to wind up a new industry like green steel, Andrea Furnaro's essay looks at using industrial policy to wind down an old one, coal, in Germany. Here, a dense network of EU and German programs accounting for billions of dollars in spending aim to simultaneously phase out carbon-intensive production and leave formerly coal-producing regions in a better place than when the program started. Furnaro outlines key factors that have made the German programs successful, including focusing on the ability of local, regional, and European institutions to become better economic planners. She also makes a contribution to theory, helping the reader better conceptualize the relationship between "place-based policy" and "just transition policy," which she considers as subsets of industrial strategies.

How workers fare in industrial transitions is the theme of César Rosado Marzán's essay, which discusses two historical cases. First, he looks at Sweden's "Rehn-Meidner" model, the 1950s through 1970s socioeconomic arrangement whereby policymakers balanced industrial competitiveness, macroeconomic stability and wage gains for workers at the bottom of the pay scale. Then, he turns to Puerto Rico—the US territory that successfully developed a textile and apparel industry while adopting a sectoral bargaining strategy that gave mainland unions a toehold on the island. He closes by proposing "Fair Transition Boards" for the US clean energy transition, which could help turn what are currently low-wage jobs in emerging industries like solar module installation into higher-wage, good jobs.

Last but not least, Lenore Palladino's essay brings us closer to the present through her case study of the bailout of Detroit automakers in the global financial crisis of 2008-2010. While much of our historical memory focuses on the ramifications of that crisis for the banking system, the US under President Obama and Vice President Biden partly nationalized manufacturing firms in ways that are not out of step with the previous case studies in this collection. Yet unlike some more forceful episodes of economic statecraft, the US refused to attach meaningful labor or other conditionalities in this bailout. Palladino concludes with recommendations of how the current EV transition could be made more economically and democratically sustainable.

5. Conclusion

None of these case studies are perfectly transposable to the United States context in 2024 and 2025. Indeed, a common theme of many of the essays is the crucial role played by supportive timing. As Omarova shows, the US lost its Reconstruction Finance Corporation at just the time the model transposed to Germany. When energy shock and transitions hit the German economy (and as historian Stephen Gross [2023] has shown, this has happened many times), the existence of these institutions (explored by Furnaro) enabled a nimbler response. Indonesia's big push toward new state institutions (explored by Kim) came after the global financial crisis, as did Puerto Rico's development of labor institutions in response to developments in the broader US mainland economy (described by Marzán).

The US has to take its own particularities into account, such as the outsized role played by a state-enabled yet non-state-checked billionaire class ([Farrow 2023](#)) and the history of racial exclusion leading to uneven trust of the state by distinct demographic groups ([Tucker 2019](#)). These characteristics can make the United States look more like a “failed state” than some of its close peers.

On the other hand, as a “late developer” in some modes of economic statecraft, the US can learn from what has come before. Indeed, part of the US turn toward industrial policy can be explained by observing the challenges to carbon pricing-centric approaches in other countries like Australia, Canada, and in Europe ([Green 2021](#)). And the US benefits from a higher degree of early fiscal federalization—which was created in a pre-neoliberal era—as compared with European institutions that built federal markets but uneven federal states ([Bergsen et al. 2022](#); [McNamara 2023](#); [Stiglitz 2019](#)).

Our hope is that this collection offers policymakers and other observers of American life some useful inputs as we contemplate where to go next after the successes and implementation challenges of the Inflation Reduction Act and other new policies.

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The Role of State Ownership: Overview of State-Owned Entities in the Global Economy

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1. Introduction

This essay reviews state-owned entities' prominence in the global economy, focusing on the government's "ownership" in economic entities. Although the government is able to influence corporate activities through incentives, preferences, and regulations, as often discussed in the literature on state capitalism and developmental state, government control over economic entities is particularly strong and direct through ownership. This essay demonstrates that state-owned entities are widespread in various sectors in both advanced and developing countries, and discusses some of the main issues related to state-owned entities in international political economy.

Section 2 of this essay introduces three key types of state-owned entities, namely state enterprises, sovereign wealth funds, and development financial institutions. Section 3 employs data to demonstrate how significant state-owned entities are in diverse sectors and countries. The section first compares the sectors in which state enterprises are present across selected advanced and developing countries. Then, it uses corporate-level data for almost 1,800 state enterprises and analyzes their country and sectoral presence. Next, focusing on the world's largest companies, the section displays how significant state enterprises are in the corporate landscape. The rest of the section analyzes the sizes of sovereign wealth funds and development banks. Section 4 highlights the background to the reemergence of state-owned entities in various parts of the world and some salient trends.

2. Three Main Types of State-Owned Entities

The government can be an owner in various forms of entities. The most common types are state enterprises or corporations whose shares are owned by the government. Some of these entities are fully owned by the government, while others are only partially owned. These companies can be further divided into majority state-owned and minority state-owned companies ([OECD 2017](#)). Even in a number of minority state-owned companies, the government is the largest shareholder. Countries often have different definitions around ownership, but many generally call companies with over 50 percent state ownership “state enterprises.” State enterprises are often concentrated in industries that produce essential products such as water, electricity, and transportation infrastructure and services. These enterprises are also found in strategic industries such as defense and aerospace. Another area in which state enterprises play a large role is finance. In some developing countries, there continue to be state enterprises in basic industries such as cement and steel, in which market failures linked to positive externalities and coordination failures are perceived to be larger than in advanced countries. Most state enterprises play a dual role of profit-making and public goods provision, and the balance of the two goals varies significantly across entities and time. State enterprises that focus heavily on profit-making could also contribute to society by paying taxes and dividends to the government.

Sovereign wealth funds (SWFs) are entities responsible for investing state money ([Alhashel 2015](#)). Many SWFs have been created and expanded as the government has injected current account surpluses. These funds are often found in countries with large trade surpluses (i.e., the gap between exports and imports), such as oil producers and China. Some SWFs have been established by receiving fiscal budget or privatization proceeds. Most of these funds have the long-term financial return of state money as their primary goal. Since liquidity is not a key concern for these funds, they make investments with a long-term horizon. To achieve their goal, the funds mix methods of active and passive investment strategy. An active investment strategy involves making targeted investment in diverse asset classes including shares, bonds, derivatives, infrastructure, and property. Passive investment strategy adopts a similar approach to index investment, in which funds have a diversified portfolio that fully or partially reflects the composition of the stock exchange. For commodity exporters, SWFs also play a role in exchange rate stabilization and intergenerational savings and transfers. Some SWFs play a role of financing domestic projects aimed at economic and social development otherwise known as development mandates.

Governments around the world own numerous financial institutions, many of which operate in commercial lending. Governments use public banks as tools to influence credit markets by altering market interest rates and size of loans. They often make the case for state banks on the basis of financial market failures and scarcity of capital. A variety of state-owned financial institutions are referred to as “development financial institutions” or “development banks,” which are primarily driven by public policy objectives or development missions ([De Luna-Martinez et al. 2018](#)). The major role of these entities is to provide funding for activities that could have wide economic and societal benefits. As they are assigned this role, these financial institutions have the benefits of having a long-term horizon and higher levels of risk tolerance than commercial banks. Some cover broad sections of the economy, while others cover narrow segments such as small and medium enterprises, cross-border trade and investment, and infrastructure. While maximizing short-term profits is not the ultimate goal, development financial institutions often have a goal of sustaining adequate levels of profitability. Some state commercial banks also have a development mission along with commercial lending, but this essay limits its analytical scope to development banks whose key role is financing development-oriented projects.

3. Spotting State Ownership

The Reach of State Enterprises in Selected Countries

This subsection compares the extent to which state enterprises are present in different economic sectors across countries using a low-level indicator called “scope of state-owned enterprises,” which is a component of the OECD’s “economy-wide product market regulation” indicator (OECD n.d.). This sub-indicator determines whether each country’s government controls at least one company across different economic sectors. The OECD’s dataset provides underlying data for 49 countries—38 OECD countries and 11 non-OECD countries. This subsection focuses on 30 of the largest economies in the dataset—those with GDPs larger than 300 billion USD in 2022. The sample countries are composed of 24 OECD countries and 6 non-OECD countries. Tables 1 and 2 compare the underlying data for the “scope of state-owned enterprises” sub-indicator in network sectors, such as electricity and transportation and “other” sectors that include manufacturing and services. Nearly all economic sectors excluding agriculture are covered.

Table 1. “Scope of State-Owned Enterprises” Sub-Indicator: Network Sectors, Circa the End of the 2010s (30 Largest Economies in the Sample)

	Indonesia	France	Russian Federation	Poland	Switzerland	Germany	Norway	South Africa	Argentina	Sweden	Romania	Turkey	Italy	Canada	Brazil	Austria	Japan	Ireland	Mexico	Korea, Republic of	Denmark	Australia	Colombia	Israel	Netherlands	Belgium	United Kingdom	Spain	United States	Chile
Scope of state-owned enterprises indicator (overall), 0~6	5.9	5.4	5.2	4.8	4.4	4.3	4.2	4.2	3.9	3.6	3.4	3.3	3.1	3.0	3.0	2.8	2.8	2.8	2.6	2.5	2.4	2.3	2.3	2.2	2.1	1.6	1.4	1.2	1.1	
OECD?																														
Electricity generation																														
Electricity import																														
Electricity export																														
Electricity retail supply																														
Gas production																														
Gas import																														
Gas export																														
Gas storage																														
Gas retail supply																														
E-Communications – fixed-line networks																														
E-Communications – retail fixed line services (voice, video & data)																														
E-Communications – mobile networks																														
E-Communications – retail mobile services (voice, video & data)																														
Railways – passenger transport																														
Railways – freight transport																														
Air transport – domestic passenger transport																														
Air transport – international passenger transport																														
Air transport – operation of airports																														
Water transport – passenger transport																														
Water transport – freight transport																														
Water transport – operation of terminal facilities																														
Road transport – freight transport																														
Road transport – long-distance domestic passenger transport by coach																														

Key

■ Yes

■ No

□ Sector does not exist or data not available

Source: Author’s illustration using OECD indicators of product market regulation database.

Note: (i) The sub-indicator identifies whether the government controls at least one firm in each sector. (ii) The countries are ranked in the order of overall “scope of state-owned enterprises” sub-indicator’s score, from highest to lowest.

**Table 2. “Scope of State-Owned Enterprises” Indicator:
Other Sectors, Circa the End of the 2010s (30 Largest Economies in the Sample)**

	Indonesia	France	Russian Federation	Poland	Switzerland	Germany	Norway	South Africa	Argentina	Sweden	Romania	Turkey	Italy	Canada	Brazil	Austria	Japan	Ireland	Mexico	Korea, Republic of	Denmark	Australia	Colombia	Israel	Netherlands	Belgium	United Kingdom	Spain	United States	Chile
Scope of state-owned enterprises indicator (overall), 0-6	5.9	5.4	5.2	4.8	4.4	4.3	4.2	4.2	3.9	3.6	3.4	3.3	3.1	3.0	3.0	2.8	2.8	2.8	2.6	2.5	2.4	2.3	2.3	2.2	2.1	1.6	1.4	1.2	1.1	
OECD?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Manufacture of tobacco products	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Manufacture of refined petroleum products	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Manufacture of basic metals	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Manufacture of fabricated metal products, machinery, and equipment	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Building and repairing of ships and boats	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Manufacture of railway and tramway locomotives and rolling stock	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Manufacture of aircraft and spacecraft	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Manufacture of pharmaceuticals, med. chemical, and botanical products	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Manufacture of chemicals and chemical products	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Manufacture of computer, electronic, and optical products	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Manufacture of motor vehicles and their parts and accessories	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Construction	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Wholesale trade, including of motor vehicles	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Accommodation, food, and beverage service activities	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Other urban, suburban, and interurban passenger transport	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Financial service activities, except central banking, insurance, pension funding	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Motion picture distribution and projection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Gambling and betting activities	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Key

■ Yes

■ No

□ Sector does not exist or data not available

Source: Author’s illustration using OECD indicators of product market regulation database.

Note: (i) The sub-indicator identifies whether the government controls at least one firm in each sector. (ii) The countries are ranked in the order of overall “scope of state-owned enterprises” sub-indicator’s score, from highest to lowest.

The overall scores for the “scope of state-owned enterprises” sub-indicator are weighted compositions of variables presented in Tables 1 and 2. For each sector, a score of 6 is given if the government has a controlling firm in the sector and 0 if not, and overall scores are also designed to have the minimum value of 0 and the maximum value of 6. Generally, non-OECD countries, though limited in number and therefore not representative of the group of developing countries, tend to have higher scores than OECD countries. For instance, Indonesia is ranked first with a score of 5.9, followed by Russia (3rd, 5.2), South Africa (8th, 4.2), and Argentina (9th, 3.9). Indonesia’s score is on par with the scores of China (6.0) and Vietnam (5.6), two highly centralized state capitalist economies whose underlying data is not publicly available and therefore not included in Tables 1 and 2. There is significant variation among OECD countries. France is ranked 2nd with a score of 5.4, followed by Poland (4th, 4.8), Switzerland (5th, 4.4), Germany (6th, 4.3), Norway (7th, 4.2), and Sweden (10th, 3.6). At the end of the spectrum are Chile (30th, 1.1), the United States (29th, 1.2), Spain (28th, 1.4), and the United Kingdom (27th, 1.6). Representative northern and western continental European countries are in the former group and representative Anglo-Saxon countries in the latter group (Hall and Soskice 2001).

On average, 10 countries with the highest scores for the “scope of state-owned enterprises” sub-indicator have state enterprises in 27 of 41 sectors. The top three countries have state enterprises in over 30 sectors. Indonesia, the country with the highest score, has state enterprises in virtually all sectors. At the other end of the spectrum, the countries with the smallest numbers of sectors with state enterprises are the United Kingdom (7), Spain (8), and the United States (8).

A quick scan suggests that it is more usual for countries to have state enterprises in network industries than across “other” industries in the OECD database. This pattern is unsurprising considering the public goods nature of the network industries’ products. The average number of countries with state enterprises across different network industries is 14, whereas across “other” industries the number is 10. The number of countries with a state enterprise is particularly high in electricity, railways, and e-communication. Within air transport and water transport, a large number of countries have state enterprises operating airports and seaports. In “other” sectors, more countries have state enterprises in services than in manufacturing. A particularly large number of countries have state enterprises in local passenger transport services and financial services. Within the manufacturing sector, state enterprises in resource-based industries are more common than those in more advanced manufacturing sectors. However, a number of countries have state enterprises in the aircraft and spacecraft manufacturing industry, a sector that is considered strategic for national military capability.

Large State Enterprises’ Country and Sectoral Distribution

This subsection focuses on a sample of sizable state enterprises. Using the [Orbis database](#), this subsection analyzes the national distribution and characteristics of large state enterprises. The sample includes active companies with the minimum total assets of 500 million USD in 2022 and only includes nonfinancial companies and excludes companies whose primary NACE⁸ Revision 2 codes are 64, 65, and 66 since financial companies’ assets could obscure the overall picture. For this subsection, state enterprises are companies with an ultimate owner classified as public authorities, states, or governments. An ultimate owner is the final entity in the corporate ownership path, linking the subject company with immediate owners with the minimum control of 50.01 percent. The sample only includes companies with a consolidated statement.

The final list has 1,791 state enterprises. Overall, the sectors with the greatest number of state enterprises are manufacturing; real estate businesses; electricity, gas, steam, and air conditioning supply; and transportation and storage (Table 3). China tops the list with 1,180 state enterprises. China’s state enterprises are concentrated in manufacturing and real estate. Ten countries with the highest score in the first subsection, except for Argentina and South Africa, all have over 10 state enterprises in the sample. Of these countries, Sweden and Germany have a particularly large number of state enterprises: 45 and 23, respectively. For Sweden, the largest state enterprise is the electricity utility company Vattenfall, which is playing a leading role in the energy transition in Northern Europe. Sweden also has numerous real estate companies controlled by governments and their entities. Similarly, the German government has large utility companies, such as Uniper and numerous real estate companies. Indonesia and Norway, which were ranked 1st and 7th in the first subsection, have 21 and 20 state enterprises, respectively. In Indonesia, several state enterprises operate in manufacturing, mining and quarrying, and construction. Norway’s state enterprises are concentrated in utilities. The list also reveals countries with large state enterprises not included in the analysis in the first subsection. After China and Sweden, India has the highest number of state enterprises (38), and Vietnam (27), Iran (26), Finland (24), Saudi Arabia (22), and Poland (21) also have large numbers of state enterprises. Overall, state enterprises are concentrated in manufacturing and utilities in developing countries and utilities, transportation and storage, and real estate in advanced countries.

8 NACE: Nomenclature statistique des activités économiques dans la Communauté européenne.

Table 3. Sectoral Distribution of Large State Enterprises in Terms of Numbers, 2022 (Top 30 Countries)

	Percentage of State Enterprises													
	Total number of state enterprises	A) Agriculture, forestry & fishing	B) Mining & quarrying	C) Manufacturing	D) Electricity, gas, steam & air conditioning supply	E) Water supply, sewerage, waste management & remediation activities	F) Construction	G) Wholesale & retail trade, repair of motor vehicles & motorcycles	H) Transportation & storage	I) Accommodation & foodservice activities	J) Information & communication	L) Real estate activities	M) Professional, scientific & technical activities	Others (N-S)
All countries	1,791	1	5	21	13	3	7	5	10	0	4	15	10	6
All except China	611	1	9	15	25	3	3	2	15	0	7	7	7	5
China	1,180	0	4	25	7	3	8	6	8	0	2	19	11	7
Sweden	45	0	2	0	18	0	2	2	4	0	0	33	33	4
India	38	0	21	42	13	0	11	0	5	0	5	0	0	0
Vietnam	27	0	7	26	22	0	11	4	11	0	11	0	0	7
Iran, Islamic Republic of	26	8	12	73	0	0	0	0	0	0	8	0	0	0
Finland	24	0	4	0	58	0	0	4	17	0	0	8	4	4
Germany	23	0	0	0	26	0	9	0	26	0	4	35	0	0
Saudi Arabia	22	0	14	41	5	0	0	5	5	0	14	5	9	5
Indonesia	21	0	24	29	5	0	19	0	10	0	10	5	0	0
Poland	21	0	10	14	14	5	5	5	19	5	0	10	10	5
United Arab Emirates	20	0	5	25	5	5	0	10	15	0	25	5	5	0
Norway	20	0	10	5	40	0	0	0	15	0	10	5	5	10
Russian Federation	20	0	5	30	55	0	0	5	5	0	0	0	0	0
Singapore	20	0	0	5	5	0	0	10	20	0	15	15	10	20
Switzerland	19	0	0	0	37	0	0	0	21	0	5	0	11	26
Korea, Republic of	19	0	5	0	37	5	5	0	5	0	0	32	11	0
Thailand	17	0	41	6	12	6	6	12	18	0	0	0	0	0
Malaysia	15	20	0	27	7	7	7	7	7	0	0	7	0	13
Denmark	14	0	0	7	21	14	7	0	7	0	7	0	29	7
Brazil	12	0	8	0	42	33	0	0	8	0	8	0	0	0
Austria	11	0	9	0	45	0	9	0	9	0	0	0	27	0
France	11	0	0	0	27	0	0	9	36	0	0	0	27	0
Italy	11	0	0	18	18	0	0	0	45	0	9	0	9	0
Colombia	9	0	11	0	44	22	11	0	0	0	11	0	0	0
Qatar	9	0	0	33	11	0	0	0	0	0	44	0	11	0
Belgium	8	0	0	0	25	0	0	0	38	0	13	0	13	13
Lithuania	7	0	0	0	57	0	0	0	14	0	0	0	29	0
Bolivia	6	0	33	17	50	0	0	0	0	0	0	0	0	0
Spain	6	0	0	17	17	17	0	0	50	0	0	0	0	0
Japan	6	0	0	0	0	0	0	0	100	0	0	0	0	0

Source: Author's illustration using Orbis database.

In terms of assets, there are differences in the countries with large state enterprise segments and their sectoral distribution (Table 4).⁹ China again ranks 1st in terms of state enterprises' assets. Compared to other countries, the sectoral distribution of state enterprises' assets is more even in China, with real estate activities, manufacturing, construction, transportation and storage, and electricity, gas, steam, and air conditioning supply each accounting for more than 10 percent of total assets. The rest of the top countries in the list can be divided into two major groups. The first group is large natural resource producers such as Saudi Arabia, India, Norway, Brazil, and Mexico. The share of state enterprises' assets in mining and quarrying is particularly large in these countries. The second group is advanced countries with large state-owned utilities such as France, Korea, and Sweden. Within public utilities, aggregate assets of state enterprises in electricity, gas, steam, and air conditioning supply are the largest, followed by those in transportation and storage and information and technology.

9 The assets of some of these companies may be double counted as their majority shareholders may be other state enterprises.

Table 4. Sectoral Distribution of Large State Enterprises in Terms of Total Assets, 2022 (Top 30 Countries)

	Percentage of State Enterprises													
	Total number of state enterprises	A) Agriculture, forestry & fishing	B) Mining & quarrying	C) Manufacturing	D) Electricity, gas, steam & air conditioning supply	E) Water supply, sewerage, waste management & remediation activities	F) Construction	G) Wholesale & retail trade, repair of motor vehicles & motorcycles	H) Transportation & storage	I) Accommodation & food service activities	J) Information & communication	K) Real estate activities	L) Professional, scientific & technical activities	M) Others (N-S)
All countries	24,352	0	13	15	17	1	10	4	13	0	3	13	6	4
All except China	7,308	0	24	10	30	2	1	2	16	0	5	4	4	2
China	17,044	0	8	17	11	1	14	5	11	0	3	17	7	5
Saud Arabia	1,030	0	68	13	12	0	0	0	0	0	4	0	2	1
France	764	0	0	0	57	0	0	12	22	0	0	0	9	0
Korea, Republic of	515	0	3	0	58	4	0	0	1	0	0	35	0	0
Russian Federation	419	0	1	2	8	0	0	0	89	0	0	0	0	0
India	396	0	41	27	28	0	2	0	1	0	1	0	0	0
Norway	329	0	54	1	30	0	0	0	2	0	8	1	0	4
United Arab Emirates	259	0	2	13	19	19	0	3	22	0	21	0	1	0
Brazil	242	0	77	0	13	7	0	0	3	0	0	0	0	0
Mexico	236	0	49	0	51	0	0	0	0	0	0	0	0	0
Sweden	228	0	4	0	41	0	0	1	1	0	0	29	23	1
Malaysia	226	0	0	78	2	3	1	1	6	0	0	1	0	5
Germany	215	0	0	0	77	0	1	0	6	0	0	16	0	0
Thailand	209	0	65	1	19	1	7	3	4	0	0	0	0	0
Singapore	167	0	0	3	4	0	0	15	26	0	30	10	7	6
Italy	165	0	0	9	22	0	0	0	18	0	2	0	50	0
Indonesia	163	0	5	59	4	0	11	0	7	0	13	1	0	0
Taiwan	133	16	24	0	57	0	0	3	0	0	0	0	0	0
Switzerland	124	0	0	0	23	0	0	0	51	0	21	0	1	3
Colombia	116	0	55	0	28	14	2	0	0	0	1	0	0	0
Iran, Islamic Republic of	110	5	8	51	0	0	0	0	0	0	37	0	0	0
United Kingdom	109	0	0	0	0	0	0	0	98	0	0	0	2	0
Vietnam	87	0	2	36	33	0	5	4	5	0	7	0	0	8
Poland	84	0	4	3	39	2	1	7	9	1	0	2	32	1
Japan	84	0	0	0	0	0	0	0	100	0	0	0	0	0
Denmark	77	0	0	1	13	4	3	0	3	0	1	0	16	59
Austria	71	0	1	0	57	0	3	0	8	0	0	0	30	0
Finland	64	0	1	0	69	0	0	3	14	0	0	9	2	1
Chile	63	0	71	12	0	0	0	0	17	0	0	0	0	0
Qatar	55	0	0	39	14	0	0	0	0	0	43	0	5	0

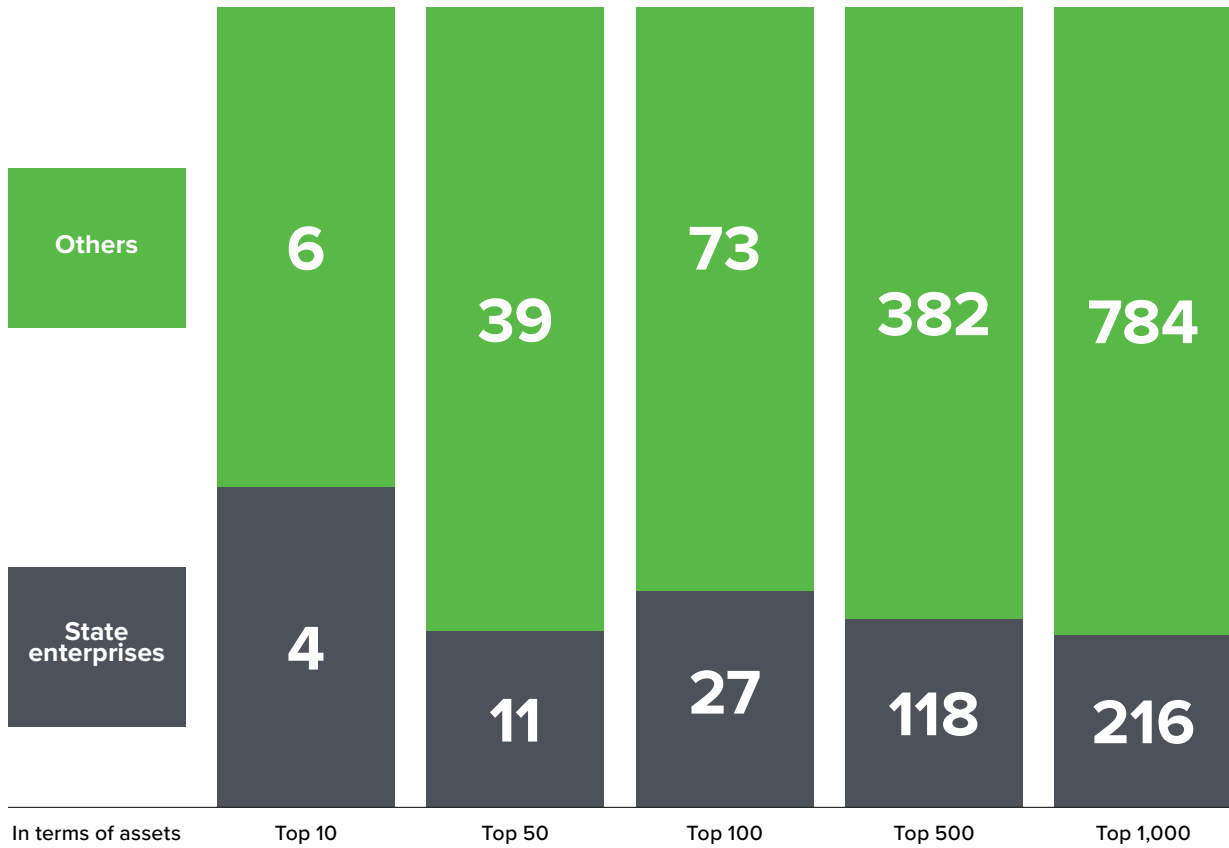
Source: Author's illustration using Orbis database.

State Enterprises at the Top of the Corporate World

This subsection describes how state enterprises stand out among the world's largest companies. The subsection uses the same methodology as the previous subsection and modifies the sample to include all companies with or without an ultimate owner and whatever that ultimate owner's type is. As Figure 1 shows, state enterprises account for over 20 percent of the largest companies in the world, irrespective of sample size. Looking at the 10 largest companies in terms of assets, there are four state enterprises in the group. While many of these state-owned firms are in the countries one might expect (e.g., China), the 7th largest company is Électricité de France (EDF), a state-owned utility company with assets of 413 billion USD.

If one loosens the definition of state enterprises, there is a higher number of companies with state ownership. For instance, Germany's State of Lower Saxony owns 11.8 percent of Volkswagen, the second largest company in the world. Additionally, an investment arm of Qatar's sovereign wealth fund owns 10.5 percent of Volkswagen. Deutsche Telekom, the 19th largest company in the world, is 13.8 percent owned by the German federal government and 16.6 percent owned by Germany's development bank. The Italian government owns 23.6 percent of Enel, the 27th largest firm, and 32.4 percent of Eni, the 73rd largest firm. The Japanese government and public bodies own 32.3 percent of Nippon Telegraph and Telephone Corporation (NTT), the 54th largest company.

Figure 1. Number of State Enterprises among Top Global Companies, 2022



Source: Author's illustration using Orbis database.

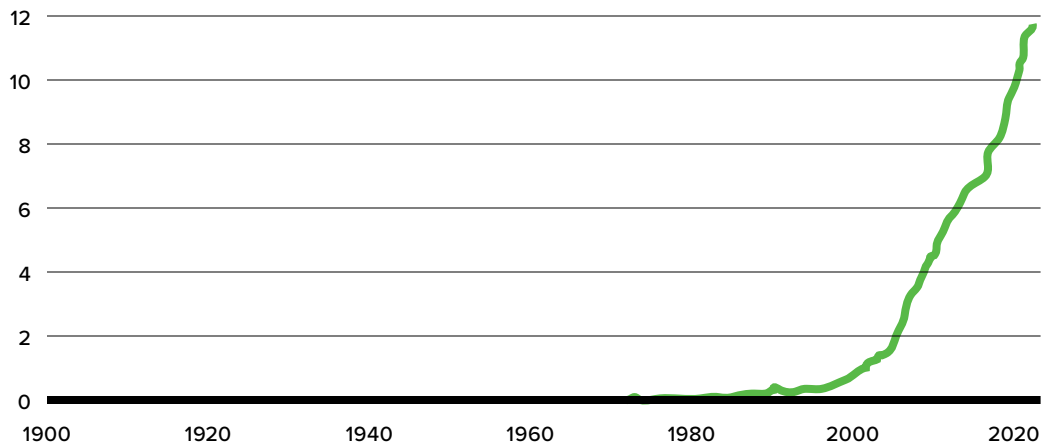
Sovereign Wealth Funds

This subsection uses the database of the Sovereign Wealth Fund Institute to analyze the size of sovereign wealth funds (SWFs) around the world ([Sovereign Wealth Fund Institute n.d.](https://www.swfins.com/)). SWFs, which are investors of state capital, have grown rapidly during this century. As of 2022, 91 countries together had 163 SWFs, meaning that some countries had more than one SWF. While most countries have one or two SWFs, some countries, notably those with federal political systems, have several subnational SWFs. For example, the United States has 15 SWFs, the United Arab Emirates has 10, Canada has 5, Nigeria has 4, and Australia has 3. SWFs had amassed assets of 11.7 trillion USD by 2022, after having increased by 1 trillion USD on average every two years over the past two decades (Figure 2).

The country with the largest SWF asset is China (excluding Hong Kong).¹⁰ China, with three SWFs that have total assets of 2,844 billion USD as of the first half of 2023, is a representative country that is in the group of countries with large current account surplus. As an individual fund, the largest one is Norway's Government Pension Fund Global, with assets of 1,478 billion USD.

¹⁰ Hong Kong is analyzed separately given its SWFs' distinct history.

Figure 2. Assets of Sovereign Wealth Funds



Unit: Trillions of USD

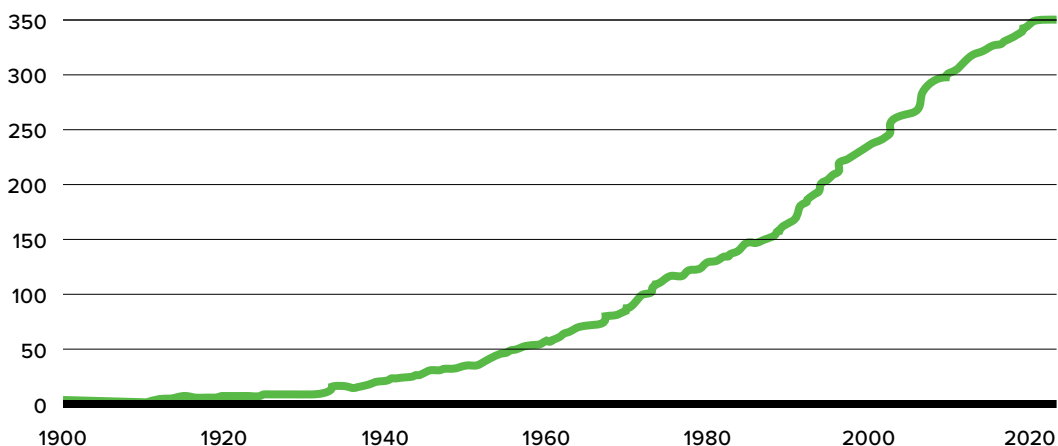
Source: Author's illustration using Sovereign Wealth Fund Institute database.

Development Financial Institutions

This subsection analyzes the size, country of origin, and official mandate of development financial institutions (DFIs). The Public Development Banks and Development Financing Institutions database, developed by Peking University's Institute of New Structural Economics and Agence Française de Développement, is used for this purpose (Xu et al. 2021). The database defines DFIs as stand-alone entities that (i) have a certain level of financial self-sufficiency without repeated budgetary transfers, (ii) deploy financial instruments as their main products, (iii) have a distinct public or development mandate that guides operation, and (iv) have the government as a key entity that controls the institution's management direction. The sample excludes multinational and subnational institutions and focuses on national DFIs owned by central governments or their entities. For brevity, the term "DFIs" refers to this group.

The dataset reveals that 151 countries have DFIs. More than half, or 86 countries, have more than one DFI. As of the end of 2021, there were 351 DFIs, and 5 DFIs were established on average each year over the past two decades (Figure 3). These DFIs' total assets were 19.2 trillion USD. Two countries, Mexico and Pakistan, have

Figure 3. Number of National-Level Development Financial Institutions



Source: Author's illustration using Public Development Banks and Development Financing Institutions databases.

nine institutions, followed by India (eight), Malaysia (seven), France (six), Nigeria (six), and Saudi Arabia (six). China, Japan, Korea, the Netherlands, the Philippines, El Salvador, Thailand, and Zimbabwe each have five DFIs. Approximately a third, or 116 institutions, have broad development mandates, while two-thirds have relatively narrow mandates like supporting small businesses or exporters.

The rank for DFIs' assets broadly follows that of countries' economic size. The United States tops the rank with assets of 7,849 billion USD, followed by China (4,840 billion USD), France (1,484 billion USD), Japan (1,039 billion USD), Germany (775 billion USD), Italy (589 billion USD), Korea (521 billion USD), and India (337 billion USD). Table 5 shows that most countries have DFIs with general or multi-mandates. Of the top 10 countries in terms of DFIs' assets, the United States and Canada stand out because they do not have a DFI with broad mandates. These two countries' DFIs target specific areas such as housing, small enterprises, international trade and investment, and overseas private-sector development. The United States' major DFIs are Fannie Mae and Freddie Mac, which focus on the housing sector. Notably, these enterprises descended from the Reconstruction Finance Corporation (1932 to 1957), which did have a broader mandate. Canada's largest DFI is Canada Mortgage and Housing Corporation, which focuses on the same sector. On the other hand, France's DFIs, such as Groupe Caisse des Dépôts (CDC) France, have broader targets. Another large European DFI that has a multi-sector mandate is the Kreditanstalt für Wiederaufbau (KfW).

Table 5. Development Financial Institutions' Total Assets and Distribution by Mandates, 2021 (Top 20 Countries)

	Total Assets 2021	Low – Mandate's Level of Targeting – High							
		General	Local Government	Infrastructure	Agriculture	Housing	MSME	International Trade and Investment	Overseas Private Sector Development
United States	7,849								
China	4,840								
France	1,484								
Japan	1,039								
Germany	775								
Italy	589								
Korea, Republic of	521								
India	337								
Canada	318								
Netherlands	291								
Mexico	209								
Brazil	143								
Thailand	118								
Norway	57								
Morocco	54								
Russian Federation	54								
Poland	49								
Spain	44								
Sweden	43								
Turkey	34								

Unit: Billions of USD

Source: Author's illustration using Public Development Banks and Development Financing Institutions databases.

4. State Ownership and Key Issues

After decades of market-oriented strategy failing to produce sufficient outcomes in sectors with significant market failure, developing countries are looking for solutions by using state-owned entities. One developing country that has made a dramatic turnaround is Indonesia. By the mid-2010s, Indonesia had a weak land transportation system, and this problem was often pointed out as a major obstacle to industrialization ([Kim 2023](#)). After the Asian financial crisis, the Indonesian government adopted several rounds of regulatory and institutional reforms with the aim of attracting private investment. But however large the opportunities were in the country with the world's fourth largest population, private investors have continued to be skeptical as they have perceived high levels of uncertainty. Even as the country experienced economic liberalization, the government has continued to have a large number of state enterprises in diverse sectors, as shown in previous sections, because there was strong nationalistic opposition to full privatization. However, state enterprises have been the target of governance and ownership restructuring, with some of them undergoing partial privatization. During this period, there were weak developmental mandates for state enterprises and their goals shifted toward profit-making while the government limited fiscal support.

When Indonesian President Joko Widodo came into office in 2014, he chose to focus on infrastructure development, working on land transportation with the aim of improving connectivity, which would contribute to industrialization. The government then adopted a systematic program of state-led infrastructure development that involved a variety of state-owned entities. A key reason for mobilizing state-owned entities was that the government is constrained by the fiscal rule that limits annual fiscal deficits to 3 percent of GDP. Given this situation, the government's viable option has been to leverage state-owned entities. The initial stage of this process was expanding the size of state-owned construction firms such as Waskita Karya, Wijaya Karya, and Pembangunan Perumahan by injecting capital, incentivizing asset revaluation, lowering dividend payout ratios, and assigning a stream of major infrastructure projects ([Kim 2021](#)). Another step was to strengthen development financial institutions ([Kim 2020](#)). While Indonesia had several gigantic state-owned commercial banks, the government realized that there were risks related to over-relying on them. Therefore, the government significantly expanded a development bank, Sarana Multi Infrastruktur, by injecting capital and using this institution to finance state construction companies' infrastructure projects. A more recent step of this state-led infrastructure development has been the establishment of a sovereign development fund, called Indonesia Investment Authority, in 2021. The fund's role is to enable the recycling of infrastructure assets that state construction companies have accrued over the years. By selling these assets to the fund, which has a long-term investment horizon, state-owned construction companies may be afforded the opportunity to conduct new projects. While performance has been impressive across various infrastructure segments, the most notable outcome has been found in the toll road sector. During less than 10 years under the Joko Widodo administration, the government has developed 1,848 kilometers of toll roads. This is more than double the length of toll roads built during the prior four decades ([Bhwana 2023](#)).

Furthermore, state ownership is also strengthening in the resource sector as the demand for critical minerals is increasing with the electric vehicle boom. For example, Mexico nationalized its lithium reserves in 2022 and assigned the state enterprise Lito para Mexico to manage the resources ([Argen and Stott 2022](#)). Chile is also in the process of nationalizing its lithium industry. In Indonesia, MIND ID, a state-owned mining holding company, nationalized a 51 percent stake of Freeport Indonesia, a major copper producer, in 2018 and a 20 percent stake of Vale Indonesia, a major nickel producer, in 2020. MIND ID is considering a further purchase of shares to become Vale Indonesia's largest shareholder ([Hartati 2023](#)). In 2021, China merged several government-owned rare earth miners into a new giant state-owned entity called China Rare Earth Group in order to strengthen its market dominance and influence in pricing ([Yu and Mitchell 2021](#)).

State-owned entities may also be used to allow the government to play a leading role in industrial projects and crowd-in investment and technology for the benefit of the domestic economy. One case of a state enterprise's collaboration with private companies is that between the United States' GE Aerospace and India's state-owned Hindustan Aeronautics. The two companies signed a memorandum of understanding in June 2023 concerning the joint production of GE Aerospace's fighter jet engines in India. India is taking advantage of its market power as the fourth largest military spender in the world to attract investment to the defense industry. As part of this strategy, the Indian government is using Hindustan Aeronautics to increase domestic value added and absorb technology from international companies seeking to expand presence in the country. In August 2023, the United States Congressional Notification Process was completed, paving the way for the next step ([White House 2023](#)).

The role of state ownership in advanced countries has also visibly strengthened in recent years. This trend is due to the emergence of two key issues that even countries with more advanced markets struggle to solve without government intervention, namely supply chain insecurity and energy insecurity. In June 2023, the Japanese government announced a plan to buy out JSR, a key producer of photoresists, a chemical used in semiconductor production, in an attempt to strengthen the chip supply chain. The state-backed Japanese Investment Corporation plans to acquire the company for approximately 6.4 billion USD in the coming year ([Lewis and Inagaki 2023](#)). The Japanese Investment Corporation was established in 2018 with the aim of fostering next-generation industries, and its shareholders are the government (96.5 percent), the Development Bank of Japan (0.4 percent), and leading corporations (3.2 percent). On the other side of the world, even a conservative member of Parliament in Britain proposed acquiring shares in Arm, a key UK-based chip designer, in 2022 as semiconductors became a central issue for economic security ([Tugendhat 2022](#)). The UK had already begun to invest in critical assets: The UK government purchased a stake in space company OneWeb by investing 500 million GBP in 2020 ([UK Government 2020](#)). Moreover, state capital is becoming even more visible in the defense sector. Twenty-three European governments participated in setting up the NATO Innovation Fund in 2022, which is the "first multi-sovereign venture capital fund" with a firepower of 1 billion EUR that aims to strengthen the defense industry value chain by investing in startups developing emerging and disruptive technologies ([NATO 2023](#)).

The resurgence of the role of state-owned entities is also visible in the area of energy security. With goals of achieving stability in energy supply and accelerating carbon reduction, the French government began a process of nationalizing EDF in 2022 to increase its stake from 84 to 100 percent by investing approximately 9.7 billion EUR ([Mallet and Thomas 2022](#)). With full ownership, the French government plans to accelerate the construction of new nuclear reactors and transition to cleaner energy. With an increase in energy insecurity due to the Russia-Ukraine war, the German government decided to nationalize a natural gas provider, Uniper, by purchasing a 99 percent stake through the injection of 8 billion EUR in 2022 ([Uniper 2022](#)). Furthermore, many government-owned financial institutions are contributing to the energy transition. KfW is playing a pivotal role in leading the coalition government's plan for the "biggest industrial modernization of Germany in more than 100 years," in which green industries would play an important role ([Chazan 2021](#)). The development bank's commitment in the area of climate change and environment for the private sector amounted to 19.5 billion EUR in 2022, an increase of 59 percent from the previous year. 10.6 billion EUR were provided in the form of federal funding for efficient buildings, and 7.1 billion EUR under the renewable energies program ([KfW 2023](#)). The Norway Government Pension Fund Global, the world's largest SWF, is nudging its investees to strengthen their contribution to carbon reduction. In September 2023, the fund announced that it would actively demand companies to reach net-zero emissions by 2050 and frequently monitor their progress ([Solsvik and Fouche 2023](#)).

5. Conclusion

This essay has discussed the presence of state-owned entities in diverse sectors across various countries. More recently, with the emergence of polycrisis, a resurgence of active state ownership is becoming more visible. The strengthening of the role of state ownership reflects not only the complexity of economic and societal challenges but also the economic and political thinking that is departing, albeit gradually, from a previous era glorifying market liberalization. Another outcome is the rapid spread of industrial policies, including massive subsidies for strategic sectors across the world, such as in the United States.

Though discussing the possibility of strengthening government ownership in the United States may continue to be taboo, even in the current political landscape in which we may be seeing “one of the largest expansions of government since the 1960s” ([Politi 2021](#)) and the “new era of big government” ([Brower, Politi, and Chu 2023](#)), state-owned entities must be considered important industrial policy tools. Developing critical technologies, scaling up green industries, and dealing with the weaponization of key commodities requires a stronger role for the government. There may begin to be a change in thinking in the United States as the Biden administration establishes a green bank as a part of the Inflation Reduction Act of 2022 ([Lattanzio 2023](#)). Furthermore, if the current speed of subsidy provision to businesses continues for the foreseeable future, there may be questions as to whether government support is worth the money and whether the benefits are appropriately shared with the society ([Mazzucato and Rodrik 2023](#)). In situations in which designing, applying, and monitoring conditionalities for the recipients of government subsidies may be challenging, state ownership may offer a solution.

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Finance as a Tool of Industrial Policy: A Taxonomy of Institutional Options

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1. Introduction: Why Financial Institutions Matter

Industrial policy is on the rise, but it has yet to evolve into the kind of financial statecraft needed to meet today's challenges. In industrial policy discussions, finance is habitually lumped together with other types of government subsidies, tax credits, and trade and regulatory policies (Criscuolo et al. 2022). The tools of financing industrial policy are typically limited to government grants, loans, loan guarantees, and various forms of financial risk-sharing through public-private partnerships (PPPs) or similar structures. These financial instruments are used primarily to lower the cost of capital for targeted private business firms seeking to enable private production of the desired goods or services on the desired scale.

Finance—which encompasses financial tools, practices, markets, and institutions—is not simply one of many commonly used industrial policy levers. It is a critical interface between the state and the economy that the state is trying to reinvigorate or redirect.

This approach paints an incomplete picture of the role finance plays in the design and implementation of industrial policy. Finance—which encompasses financial tools, practices, markets, and institutions—is not simply one of many commonly used industrial policy levers. It is a critical interface between the state and the economy that the state is trying to reinvigorate or redirect. Finance is a direct transmission mechanism of the state's industrial policy, which fundamentally shapes the context within which all other industrial policy tools operate. The financial market is not simply a back-office infrastructure for the mechanical execution of economic decisions made by nonfinancial actors; it is a powerful driver shaping many of those decisions in today's heavily financialized economy.

Furthermore, to harness the full potential of finance as a lever of industrial policy, it is essential to focus on the institutional forms through which the state can act as a direct financial market player. The amounts of money spent or allocated to industrial policy goals, or the form in which the money is disbursed (grants, loans, guarantees, etc.) is only part of the picture. Just as important is the institutional channel through which the money flows: It determines how the actual allocation decisions are made, by whom, under what constraints and in response to what factors, and with what ultimate result. Institutions in charge of financing industrial policy critically shape the implementation process and the ultimate economy-wide impact of the government's programs.

Designing a special-purpose institution that can act as an effective financier of the state's industrial policy is, therefore, a central component of the overall design and execution of a successful industrial policy. It is a far more optimal approach than relying on the existing general-purpose government agencies using generic fiscal policy tools subject to traditional political and budgetary constraints. A dedicated institution can be designed to have more flexibility, both financially and administratively, to target particular capital needs, and to tailor the conditions under which public resources are deployed for specific purposes.

This essay offers a basic taxonomy of financial institutions productively employed as instrumentalities of developmental and industrial policies. It focuses on three main institutional categories currently in operation outside the United States: sovereign wealth funds (SWFs), national development banks (NDBs), and state holding companies (SHCs).¹¹ Given the diversity and context-specific features of these entities, it is instructive to examine these phenomena through mini case studies of individual institutions whose success and global recognition make them a standard for their respective institutional forms. Bringing in the United States experience, this essay analyzes the Reconstruction Finance Corporation as an institutional experiment in emergency public finance. It concludes with a few thoughts on how a new US instrumentality of developmental finance—the proposed National Investment Authority (NIA)—could build on the existing institutional types to implement an ambitious industrial policy the US needs today.¹²

2. The Sovereign Wealth Fund (SWF) Model: Norway's Government Pension Fund Global (GPF)

SWFs are a diverse group of special-purpose, government-owned portfolio investment vehicles that pursue a wide variety of domestic policy objectives, including macroeconomic stabilization, cross-generational wealth preservation, and socioeconomic development ([Gelpern 2011](#); [Al-Hassan et al. 2013](#)). Countries as diverse as Norway, China, Kuwait, and Ireland, among many others, have established SWFs using public funds from receipts from exports of natural resources, fiscal or balance-of-payments surpluses, and other sources ([Sovereign Wealth Fund Institute n.d.](#)). While their investment strategies differ greatly, SWFs generally aim to preserve and grow the nation's financial resources by building diversified portfolios of primarily publicly traded, foreign currency denominated securities. The fact that SWFs typically have no debt liabilities allows them to take longer investment views and act as suppliers of “patient” capital critical for transformative infrastructure projects ([Rose 2016](#)).

One of the world's largest and most influential SWFs is Norway's Government Pension Fund Global (GPF, or the Fund). The GPF was established in 1969, shortly after the discovery of massive oil reserves in the North Sea, for the dual purposes of managing petroleum revenues and providing for future obligations of the state ([Centre for Public Impact 2019](#)). As of December 2022, the Fund held over \$1.27 trillion in assets—or about \$231,000 per Norwegian citizen ([Norges Bank Investment Management 2019](#)).¹³

Technically, the GPF is a deposit account at Norges Bank, Norway's central bank, into which the Ministry of Finance (MoF) transfers Norway's petroleum income. As the official owner of the account, MoF is responsible for adopting general guidelines for the Fund's management to be implemented by Norges Bank's Executive Board—which delegates fund operation to its specialized unit, Norges Bank Investment Management (NBIM). The GPF is subject to independent audits, complies with extensive public disclosure requirements, and regularly reports to the legislature.¹⁴

11 This essay focuses on national-level financial institutions, as opposed to multinational or subnational entities. It also excludes traditional government agencies that may disburse appropriated government funds for industrial policy purposes as part of their broader sectoral mandate. The focus here is on specialized institutions of public investment.

12 For the full NIA design proposal, see [Omarova 2022](#).

13 The government can draw funds from the GPF, up to a specified limit ([Alsweillem et al. 2015](#)).

14 The Storting (Norway's legislative body) establishes the Fund's formal framework and assigns responsibility for its implementation to the MoF. The Storting has to approve any significant change to the Fund's investment strategy ([Norges Bank Investment Management 2019](#)).

The GPFG is one of the few large SWFs owned by a democratic government, and is currently the single largest owner in the world's stock markets, with its equity holdings representing over 1.5 percent of total ownership in all of the world's publicly listed companies. The Fund's investments are concentrated in foreign equities, fixed income, real estate, and renewable energy infrastructure. As a large shareholder, the GPFG openly seeks to influence its portfolio companies' business decisions by directly exercising its corporate management rights, as well as by limiting or prohibiting investment in individual companies on ethical grounds ([Halvorssen and Eldredge 2013](#)). This activism is part of the Fund's mandate: Norges Bank's Executive Board requires NBIM to "seek to influence companies in its role as a financially motivated shareholder . . . in accordance with the management mandate for the Fund" ([Norges Bank Investment Management 2023d](#)).¹⁵ The MoF expressly instructs Norges Bank that "a good long-term return is considered to depend on sustainable economic, environmental and social development, as well as on well-functioning, legitimate and efficient markets" ([Norges Bank Investment Management 2023c](#)). The MoF also prohibits the GPFG from investing in foreign companies that commit serious violations of human rights, promote war and conflict, cause severe environmental damage, foster corruption, or otherwise violate fundamental ethical norms. A special Council of Ethics, consisting of five outside experts appointed for fixed terms, advises the MoF and continuously monitors the Fund's portfolio for specific investments inconsistent with ethical guidelines. Upon recommendation from the Council of Ethics or the MoF, Norges Bank can block specific companies from inclusion in the Fund's portfolio ([Norges Bank Investment Management 2023a](#); [Halvorssen and Eldredge 2013](#); [Norges Bank Investment Management n.d.](#)).

The GPFG has long invited criticism as "a template for substantially transparent but politically instrumental funds that also seek to maximize wealth" ([Backer 2015](#)). The primary reason for these criticisms is the perception of the Fund as an instrument of extraterritorial exercise of political power through private market means. From the perspective of industrial policy capabilities, however, Norway's experience is valuable precisely because it demonstrates the potential of a SWF structure to serve as an institutional tool for changing economic incentives and behavior of multiple private companies in multiple sectors. Yet, SWFs operate on the cusp of market and politics in a very particular way. Because they do not borrow in private capital markets, their capacity to make mission-driven investments is not constrained by private bondholders' demands. That makes them uniquely potent vehicles for implementing democratically established economic priorities. Their greatest strength lies in the scale and scope of their investment portfolios: The bigger a shareholder an SWF is, the more power it can exert on the behavior of a wider range of companies. Importantly, SWFs exercise their influence directly inside the companies, through well-established corporate governance rights. At the same time, however, their core function as a conduit for profitably investing the state's surplus revenues, usually by holding foreign companies' securities, limits their flexibility to use that capital for supporting domestic industrial policy goals not aligned with that mandate.¹⁶

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¹⁵ By 2021, the GPFG had divested its holdings of fossil fuel company assets ([Arvin 2021](#)).

¹⁶ This foreign-domestic division is a direct function of individual SWFs' mandates. Some SWFs, such as Ireland's Strategic Investment Fund (ISIF), have an explicit mandate to invest in domestic industries (National Treasury Management Agency n.d.). Financial returns, however, are an essential element of the SWF business model, which again limits their flexibility as a tool of investing in a broader range of domestic public goods.

3. The National Development Bank (NDB) Model: Germany's Kreditanstalt Für Wiederaufbau (KfW)

Development banks are another category of public investment institutions widely used for purposes of financing industrial policy objectives (Griffith-Jones et al. 2022; Mertens, Thiemann, and Volberding 2021; [Griffith-Jones et al. 2018](#)). Hundreds of multinational, national, and subnational public development banks currently operate in multiple countries around the world ([Institute of New Structural Economics n.d.](#)). That list includes entities as varied as the European Investment Bank, Asian Development Bank, Brazil's Development Bank (BNDES), Canada Infrastructure Bank, and China Development Bank. National development banks, or NDBs, differ from SWFs in their explicitly domestic focus, more diverse sources of funding, and greater flexibility of their investment strategies. Unlike SWFs, NDBs are predominantly credit institutions. Depending on their individual mandates, NDBs invest in the construction of traditional physical infrastructures, agricultural development, social housing, strategic export industries, and other areas prioritized by their governments ([Finance in Common 2022](#)).

One of the most successful contemporary examples of the NDB model is Germany's Kreditanstalt für Wiederaufbau (KfW). Established in 1948, the KfW was initially tasked with distributing and lending funds appropriated to Germany under the Marshall Plan. It is owned jointly by the German federal government (80 percent) and the German states (20 percent), and its activities are directly linked to its two shareholders' public policy objectives and political priorities ([KfW 2022](#); [Marois 2021a](#)). KfW is directly supervised by the Federal Ministry of Finance, together with the Federal Ministry for Economic Affairs and Energy. Two primary governance bodies oversee the KfW's operations: (1) the Executive Board that manages the bank's day-to-day operations and comprises members appointed for fixed terms, based on their expertise; and (2) the 37-member Board of Supervisory Directors that exercises overall strategic oversight of KfW's business affairs ([KfW 2022](#)).

Under the KfW Law, the Federal Republic of Germany guarantees all existing and future obligations of KfW and any obligations of third parties expressly guaranteed by KfW ([KfW 2020](#)). Because of the government backing, KfW enjoys a very strong credit rating and derives the bulk of its funding from global capital markets. By issuing federally guaranteed bonds, KfW channels large volumes of money into its domestic and global policy-driven lending and investment activities ([Naqvi, Henow, and Chang 2018](#)).

Today, KfW is one of the largest publicly owned banks in the world. As of the end of 2022, the KfW had total assets of nearly €555 billion. The KfW Law obligates it to provide financing for a wide variety of government policies. The KfW Group accordingly operates through multiple subsidiaries with separate portfolios. Generally, KfW's credit portfolio includes loans to small and medium-sized enterprises (SMEs) that constitute the backbone of the German economy, housing-related loans, educational grants, financing for infrastructure projects, and an array of global funding instruments intended to support Germany's global developmental objectives. The vast majority of KfW's loans are extended through, and in partnership with, Germany's public and private commercial banks.¹⁷ In that sense, KfW acts as a "banks' bank," using its "as good as gold" credit to augment the flow of private credit throughout the economy (Marois 2021b). In addition to running a large portfolio of credit assets, KfW makes strategic equity investments in various sectors and regions. These long-term investments are meant to provide the federal government with the means of taking higher financial risks to promote industrialization, sustainability, and other public policy goals. Notably, one of KfW's specialized subsidiaries, KfW Capital, invests in German and European venture capital funds, for the purpose of strengthening the growth of start-up businesses ([KfW 2022](#)).

¹⁷ The KfW Law expressly mandates this participation approach ([KfW 2020](#)).

This combination of legal mandate and other institutional design features makes the KfW a potent tool of Germany's industrial policy. In the 75 years of its existence, KfW has evolved into a formidable public institution, firmly embedded in the global financial market and actively directing capital flows into the regions and sectors prioritized by the government. KfW's market-actor capabilities were on full display during the COVID-19 pandemic and subsequent period. In response to the pandemic, the German government tasked the KfW with expanding its credit offerings and guarantees for all sizes of firms, credit insurers, and nonprofit institutions. In the first half of 2020 alone, KfW's financing more than doubled in volume as a result of the public financial assistance programs (Marois 2021b, 156-157). In 2022, KfW was at the forefront of Germany's efforts to manage the economic impact of the invasion of Ukraine and ensuing volatility in energy prices. Actively utilizing its financial resources, KfW "achieved its historically strongest promotional year" in 2022, when its policy-driven business rose by 56 percent due to financing government's efforts to secure the energy supply in Germany (KfW 2022).

Outside of emergency situations, KfW is increasingly focused on Germany's long-term sustainability and energy sufficiency policies. KfW actively supports the German government's ambitious plans to combat climate change, aiming for carbon neutrality by 2050 (Mazzucato and Rodrik 2023). A recent study, for example, details KfW's financing of the Energy Efficient Refurbishment and Construction Programs aimed at transferring all residential and business buildings to new energy-efficient standards (Mazzucato and Rodrik 2023). To support this large-scale retrofitting and construction campaign, KfW rolled out massive grant and loan facilities that use attractive interest rates, flexible repayment terms, and partial debt relief to incentivize private-sector adoption of the highest environmental standards. These efforts have generated three times as much total investment in these improvements as KfW's commitments. It is projected to generate aggregate returns to the federal government of as much as €4 per every €1 of budget allocation to the Energy Efficient Refurbishment and Construction Program (Mazzucato and Rodrik 2023).

In sum, KfW exemplifies the potential of a well-designed and ambitious NDB to deliver tangible long-term economic and political results. It highlights the core strengths of the NDB model: the possibility of a broader and more ambitious developmental (as opposed to reserve management) mandate, ability to access private financing in capital markets, and potential diversity of investment tools to advance various policy goals. A typical NDB acts primarily as a lender but can also be an equity investor, so it can use its influence in both roles to direct private-sector behavior and amplify the flow of private capital toward publicly beneficial projects.

To maximize these benefits, however, certain baseline conditions need to exist. The scope and nature of the NDB's mandate determine the scope and scale of its operations and, therefore, must be formulated in a way that preserves the NDB's flexibility and ability to achieve multiple public policy goals. The government's full faith and credit backing is critical to the NDB's ability to access global capital markets, but it puts the government at risk of financial loss—and potentially the loss of political credibility. This increases the importance of a clear legal and institutional framework for the government's support and democratic oversight of the NDB's operations. Yet, government incumbents should not infringe upon the NDB's operational autonomy nor restrain its transformative potential for political reasons. Heavy reliance on private bond financing can also significantly constrain NDB's ability to promote the goals of industrial policy by financing projects unlikely to generate commercial revenues necessary to cover the NDB's debt service payments.

Generally, it is important to remember that the historical, political, and economic context in which an individual NDB operates fundamentally shapes its business choices and its chances of success. The KfW's experience may not be easily replicable in other contexts, where the state's legitimacy as an economic market actor is not as effectively embedded in the existing institutional arrangements. Moreover, in the absence of a vast and well-established ecosystem of public banks operating on state and local levels, as is the case in Germany, legally mandating an "on-lending" (or similar private-public partnering) model increases the risk that an NDB would lose control of the capital allocation process and misallocate public funds to the disproportionate benefit of private interests (Schmidt, Bülbül, and Schüwer 2014). This example underscores the need to contextualize individual institutional design features of successful NDBs.

4. The State Holding Company (SHC) Model: Singapore's Temasek

SHCs constitute the third major category in the taxonomy of existing institutions of industrial policy. While an SHC can be seen as simply another form of state-owned enterprise—an unfortunately ideologically laden label—it can also be designed as a public asset manager, a public interest-oriented counterpart to private asset managers. In this capacity, an SHC can be utilized for the purposes of industrial policy in a much more direct and assertive way than either an NDB or a SWF model would typically allow.

Singapore's Temasek Holdings Ltd. is an example of a modern-day SHC operating along the lines of a public portfolio manager and a venture capital firm. Temasek was incorporated in 1974 to manage Singapore's public funds on behalf of the Ministry for Finance (MFF), its sole shareholder.¹⁸ In 1991, the government designated Temasek as a “Fifth Schedule entity” allowed to draw from the government's reserves ([Temasek 2023a](#)).¹⁹ Together with the Monetary Authority of Singapore (MAS) and the Government of Singapore Investment Corp (GIC), Temasek supports Singapore's annual budget by allowing the government to spend up to 50 percent of its expected net investment returns each year.²⁰

Temasek's charter describes it as “an active shareholder and investor,” “a forward looking institution,” and “a trusted steward” of Singapore's public funds ([Temasek n.d.](#)). Its primary objective is to “build a resilient portfolio that delivers sustainable returns over the long term” ([Temasek n.d.](#)) In its earlier years, Temasek's equity stakes were heavily centered on Singapore's strategic growth sectors: telecommunications, shipping, and banking. As the nation's economic priorities evolved, so did Temasek's. Today, Temasek's investment activities are focused on long-run structural trends in national and global economies, including digitization and sustainability.²¹

Temasek is an active investor in domestic and foreign equities. Its portfolio—which stood at S\$382 billion as of March 31, 2023—includes a variety of publicly traded securities and (increasingly) unlisted shares, held directly or through investment funds.²² Temasek also forms and manages investment funds, joint ventures, and partnerships. For example, in 2021, Temasek partnered with BlackRock to form Decarbonization Partners, a platform for launching late-stage venture capital funds and early growth private equity funds focused on advancing efforts to achieve a net-zero economy by 2050. At portfolio level, Temasek exercises full discretion to rebalance its holdings dynamically, without a precommitment to any specific sector or asset class. Its emphasis is on being an active portfolio manager, nimbly positioning itself for the maximum return over the long horizon. Nonetheless, Temasek—which was initially capitalized by the Singaporean government transferring shares of 35 government-controlled domestic companies to it—holds controlling equity stakes in Singapore's sectoral champions, including Development Bank of Singapore and Singapore Airlines. As of March 31, 2023, 54 percent of Temasek's holdings were in Singapore-headquartered companies ([Temasek 2023a](#); [Temasek n.d. b](#); [Temasek 2021](#); [Temasek 2023b](#)).

18 Minister for Finance (Incorporation) Act (Cap 183, 2014 Rev Ed), <https://sso.agc.gov.sg/Act/MFIA1959>; see also TEMASEK, *Temasek Review 2023*, TEMASEK.COM (2023), <https://www.temasekreview.com.sg/>.

19 See *Temasek Review 2023, A Trusted Steward*, <https://www.temasekreview.com.sg/stewardship/a-trusted-steward.html>; Constitution of the Republic of Singapore, Fifth Schedule (Sing), <https://sso.agc.gov.sg/Act/CONS1963?ProvlDs=Sc5-#Sc5->.

20 MAS is Singapore's monetary authority; GIC is the principal SWF.

21 Toward the latter goal, Temasek claims to “deploy capital to catalyze solutions that enable the transition to a low carbon economy” ([Temasek n.d.d](#)).

22 In recent years, Temasek has pivoted away from public markets and toward private markets ([South China Morning Post 2019](#)).

Temasek finances its activities primarily through portfolio revenues, debt issuances, short-term bank borrowings, and borrowings from the MFF. Temasek's strong credit rating enables it to issue long-term bonds and commercial paper instruments.²³ Importantly, the company uses part of its revenues to finance a wide variety of social services and provide public goods to communities.²⁴ This function was especially significant during the COVID-19 pandemic, when Temasek's social funds were mobilized to implement the government's wide-ranging response measures ([Temasek Foundation 2023](#)).

As a single-shareholder entity, Temasek is lightly regulated and is subject to limited public disclosure requirements ([Chen 2016](#)). As a Fifth Schedule company with the right to draw upon Singapore's reserves, however, Temasek is subject to other forms of mandatory public oversight. For instance, Temasek's Board of Directors is accountable to the Singapore president and the parliament, and the president's approval is required for the appointment, reappointment, or removal of any board members.²⁵ Temasek is also required to provide regular financial reports to the president who has the authority to disapprove its budget.²⁶ Nevertheless, Temasek strongly emphasizes its independence from the government and the fact that it is a "commercial investment company" operating under the guidance of its board, with neither the country's president nor the MFF being involved in its management or investment decisions ([Temasek n.d.](#)). There are also signs suggesting official efforts to bolster a perception of Temasek's independence from the Singaporean government ([Venkat and Paris 2009](#); [Lim and Chatterjee 2009](#)).

In sum, as Temasek's example shows, the SHC model supports a wide range of direct and flexible institutional channels for the state's pursuit of active industrial policies. Unlike NDBs, these entities are not focused primarily on lending but can build predominantly equity holdings, which gives them more effective ways of influencing their portfolio companies' business strategies. In contrast to SWFs, SHCs can take controlling stakes in private companies, which is especially important for nurturing innovative early-stage businesses and facilitating commercialization of new technologies. If that is a significant element of the government's developmental strategy, having an SHC to act as a venture capital fund greatly enhances its implementation capabilities. Furthermore, exercising corporate control over strategically important domestic companies allows the government not only to continuously shape the structure of the economy or maintain its geopolitical viability but also to respond more effectively and quickly to any emerging macro-level pressure or emergency. The flexibility of an SHC's investment tools and mandate allows it to adapt dynamically to the needs of the economy or the state managing it.

That flexibility, however, is also a source of potential vulnerability of the SHC form to political criticism and attacks on its legitimacy. This is a particularly weighty concern in a democratic polity. The intimate connection between the state and the SHC it controls heightens the need for an effective governance and democratic accountability structure that would preserve this entity's decisional autonomy and ability to pursue public objectives through market means.²⁷

23 As of March 31, 2023, Temasek had S\$20.2 billion in outstanding bonds, and S\$1.3 billion in Euro-denominated commercial paper ([Temasek n.d.c](#)).

24 By 2023, the company has committed in total close to S\$1 billion to operate its nearly 1,500 social programs that include mental and physical health services, cultural exchange, music and arts educational facilities, care for the elderly, and so forth ([Temasek Foundation n.d.](#)).

25 Constitution of the Republic of Singapore, §22C (1A) (Sing), <https://sso.agc.gov.sg/Act/CONS1963?Provids=P15-#pr22C->.

26 Constitution of the Republic of Singapore, §22D (1A) (Sing), <https://sso.agc.gov.sg/Act/CONS1963?Provids=P15-#pr22D->.

27 Given the direct state ownership of an SHC (especially if it is organized as a commercial corporation with a single shareholder), this model is likely to face the same political and ideological obstacles as the more general category of a "state-owned enterprise" (SOE), routinely vilified in the mainstream economic literature of the last several decades.

5. The US “Emergency Public Finance” Experiment: The Reconstruction Finance Corporation

Although the US has no dedicated federal institution tasked with financing or implementing industrial policy, it is a home to one of the most interesting and instructive historical experiments in this area: the Reconstruction Finance Corporation (RFC). During its years of activity (1932–1953), the RFC has achieved remarkable success in mobilizing America’s financial resources to lead the nation through the Great Depression and the World War II effort. The RFC offers an example of what can be termed an emergency public finance option: functionally, a hybrid of NDB and SHC models, with a limited term but significantly broader operational flexibility.

The RFC was established as a special government corporation in the wake of the 1929 stock market crash.²⁸ It marked a unique effort by the US government to intervene directly in a troubled economy to restore public confidence in the nation’s financial system. The RFC was meant to restart the flow of credit necessary to prevent the nation’s economy from collapse by lending to banks, trust companies, and other financial institutions. Congress later authorized the RFC to purchase preferred stock in banks, insurance companies, and other lenders. The RFC was also granted authority to make loans to business enterprises and assist in financing the construction of public works. Under its expanded mandate, the RFC engaged in large-scale direct lending to municipalities, utilities, commercial businesses, farmers and farm co-ops, production credit associations, joint-stock land banks, livestock credit corporations, and local lending institutions. Operating through multiple specialized finance subsidiaries and 33 regional offices nationwide, the RFC became the New Deal’s “capital bank.” During World War II, the RFC took the lead in financing and implementing national defense programs, which included constructing, owning, and operating defense-related manufacturing facilities. To this end, the RFC established eight subsidiary corporations to produce strategic defense goods ([Secretary of the Treasury 1959](#); [Wheelock et al. 2013](#); [Olson 1988, 42–46](#); [Bossie and Mason 2020](#)).

The RFC was initially capitalized by selling \$500 million in stock to the US Treasury. It was also authorized to borrow from the Treasury. Over time, the RFC borrowed a total of \$51.3 billion from the Treasury and \$3.1 billion from the public, all backed by the full faith and credit of the US. The RFC typically invested in projects that provided a reasonable assurance of repayment, so that its investment income generally exceeded its losses and expenses. In that sense, it was a commercially sound enterprise. However, many of the RFC’s loans and investments were made with little to no expectation of recovery. Notable examples included grants and loans to other federal government and state agencies during the New Deal era and expenditures in support of the WWII effort. In these cases, Congress “recognized the unbusinesslike nature of these expenditures” and canceled the RFC’s obligations to repay the funds to the Treasury. As the Treasury’s final report on the RFC emphasized, “Nowhere in the basic RFC legislation are there any indications that RFC was established for the purpose of making a profit. The stated purposes for RFC’s existence were to deal with emergency situations and to aid in attaining broad economic goals” ([Secretary of the Treasury 1959](#)).

The extraordinary scale of the RFC’s operations and the high degree of flexibility in structuring its investment portfolio were critical determinants of both its commercial success and its extraordinary efficacy as a tool of industrial policy. At its peak, the RFC’s balance sheet dwarfed the combined balance sheets of Wall Street banks ([Olson 1988, 20](#)). The RFC’s authority to make equity investments, in particular, augmented its policy-based market footprint. By 1934, the RFC held voting rights in thousands of American firms and was the single largest investor in the country ([Olson 1988, 124](#)). It often operated by purchasing as much preferred stock as there was common stock outstanding, thereby doubling the firm’s capital and acquiring a controlling interest. To protect its investment from insider misappropriation or abuse, the RFC actively exercised its shareholder and creditor rights to influence portfolio companies’ dividend and executive compensation policies ([Olson 1988, 112, 125–126](#); [Jones and Angly 1975, 156–158](#)). In that sense, it was acting much like a public venture capitalist.

28 See Reconstruction Finance Corporation Act, 15 U.S.C. § 601 et seq (repealed 2010) [hereinafter RFC Act].

The RFC was terminated by Congress in 1951 but continued operating until 1957, when its assets were transferred to other federal agencies ([Butkiewicz 2002](#)).²⁹ While unique in many respects, its experience shows both the need for and the viability of a distinctly American institutional model for implementing a large-scale industrial policy program. We've done it before; we can do it again—but better.

6. Conclusion: Institutional Design Lessons for Financing US Industrial Policy

The choice of the institutional form optimally suited for delivering the desired macroeconomic and sociopolitical results is an essential component of a viable industrial policy. This essay has offered a taxonomy of the key types of national financial institutions that currently perform—or have historically performed—this function. Understanding their distinctive features provides the basis for designing a more finely tuned institutional instrument for the type of industrial policy the United States needs to address multiple challenges it faces today.

These challenges demand a more robust and flexible institutional approach than what even the best-known existing models—Norway's GPF, Germany's KfW, and Singapore's Temasek—can offer. As this essay shows, each of these examples reflects a unique set of economic, political, cultural, and other circumstances that enabled them to rise to their current prominence. Their success cannot, and need not, be replicated through a wholesale institutional form adoption. Instead, US policymakers should focus on the more granular design choices with respect to financing the new public institution, defining its investment priorities and powers, and ensuring its democratic accountability.

The proposal to establish a National Investment Authority (NIA) takes such a modular approach to institutional design ([Omarova 2022](#)). It builds on certain key elements of the NDB and the SHC models, combined with the RFC's intense focus on the political-economy aspects of its mission.

The NIA is envisioned as a dedicated institutional platform for operationalizing, financing, and implementing nationwide developmental and industrial policy initiatives. Its proposed structure allows for a coordinated public action in multiple markets through multiple channels. The NIA Governing Board, an independent federal agency subject to democratic control by Congress and the president, would oversee and strategically direct several operating entities—federally chartered government corporations—managing large, diversified portfolios of investments ([Omarova 2022](#)). One operating NIA subsidiary, the National Infrastructure Bank (NIB), would focus on credit-based financing of industrial policy priorities through loans, guarantees, securitization, and secondary market-making ([Omarova 2022](#)). It would function as a modified version of an NDB, with a broader set of tools applied at a deliberately large scale.

A separate NIA subsidiary, the National Capital Management Corporation (NCCM, or “Nicky Mac”), would specialize in equity-based finance, mainly of higher-risk structural priorities ([Omarova 2022](#)). It would function as a publicly owned asset manager, setting up multiple investment funds and soliciting pension funds, endowments, and other potentially “patient” institutional investors to purchase passive equity stakes as limited partners in its funds.³⁰ As the sole general partner, Nicky Mac would select and manage, with appropriate public input and oversight, individual funds' portfolios of equity investments in advanced clean technology, critical physical and social infrastructure, and other transformative projects that currently do not get financed on the necessary scale. In effect, Nicky Mac would augment the traditional SHC model's active investment management capabilities, taking it closer to the RFC's finest moments as the engine of long-term economic renewal.

29 The RFC's surviving offspring include the Federal National Mortgage Association (Fannie Mae), the housing finance giant originally established as the RFC's mortgage subsidiary, and the Small Business Administration (SBA), which was set up in 1953 to take over the RFC's small business and disaster relief loans ([Butkiewicz 2002](#)).

30 To minimize undesirable arbitrage opportunities, Wall Street banks, private equity funds, and hedge funds would not be eligible participants.

Learning from successful NDB and SHC examples, it is critical to maintain the NIA's ability to self-finance. However, to maximize its operational autonomy from both incumbent politicians and private bondholders, the NIA would have to avoid excessive dependence on explicit federal guarantees and private capital markets. To this end, the Federal Reserve would provide liquidity support for the NIA subsidiaries, much like it does for many public and private entities today. In an emergency, the NIA would also have the right to borrow directly from the Treasury. This form of government backup would enable the NIA to pursue long-term industrial policy goals without being hampered by demands of “commercial viability” or electoral cycles ([Omarova 2022](#)).

Many other design features of the proposed NIA—including its mandate, functions, governance, and accountability mechanisms—creatively adapt and build on the cumulative experience of other public investment institutions, at home and abroad. For purposes of this essay, the key is simply to highlight the general direction in which we can take the project of building a new institution for financing America's new industrial policy. As this brief sketch of the NIA idea shows, we can approach this task thoughtfully but boldly, so that the result is both historically rooted and decisively forward-looking.

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Leading with Industrial Policy: Lessons for Decarbonization from Swedish Green Steel

By Jonas Algers

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1. Introduction

Heavy industry is characterized by significant inertia and path-dependency, locking in unsustainable use of fossil fuels. Steel is a major industrial subsector, emitting 7 percent of global energy system emissions in 2019–10 percent including indirect emissions ([IEA 2019](#)). However, two “green steel” projects located in Northern Sweden are showing a way out of fossil lock-in; one is the Hydrogen Breakthrough Ironmaking Technology initiative—known as HYBRIT—and the other is the start-up H2 Green Steel. In this essay, I will trace the role of policy in enabling these two projects.

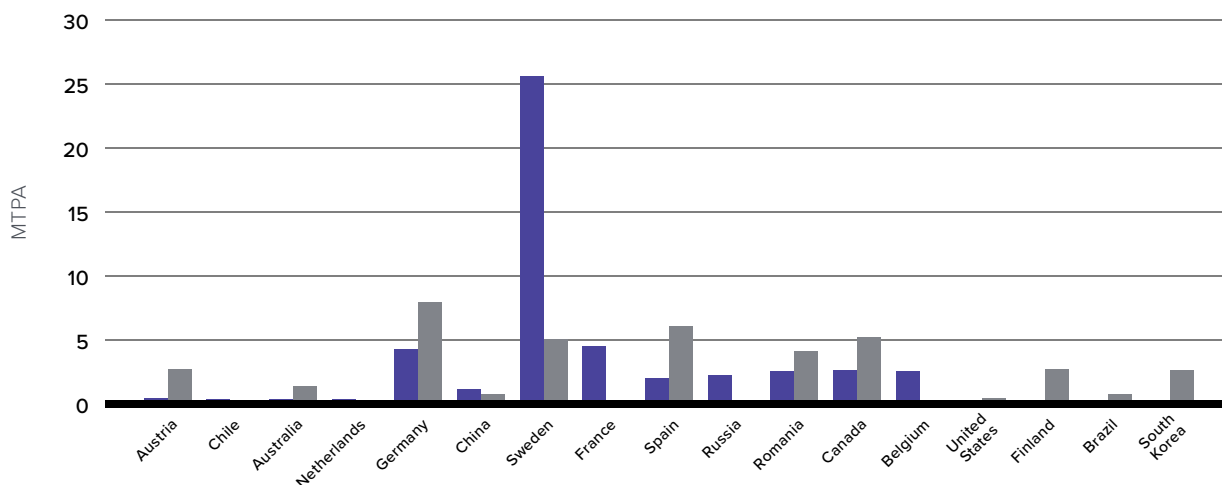
Globally, about 70 percent of steel is produced through what is called the primary route, using iron ore as the main input. This route reduces iron ore to iron, and later this iron is smelted together with other materials, turning it into the alloy steel. About 90 percent of primary steelmaking uses a blast furnace (BF) to reduce the iron ore into iron and a basic oxygen furnace (BOF) to turn iron into steel. Coking coal is used as a reductant in the BF, making this route emission-intensive, producing almost 3 tonnes of CO₂ per tonne of steel directly and indirectly ([IEA 2022](#)). The remaining 30 percent of global steelmaking is done through the secondary route, using scrap as the main input and smelting the scrap in an electric arc furnace (EAF). This is a much less emission-intensive process, producing under 0.3 tonnes of CO₂ per tonne of steel, most of which arise from electricity used. However, limits to availability and quality restrict the scope of scrap-based steel, making new, low-emission primary production processes necessary ([IPCC 2022a](#)).

The process detailed in this essay is the hydrogen direct reduction route, which produces direct reduced iron (DRI) that can later be smelted in an EAF, called the H-DR-EAF route ([Vogl et al. 2018](#)). Using green hydrogen from renewable energy as a reductant, hydrogen-based steelmaking can reduce emissions from primary steel by 95 percent compared to the BF-BOF baseline, and remaining emissions are a smaller innovation challenge ([Vogl and Åhman 2019](#)).

There are currently two hydrogen-based primary steel projects in Northern Sweden, the HYBRIT initiative and the start-up H2 Green Steel. HYBRIT is a joint venture between Swedish power utility Vattenfall, miner LKAB, and steelmaker SSAB. SSAB plans to replace its BFs in Sweden and Finland with a current steelmaking capacity of 6.4 million tonnes per annum (mtpa) with EAFs fed with DRI from LKAB which takes over the reduction step. This will remove about 8 million tonnes of annual CO₂ emissions by 2030—10 percent of Sweden's total emissions plus 7 percent of Finland's emissions ([SSAB 2022](#)). However, the largest contribution to global emission reductions from HYBRIT is miner LKAB exporting direct reduced iron rather than iron ore. Currently, LKAB produces 80 percent of the European Union's iron ore, and LKAB's decarbonization plan will reduce annual emissions by 40 to 50 million tonnes, equivalent to Sweden's total territorial emissions ([LKAB n.d.b](#)).

The second project is the start-up H2 Green Steel (H2GS), which plans to produce 2.5 mtpa by 2025 and 5 mtpa by 2030. H2GS was started by venture capitalist Harald Mix, who is also a key player behind Swedish battery maker Northvolt and is led by Henrik Henriksson, formerly CEO of Swedish truck manufacturer Scania. H2GS will expand Sweden's steel capacity from 4 to 9 mtpa, aiming to replace emission-intensive, fossil-based steel abroad. These projects have propelled Sweden to the top of the globe among green iron and steel announcements, as can be seen in the figure below.

Figure 1. Green Iron and Steel Announcement by Capacity



Key

- Green Iron
- Green Steel

Note: Figure 1 shows green iron and steel announcements by capacity. The methodology for accounting green steel projects does not yet include H2 Green Steel's full plans but is used here for comparability with other countries.

Source: LeadIT Green Steel Tracker.

These two projects have very different profiles. H2GS is a start-up that has neither been publicly listed nor produced a single tonne of steel yet, while HYBRIT is a joint venture of 100 percent state-owned Vattenfall and LKAB, which in turn is the largest shareholder of SSAB. SSAB has produced steel for over 40 years while LKAB has produced iron ore for more than 130 years. SSAB was founded when the government restructured the steel industry in response to the steel crisis of the 1970s, and LKAB became a key shareholder when SSAB was listed in 1989. However, the differences between these two projects show how distinct types of actors—with different types of state involvement—can play complementary roles across the same innovation system.

The differences between these two projects show how distinct types of actors—with different types of state involvement—can play complementary roles across the same innovation system.

Why has Sweden reached a globally leading position on iron and steel decarbonization? And what has been the role of industrial policy in enabling the transition away from fossil-based steel? In the next section, I present how the Swedish steel sector moved toward hydrogen-based steelmaking. In the third section, I discuss the key policies that have mobilized finance for these projects. Finally, I draw conclusions for industrial policy supporting deep industrial decarbonization in the US steel industry.

2. The Climate Policy Framework

After the Paris Agreement was signed in 2015, the Swedish parliament agreed on a Climate Policy Framework binding parties from the Left and Right to long-term climate targets ([Klimatpolitiska rådet n.d.](#)). The target set out in the Climate Policy Framework is to reach net-zero emissions by 2045, and net-negative emissions thereafter. This was a clear change in Swedish climate policy, as it committed both the Right and Left to policy not merely for *reducing emissions*, but for *deep decarbonization*. This framework therefore set a clear marching order—or *direction* ([Nilsson et al. 2021](#))—that Swedish companies should develop their business in line with zero emissions over the long term. For steel, that is a significant difference, as energy and material efficiency within a fossil-based system cannot reach net-zero emissions, instead requiring new production processes (even with carbon capture utilization and storage [CCUS], BF-BOF steelmaking still cannot reach sufficient emission reductions [[Vogl and Åhman 2019](#)]). In addition, the government launched a program for decarbonization called Fossil Free Sweden ([Regeringen 2016](#)) to coordinate business initiatives by sectors and institutionalize a relationship between government and business in which business could communicate policy needs to achieve the government's targets, improving what political sociologist Peter Evans calls the “embeddedness” of the state with business ([Juhász et al. 2023](#)).

With the Paris Agreement signed and the Swedish Climate Policy Framework in place, SSAB had to consider how to respond to the push for long-term decarbonization. For a long time, carbon capture and storage (CCS) had been the favored route in the steel industry, despite CCS being insufficient in fully decarbonizing steel due to low capture rates ([ICCP 2022a](#); [IEA 2022](#)). However, SSAB's problem was that its coking plant (which turns coal into coke to be used in the BF) in Oxelösund had failed environmental permits due to air pollution and had only received an exemption until 2027 ([Mark- och miljödomstolen 2019](#)). Both retrofitting its plants with CCS and building a new coking plant was not appealing to SSAB, as it would lock in fossil fuel use without any realistic prospects to reach parliament's target of zero emissions.

3. Renewable Energy Cost Declines Enable Hydrogen-Based Steelmaking

While problems with CCS persisted, hydrogen-based steelmaking was a known alternative among key players at SSAB, including CTO Martin Pei. But while the hydrogen route was a familiar idea, it hadn't been tried at scale, as it requires vast amounts of electricity to replace energy derived from coal, increasing costs and making green steel uncompetitive.

However, with the cost declines for renewable energy seen in the 2010s, this problem was becoming surmountable. Studies found that future costs would be up to about 20 percent higher per tonne of steel produced in the H-DR route than in the BF-BOF route, highly subject to electricity costs ([Material Economics 2019](#); [Vogl et al. 2018](#)). Northern Sweden's ample hydropower and significant wind power opportunities therefore give the region significant competitive advantages for hydrogen-based steelmaking. In addition, as steel is an intermediary input, cost increases for green steelmaking were found to be minor for final goods, ranging from about 0.3 to 2.1 percent of total costs ([Delasalle et al. 2022](#); [Rootzén & Johnsson 2016](#)). Because hydrogen-based steelmaking requires a different value chain, using electricity over coal and DRI rather than iron ore, SSAB reached out to miner LKAB and power utility Vattenfall to integrate the rest of the value chain in its plans and to coordinate a transition. LKAB produces 80 percent of the EU's iron ore and almost all of Sweden's iron ore, and Vattenfall owns 41 percent of all power capacity in Sweden ([Lejestrand 2023](#)). Getting both of them on board for decarbonizing steel was key due to the companies' significant influence on the innovation system as a whole.

Importantly, hydrogen-based steelmaking was also a way to please LKAB's and Vattenfall's owners: the state. Both companies are 100 percent state-owned, and the state had set a clear direction toward decarbonization. In 2016, as the Climate Policy Framework was being developed, Vattenfall announced an "action plan" for emission reductions that included the sale of coal assets, and an intention to focus on "enabling customers to reach their climate targets" ([Vattenfall 2016](#)), meaning businesses purchasing power from Vattenfall such as iron and steelmakers.

HYBRIT

Together, SSAB, LKAB, and Vattenfall launched HYBRIT, creating a common research platform to decarbonize the entire iron and steel value chain. Meanwhile, the government set up the The Industrial Leap ([Industriklivet n.d.](#))—a program under the Swedish Energy Authority to support decarbonization initiatives in heavy industry. While the initial funds were relatively small, they were important in funding early research. Universities and research institutes were invited to research several aspects of the steel transition, from technical to market effects ([HYBRIT n.d.b](#)).

The pace of development increased in 2020, when HYBRIT launched a pilot plant for testing H-DR ([HYBRIT n.d.a](#)). By the end of the year, LKAB announced plans to invest 400 billion Swedish Krona (SEK) (roughly \$40 billion) over 20 years to transition from producing iron ore to DRI. This would enable zero emissions from all products and processes by 2045—slashing 40 to 50 million tonnes of annual CO₂ emissions ([LKAB n.d.b](#)). In January 2022, SSAB declared that it would invest SEK 45 billion (roughly \$4.5 billion) in decarbonizing its facilities ([SSAB 2022](#)).

With these plans, the companies' power demand will increase to 20 Terawatt-hours (TWh) by 2030 and 70 TWh by 2050—about half of Sweden's total production today and nearly the amount of electricity generated in the state of Missouri.

H2 Green Steel

The second green steel project in Sweden is the start-up H2 Green Steel (H2GS), launched in 2020 by venture capitalist Harald Mix and his investment firm Vargas Holding. Mix had been involved in the battery start-up Northvolt and it had become clear that steel would be the next step in the decarbonization of the vehicles industry. Green steel would enable carmakers to offer an even "greener" car to climate-conscious early adopters, and costs would only increase by a few hundred dollars that could be passed on to consumers.

H2GS was announced in early 2021. The plan is to build a facility that includes production of hydrogen, iron, and steel in the town of Boden in northern Sweden. Production is set to start in 2025, gradually increasing capacity to 5 mtpa by 2030—doubling Sweden's current steelmaking capacity.

Mix and his team's most significant challenge was creating a start-up reliant on large investments in unproven technology in the highly inert steel industry. Their strategy has been based on getting upstream and downstream actors to buy in on the success of the company. They recruited Henrik Henriksson, former CEO of the truck-making company Scania, to lead the new company. Then, H2GS worked the market to get offtake agreements with major steel purchasers. Scania was one of the first customers, together with machinery makers Miele and Electrolux. In 2022, H2GS announced that it had sold 1.5 out of the 2.5 million tonnes worth of initial annual output over 5 to 7 years—orders worth over 100 billion SEK (\$9.5 billion) ([Svensson 2022](#)). In June 2023, Scania announced that it will buy an undisclosed amount of green steel from H2GS as part of its plan to use 100 percent green steel by 2030 ([H2 Green Steel 2023a](#)). Upstream firms such as Kobe Steel, the owner of Midrex, one of the two companies that manufacture H-DRI furnaces ([H2 Green Steel 2022](#)) and cable and grid technology manufacturer Hitachi Energy have both purchased equity in the company. These contracts and

offtake agreements have been important to secure funding, as H2GS could show that there is demand for the product in negotiations with banks to lower capital costs. In October 2022—a year and a half after the company was announced—H2GS had secured €3.5 billion in debt financing, out of its goal of €5 billion ([H2 Green Steel 2022](#)).

4. Financing the Transition

The state has had a direct engagement in fostering the development of green steel in Sweden. As mentioned earlier, the Climate Policy Framework gave clear directionality for the Swedish iron and steel industry toward deep decarbonization, and the Fossil Free Sweden also formalized a framework for coordinating business initiatives for decarbonization with policymakers. Furthermore, the state—both at the national level and at the EU level—has played a key role in taking on risk and financing the transition through several channels, listed and discussed below.

Table 1. Identified Key Interventions Supporting the HYBRIT and H2 Green Steel Projects

Intervention	Type of Intervention	Backing Organization	Funds
Industrial Leap and EU exemptions for state aid	Subsidies	The Swedish Energy Authority	SEK 3.1 billion for HYBRIT and SEK 3.8 billion for H2 Green Steel
Green Credit Guarantees	Credit guarantees	The Swedish National Debt Office	Guaranteeing 80 percent of a €1.2 billion loan to H2 Green Steel
Export bank support	Loan and import guarantee	The Swedish Export Credit Agency and Euler Hermes Aktiengesellschaft	Undisclosed
New financial targets in LKAB	Lower dividends from LKAB	The Swedish Government and LKAB	Lowering the return on equity from over 12 percent to 9 percent and increasing the net debt/equity ratio to less than 0.6 times from 0 to 0.3
The European Investment Bank	Loan	The European Investment Bank	€750 million in senior debt funding to H2 Green Steel
The EU Innovation Fund	Subsidies	The EU Innovation Fund	€143 million in support to HYBRIT and an undisclosed amount to H2 Green Steel

The Industrial Leap and EU Exemptions for State Aid

In 2016, the government set up The Industrial Leap, run by the Swedish Energy Authority, which supports investments in clean technologies and research on an application basis. As mentioned earlier, this program was important for initial research in the HYBRIT initiative but has also given SEK 30 million for initial technical work at the H2 Green Steel site.

The Industrial Leap has now been expanded and can give larger subsidies for major investments. It was the Swedish government's contribution to the EU's Recovery and Resilience Facility in 2021 ([Energimyndigheten 2023a](#)). HYBRIT and H2 Green Steel have applied for SEK 3.7 billion and SEK 3.8 billion, respectively, under the program ([Björkland 2023](#)), and the Energy Agency has approved SEK 3.1 billion for HYBRIT ([Energimyndigheten 2023b](#)). This form of state aid was previously banned in the EU, but this ban has been lifted on state aid that supports the EU's goals of a clean economy ([European Commission 2021](#)).

Green Credit Guarantees

In 2021, the government gave the Swedish National Debt Office (SNDO) the mandate to issue “green credit guarantees” in SEK, euros, or dollars to guarantee up to 80 percent of the loan for an investment that contributes to lower emissions ([Riksgälden n.d.](#)). By guaranteeing a loan and thus taking over risk, the government can show commitment to a project and lower its capital costs. The SNDO has now approved a green credit guarantee for H2 Green Steel for a €1.2 billion loan ([Riksgälden 2023](#)).

Export Banks

In October 2022, H2 Green Steel announced that it had received debt financing of €3.5 billion in an agreement with the Swedish Export Credit Agency (SECA) and a number of private banks ([H2 Green Steel 2022](#)). In 2020, the government tasked the SECA with investigating how it can contribute to the global climate transition and help Sweden reach its targets under the Climate Policy Framework ([EKN 2021](#)). Energy sector exporters in Sweden can now apply for funding from the SECA ([Svensk Exportkredit n.d.a](#)), and the agency has established a Scientific Climate Council to support and advise its operations to align export finance with climate targets ([EKN 2021](#)). The SECA now has a target that 50 percent of issued loans should be green by 2030 ([Svensk Exportkredit n.d.b](#)).

New Financial Targets in LKAB

In October 2021, LKAB held an extraordinary general meeting with the state during which new financial targets were agreed upon ([LKAB 2021](#)). The government stated that “to support the strategy and increase flexibility in the upcoming transformation” ([LKAB 2021](#)), the government would increase the allowed net debt/equity ratio to <0.6, up from 0–0.3, and lower the targeted return on equity from 12 to 9 percent. Through its direct and full ownership, the state has been able to allow for higher debt and lowering the target return on equity, thus supporting LKAB to achieve its transition by lowering revenue to the state budget rather than by increasing expenditure via subsidies.

The European Investment Bank

The EU has also been an important direct player in the Swedish green steel transition. In 2019, the European Investment Bank (EIB) received an updated mandate to turn it into “the EU climate bank” in line with the Green Deal of 2019 ([EIB 2020](#)). This new mandate emphasizes low-carbon projects such as H2GS. The EIB came out as a financial intermediary for H2GS in 2021, and in 2022 it was announced that EIB had received board approval of €750 million in senior debt funding for H2GS ([H2 Green Steel 2022](#)).

The EU Innovation Fund

Under the EU’s Emission Trading Scheme (ETS), firms have to pay for emissions in the EU. Revenue from this scheme funds the EU Innovation Fund, which funds the deployment of green technologies. The Fund announced in April 2022 that it would support HYBRIT with €143 million ([Vattenfall 2022](#)) and in July 2023 H2GS announced that it had been chosen as one of 41 projects in the EU receiving €3.6 billion ([European Commission 2023](#); [H2 Green Steel 2023b](#)).

5. Discussion: Directionality, Risk-Taking, Ownership, and Competition

Sweden is currently a leader in steel decarbonization. But why has steel decarbonization reached so far in Sweden, and not in other countries with similar endowments of renewable energy and iron ore? What lessons can be learned from Sweden for industrial decarbonization elsewhere?

In the interviews and document analysis conducted for this early study, four policy factors stood out: 1) clear directionality with broad political backing on where iron and steelmaking should be heading, 2) risk-taking by the state in the innovation process, 3) ability to influence the innovation system through its direct ownership, and 4) competition bringing speed and diversity to the transition.

Directionality

The scientific literature on innovation for industrial transitions points to *directionality* as a key pillar enabling transformations ([Grillitsch et al. 2019](#); [Mazzucato 2016](#); [Nilsson et al. 2021](#)). Innovation is inherently uncertain and bears significant risks, especially when associated with heavy industries using large production units that are heavily reliant on infrastructure and that invest over very long time horizons. To manage such risks, the state should not pick a “winning” technology but rather set a “direction of change” and allow experimentation and learning from industry and other stakeholders ([Mazzucato 2016](#)). This process allows the different parts of the innovation system to coalesce around a path to decarbonization and collaborate across the value chain in its development.

The Swedish Climate Policy Framework created this directionality and long-term policy stability, and the creation of Fossil Free Sweden established an institution through which learning and cooperation across private firms, the state, and other stakeholders could be developed. The wider development in the EU with the EU ETS and phase-out of free emissions credits have further enhanced this directionality.

Risk-Taking

Second, rather than merely “fixing” the market by putting a price on externalities, i.e., pricing carbon, the state has been pushing innovation by actively taking on and sharing risk along with private firms ([Lazonick and Mazzucato 2013](#); [Mazzucato 2013](#)). Such risk-taking based on a path toward decarbonization can enable innovation, create new markets, and thus help break out of fossil dependency.

There is an ongoing debate on the recent turn to industrial policy and what has been dubbed as the “de-risking state”—when the state takes on risk to enable private investment. UK-based Professor of Economics and Macro-Finance Daniela Gabor, who has been a prominent participant in the debate, argues that a clear limit with this approach is that it “outsources the pace of decarbonisation to private capital, and in so doing, can amplify its disorderly expansion guided by shifting profit opportunities” ([Gabor 2023](#)). Indeed, in the Swedish case, the target of net zero by 2045 is set for the government, and apart from carbon pricing under the EU ETS, there are no extra penalties for firms that do not reduce their emissions to zero by 2045. However, de-risking has been important in the Swedish case specifically in increasing the pace of the transition by lowering capital costs for technologies that have been untested at scale, for example electrolysers for H2 Green Steel imported from Germany ([Martin 2023](#)), and for accessing finance of the size required. HYBRIT did not plan to apply for the relatively larger subsidies under The Industrial Leap in the original timeline of decarbonization by 2045, as technology risk was manageable in this slower pace. In the shorter timeline, subsidies became a key enabler.

A more important limitation with the de-risking approach in the Swedish case is the lack of conditionalities that distribute both risks and rewards ([Lazonick and Mazzucato 2013](#)). De-risking has been important in lowering capital costs for H2GS and helping attract investors, but there are no conditionalities on the distribution of rewards. While the start-up is building a new plant, and therefore by definition should create jobs and provide tax revenue, there is no guarantee of long-term success. There are ample opportunities for personal profiting even though the project struggles (see, for example, the battery manufacturer Freyr in bordering Norway, which received unconditioned support from the EU Innovation Fund as late as July 2023 after which the CEO took out the equivalent of \$11 million in dividends and is now moving operations to the US). Support for H2GS and other industries could be combined with curbs on personal remuneration until the plant is operating commercially.

State Ownership

In addition to directionality and risk-taking, the Swedish state's ownership in key firms enabled a deeper push for iron and steel decarbonization. Sweden has for the last few decades been governed in a market-oriented fashion, with privatization of welfare services and companies. However, LKAB and Vattenfall are exceptions to this trend and have remained state-owned. While the Swedish government cannot command its state-owned enterprises (SOEs), it can appoint board members in the companies and set general targets for SOEs through its ownership policy.

Due to state ownership of LKAB and Vattenfall, these companies can incorporate the long-term social (and not commercial) goal of decarbonization in their strategies, without having to please shareholders whose main concern is to maximize short-term financial returns ([Lazonick 2015](#)). While it is commonly argued that SOEs are less efficient than private firms, they can play a particular role as instruments of innovation policy in an innovation system by “combining risk-taking and long-term orientation” and acting as “coordinating or direction giving change agents” ([Tönurist and Karo 2016](#)). The long-term orientation and risk-taking is indicated by LKAB's new financial targets. The ownership structure also allowed the firms to coordinate the value chain and cooperate in negotiations with government, which is unusual.

State ownership has been shown to distort the steel market, and the OECD has found it to be related to subsidies and overcapacity ([OECD 2018](#)). At the same time, state ownership can play a particular role in innovation and decarbonization. The OECD has also found that “due to the use of SOEs by the state to further a ‘green’ agenda and use the SOE as an instrument to directly increase deployment of zero or low carbon electricity generation . . . SOE ownership has a positive effect on investment in the renewable electricity generation sector in OECD and G20 countries” ([Prag et al. 2018](#)). This is in line with other empirical studies (see, for example, [Mazzucato and Semieniuk 2018](#)). While SOEs may have market-distorting effects, they can be useful tools for innovation and decarbonization. Encouraging SOEs to take on an innovative role in the decarbonization process while avoiding damaging market distortions will be a difficult but important balancing act.

Direct and indirect state ownership has also disciplined LKAB, SSAB, and Vattenfall to follow the goal of decarbonization rather than pushing back to maximize shareholder value ([Lazonick 2015](#); [Palladino and Estevez 2022](#)). This discipline complements the de-risking approach discussed above, avoiding the pitfalls described in [Gabor 2023](#).

Competition

Finally, having two different types of projects that can both complement and compete with one another has sped up and diversified the decarbonization of the Swedish iron and steel industry.

First, HYBRIT's pilot plant was an important enabler of H2GS. H2GS is a start-up, and spending years first on researching the technology and then piloting would not have been possible for a company without revenue. With HYBRIT having done much of the initial work showing that the H-DR-EAF steelmaking route was not only technically possible but could also be financially viable, it became possible for H2GS to credibly make the case for steelmaking using similar technology.

Second, H2GS has to get a revenue stream up and running as quickly as possible, and has therefore set itself a very tight deadline. While HYBRIT took on an early role in bridging green innovation from the step of early technology development to demonstration and deployment, H2GS put speed at the heart of the process. As H2GS needs to minimize the time during which it is spending venture capital before generating revenue, its incentives are aligned with the need for rapid action on climate. H2GS was announced in 2021, and this competition pushed HYBRIT to move forward its plans, sparing the atmosphere millions of tonnes of CO₂. H2GS therefore responds to what [Lazonick and Mazzucato 2013](#) call the “opportunity creation” of the Swedish entrepreneurial state, and reciprocates by speeding up the entire process.

At the same time, HYBRIT and H2GS have somewhat different profiles and customer segments. HYBRIT includes a transition of SSAB, building on established value chains and customer bases, but also ironmaking. This can enable transitions both in Sweden and abroad, as other steelmakers can replace their integrated BF-BOF mills with EAFs fed with DRI from LKAB. H2GS, on the other hand, is meeting a certain segment of early adopters across industries. This helps diffuse hydrogen-based steelmaking but will not be a strategy that's possible for all steelmakers when all steel should be green steel.

6. Conclusion

The Swedish iron and steel transition is at the forefront of the global steel decarbonization process, and the state has played a key role via long-term directionality, risk-taking, and state ownership. While increasing carbon prices and the phase-out of free emissions credits under the EU Emission Trading Scheme (EU ETS) has of course played an important role in shaping the market, the Swedish approach has neither been simple carbon pricing nor passive subsidies for industry initiatives. Instead, use of industrial policy has been active and multifaceted, spanning from broad direction-setting to direct involvement in the innovation system.


We are still in the early phase of the decarbonization process and don't know whether the projects will deliver on time or be profitable in the long term. How to meet expected power demand is also becoming a contentious issue; several officials in the new government have expressed the opinion that the projects should be paused until new nuclear plants are built, though officially the government continues to back the green steel plans. Furthermore, the distribution of risks and rewards via effects on labor markets, taxes, and profits are yet to be seen. At this point, however, we can conclude that the relevant companies have committed to clear timelines and strategies, received financing for their plans, and have shown the potential of a green technology that is now a key component of the global steel industry's path to decarbonization, highlighted as notable progress for the steel industry by the International Energy Agency ([IEA n.d.](#)).

So, what can we learn from the Swedish case for decarbonization of US industry?

The steel industries of the United States and Sweden differ significantly. The US steel industry is much larger and has more firms, a high share of scrap-based steelmaking, and no state ownership. The US political landscape is more polarized, further diminishing the prospect of long-term policy stability. The US power mix is also more carbon intensive than Sweden's, and a simple transition from coal to hydrogen steelmaking would only provide emission reductions of 19 percent, relative to Sweden's 95 percent ([Blank 2019](#)). In addition, the US also has a coal industry that is likely to resist a transition.

A second Biden administration will have to ensure policy stickiness (see, for example, [Meckling et al. 2015](#)) to make it difficult for later administrations to simply dismantle decarbonization policies. As Sweden's example shows, a key step to push primary and secondary steelmakers to decarbonize will be to enable value chain cooperation and to transform declining renewable energy costs into attractive paths to decarbonization. Lacking the advantage of a clean power mix, the US needs to both replace fossil energy in the power sector and expand the total power generated to electrify industrial processes. Though the Inflation Reduction Act provides a generous subsidy for green hydrogen, significantly improving the cost competitiveness of clean industrial processes ([Department of Energy n.d.](#)), the federal government could leverage its federally owned Power Marketing Administrations and Army Corps of Engineers to produce and deliver low-cost clean energy for steelmakers.

Regulations and economics will always limit the strategic options available for both investor- and state-owned entities. Notably, Vattenfall paused an offshore wind project in the UK citing higher costs without being able to raise revenue from power generation. But state-owned entities can play a key role in strategically pursuing decarbonization objectives independently of short-term shareholder value maximization. At the federal level, the five federally owned electric utilities and/or the Army Corps of Engineers could be authorized to build and operate clean energy generation in collaboration with energy-intensive industries, supported with a pause in US Treasury payments. They can also be mandated to prioritize low-cost energy to innovative industrial decarbonization projects. By doing so, they could support innovation, increase competition with investor-owned utilities, and develop crucial government capacity within clean energy and hydrogen management.



State-owned entities can play a key role in strategically pursuing decarbonization objectives independently of short-term shareholder value maximization.

Furthermore, the US primary steel industry is dominated by US Steel and Cleveland-Cliffs. Japanese steelmaker Nippon Steel has made an offer to buy US Steel ([de la Merced and Swanson 2023](#)) though its bid will be reviewed by the White House and it is unclear whether Nippon Steel is sufficiently ambitious on decarbonization. Cleveland-Cliffs has been mentioned as a potential alternative buyer of US Steel ([Bushey et al. 2023](#)). Cleveland-Cliffs recently announced that it will reline a blast furnace, extending the lifetime of the furnace by another several decades and indicating that it does not believe it will need to decarbonize soon ([Pete 2023](#)). A Cleveland-Cliffs monopoly in the primary steel sector would yield shareholders in Cleveland-Cliffs outsized power to set the pace of US primary steel decarbonization, and the White House should carefully consider how any potential buyer of US Steel may affect how competition aligns with decarbonization in the sector.

The United States has started its journey toward a clean energy future. But to increase the pace of the transition, ensure policy stickiness, and minimize potential pushback, the next administration could learn from Sweden and complement the current de-risking-oriented approach established with the Inflation Reduction Act. Enabling value chain cooperation and ensuring competition from firms with different ownership and ownership types could be key steps moving the fight for a healthy planet forward.

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Just Energy Transition in the Time of Place-Based Industrial Policy: Patch or Pathway to the Green Industrial Transformation?

By Andrea Furnaro

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1. Introduction

In recent years, policymakers have witnessed a notable rise in two interconnected policy frameworks: Place-Based Industrial Policy and Just Transition Policy. Place-Based Industrial Policy (PBIP) represents a proactive approach to economic policy in which governments intervene not only in specific industries but also in specific locations to stimulate economic growth ([Hafiz 2023](#)). It recognizes the need to target strategic investments and interventions in regions that may be lagging behind economically. Just Transition Policies (JTP), on the other hand, especially those that emphasize subnational regions,³¹ are crafted to mitigate some of the adverse economic impacts associated with the shift from fossil fuel-based to more sustainable industries.

This essay examines the German experience with PBIP and JTP. Germany is notable for its extensive history of experimenting with JTP (even before this term was coined) ([Oei et al. 2020](#); [Furnaro et al. 2021](#)). During different periods and to varying extents, Germany has also integrated place-based industrial policy approaches into its economic strategies.

Place-Based Industrial Policy (PBIP) represents a proactive approach to economic policy in which governments intervene not only in specific industries but also in specific locations to stimulate economic growth.

Just Transition Policies (JTP), on the other hand, especially those that emphasize subnational regions, are crafted to mitigate some of the adverse economic impacts associated with the shift from fossil fuel-based to more sustainable industries.

³¹ Just transition policies can encompass a much broader range of interventions, including support for workers in fossil fuel industries affected by the energy transition, communities adversely impacted by the expansion of projects to extract minerals needed for the energy transition, communities affected by new renewable energy investments, or developing countries rich in fossil fuels, among others.

This has resulted in a complex landscape of tools and outcomes, with varying degrees of success over time ([Schneider 2023](#)). These policies have evolved to address the challenges of transitioning from coal and other fossil-fuel based industries to cleaner alternatives, fostering synergies between industrial and just transition policy.

The subsequent sections delve deeper into the literature of PBIP and JTP, placing emphasis on the trade-offs and challenges inherent in their relationship. The essay then emphasizes five key elements of the German experience: (i) educational and research investments, (ii) the debate around balancing support for incumbent and emerging sectors, (iii) anticipatory and proactive planning, (iv) spatial governance, and (v) a robust baseline.

2. The Rebirth of Place-Based Industrial Policy

Within the broader spectrum of industrial policy, PBIP is characterized by its deliberate focus on specific geographic locations, with the primary objective of transitioning the economic landscape of these areas toward higher-productivity activities ([Neukman and Simpson 2015](#); [Muro et al. 2022](#)). What characterizes a PBIP as such is its intentionality—its explicit spatial targeting—rather than solely the localized outcomes it generates (since place-neutral industrial policies inadvertently yield geographically differentiated results).

What is defined as the targeted place can vary. It can encompass subnational regions, cities, municipalities, or other types of jurisdictions. It can focus on economically defined regions, such as innovation districts, special economic zones, and functional regions that may or may not overlap with specific jurisdictions. In some PBIPs of the European Union, such as the European Structural Fund, subnational regions from multiple countries are targeted ([Notermans 2016](#)). Some PBIPs target specific, named regions, such as the 1933 Tennessee Valley Authority (TVA) and the 1965 Appalachian Regional Commission (ARC) programs in the United States ([Kline and Moretti 2014](#)).³² Similarly, the 2020 Coal Phase-Out Act in Germany was designed to focus on the three remaining coal regions. In contrast, other policies target a particular category of region, as exemplified by the EU Structural Fund, which targets less developed regions. Within each region, PBIP initiatives can target either people, firms, broader industries, or organizations, just as is the case with spatially blind industrial policies.

For at least four decades, industrial policy was in decline and the conventional approach for economic policy in general was place-blind, with policies targeting individuals, industries, or firms without specific regard for geographic locations ([Bailey et al. 2015](#)). The underlying assumption was that place-based interventions are less effective as they might divert resources from industries and areas with growth potential that are better selected by the market alone, shrinking the overall national economic pie that could otherwise be better redistributed ([Südekum 2021a](#)). According to Bailey et al. (2015), the space-neutral approach was characterized by the belief that “spatial adjustments occur relatively smoothly between levels of equilibrium in response to market-based price and cost signals.”

Another criticism against PBIP centered on the potential to disproportionately benefit a select few, as these policies might be captured by a local elite, while other critiques argued that these policies are rarely able to reach local firms with high growth potential, as declining firms tend to have higher probability to access subsidies ([Martin et al. 2011](#); [Navaretti and Markovic 2021](#)). A common object of concern in these critiques is related to the mobility of people and businesses. Workers and firms might respond to policy incentives by relocating to areas with more favorable conditions, potentially diluting the intended benefits. Additionally, as one area experiences growth through PBIP, it could potentially affect economic activity in other regions, prompting questions about the overall contribution to economic growth ([Neukman and Simpson 2015](#)).

Empirical evidence has played a significant role in driving the shift toward PBIP. A growing body of research has shown that place-based policies can promote regional economic growth, productivity, and employment ([Lang et al. 2022](#); [Becker et al. 2010](#); [Busso et al. 2013](#); [Seidel and von Ehrlich 2018](#)). Researchers have increasingly recognized the economic benefits associated with promoting agglomeration economies, including enhanced

32 Biden's recent policies allocated \$80 billion for place-based spending, which is eight times more than the amount allocated for TVA or ARC.

innovation, knowledge spillovers, and increased productivity ([Neukman and Simpson 2015](#)). Studies have also demonstrated that perfect mobility by individuals is often an unrealistic assumption ([Südekum 2021a](#)). Factors such as housing costs and social ties limit individuals' ability to relocate. This consideration is crucial, particularly since many regions—in the US and around the world—are witnessing a decrease in labor mobility ([Neukman and Simpson 2015](#)).

Another important driving force explaining the resurgence of PBIP is the increasing recognition of the political ramifications of neglecting economically disadvantaged regions and the resulting “geographies of discontent,” marked by a surge in political populism and polarization ([De Ruyter et al. 2021](#)). The shift from traditional manufacturing to knowledge-intensive services and digitalization, concentrating economic activities in urban centers, has worsened this spatial inequality ([Südekum 2021a](#)). This inequality can be further amplified by the phase-out of fossil fuel-related activities, which are often concentrated in rural or more remote regions ([Tomer et al. 2021](#)).

The literature on spatial—and particularly multilevel—governance, has contributed to the rebirth of PBIP by highlighting the significance of local perspectives in decision-making for more tailored interventions. Simultaneously, it highlights the strategic use of interactions between local and external actors and institutions to promote new knowledge and ideas, establish oversight, and mitigate the risk of disproportionately benefiting local elites, who, as per Barca ([2011](#)), may have a natural inclination to seek rent from public interventions. Striking this balance, however, is difficult. Multilevel governance entails addressing information gaps at both the national and local levels that limit optimal decision-making, particularly in the selection of investment alternatives ([Bailey et al. 2015](#)). Concurrently, the supervisory role of higher levels of government is essential but must be harmonized with the objective of “ensuring high-quality public spending without fostering a ‘culture of mistrust’ through excessive checks and controls that burden the involved parties” ([Südekum 2021b](#)).

Table 1. Place-Neutral vs. Place-Based Industrial Policies: Examples of Policy Tools

	Place-Neutral Industrial Policies	Place-Based Industrial Policies
Shared tools (differentiated by the presence or absence of spatial targeting)	<ul style="list-style-type: none"> • Direct and indirect subsidies (lump-sum transfers, grants, loans, underwriting and guaranteeing investments, tax incentives, public procurement, etc.) • Infrastructure investments • Research and development • Workforce training programs • Provision of low-carbon goods and services (common in green industrial policy) 	
Specific tools (specific to each type based on their spatial scope)	<ul style="list-style-type: none"> • Changes in trade policy to support domestic industries • National employment policies • National development banks 	<ul style="list-style-type: none"> • Local cluster policies • Special economic zones (e.g., enterprise zones, industrial parks, etc.) • Funds to support economically declining regions

3. Place-Based Industrial Policy Vis-à-Vis Just Transition Policy

The new wave of PBIP coincides with a surge in JTP. JTP refers to a set of strategies and interventions aimed at minimizing the social, economic, and environmental disruptions caused by transitions to more sustainable economic systems. These policies operate at various scales, from the global and national levels to regional and workplace contexts, and are designed to ensure that social groups affected by the transition process are supported, while also advancing broader environmental and social goals. While the term “just transition” initially emerged in the 1980s within the context of labor demands, it has seen rapid expansion in recent years to encompass various domains ([Stavis and Felli 2020](#)). In the context of subnational policies, which are the primary focus of this essay, JTPs constitute a form of place-based intervention aimed at mitigating the adverse consequences arising from the transition to low-carbon energy, especially in regions economically reliant on fossil fuel-related activities.

Nonetheless, these two approaches frequently differ in scope. JTPs typically encompass a broader array of elements that extend beyond economic development, often placing a strong emphasis on social policies. PBIPs may emphasize other types of economic initiatives, particularly when their primary objective is to bolster promising regions rather than those experiencing economic decline. A prime example can be observed in regions that are not necessarily dependent on fossil fuel-related activities but possess abundant resource endowments or other competitive advantages in cleaner industries, such as regions with high solar radiation or geological conditions for carbon storage (e.g., [Bnamericas 2023](#); [Gardner 2022](#)).

PBIP and JTP can also be seen as complementary tools for addressing the complex challenges of a green industrial transformation. JTP can help address some of the economic problems associated with a “picking the winners” approach, which tends to favor certain industries at the expense of others (potentially shrinking the overall economic pie) and to concentrate economic activity in specific regions (contributing to regional inequality). The utilization of JTP can help address other issues associated with PBIP, such as the concentration of benefits among economic elites, rising rent prices, and employer monopolies in specific regions. However, it’s crucial to acknowledge that policy efforts to stimulate economically distressed regions through incentives for innovations and technological clusters have had mixed success (Lerner 2009; [Glaeser and Hausman 2019](#)). The effectiveness of PBIP is still an area in which more impact analyses are needed.

Certain PBIP initiatives have become more similar to, rather than complementary with, JTP, particularly when they incorporate a proactive component and substantial funds to support regions at risk as a result of the green industrial transformation (see Table 2 for a summary). A key debate in the context of PBIP/JTP is whether policies should focus on productive investments within sectors that are already dominant, leveraging existing (static) competitive advantages, as opposed to promoting new (dynamic) sectors ([Armitage et al. 2023](#)). Smart specialization, a principle highlighted by the OECD for good place-based policies, encourages regions to leverage their available local competencies ([OECD 2020](#)). However, other analysts advise caution with path-dependent approaches, as they may favor incumbent large firms and hinder new entrants and more radical innovation ([Armitage et al. 2023](#); based on [Agrawal et al. 2010](#) and [Chatterji et al. 2014](#)). Instead, PBIP in economically declining regions should support emerging sectors that hold potential for agglomeration effects, regardless of existing economic activities. For instance, nascent industries like hydrogen and direct air capture have the capacity to generate synergies among innovation, environmental, and equity objectives. According to [Armitage et al. \(2023\)](#), agglomeration benefits in disadvantaged regions can be promoted when these benefits are specific to the novel technologies (rather than cumulative with existing ones). They suggest that by introducing these nascent industries in disadvantaged regions or those expected to face challenges in the transition away from fossil fuels, policymakers can mitigate regional inequalities while tapping into future agglomeration benefits ([Armitage et al. 2023](#)).

Table 2. Key Approaches in Place-Based Industrial Policies and the Role of Just Transition Policy

	Focus on promising regions	Focus on economically challenged regions
Traditional industrial policy	Traditional regional development policies often employ a winner-picking approach, with a focus on opportunity-rich regions or the preservation of existing agglomerations.	Traditional regional redevelopment and revitalization policies, characterized by a reparative approach. Their primary objectives include fostering agglomeration or preventing deglomeration in regions facing economic risks.
Green industrial policy	Commonly observed in regions with substantial potential for low-carbon investments. Some JTP initiatives complement this approach by providing support to regions economically reliant on fossil fuel activities that are impacted by new investments.	Approach frequently seen in JTPs that aims to assist regions economically reliant on fossil fuels through abundant economic support (in these cases, JTP represents a subtype of PBIP).

4. Relating Place and the Just Transition in Place-Based Industrial Policymaking: The German Case

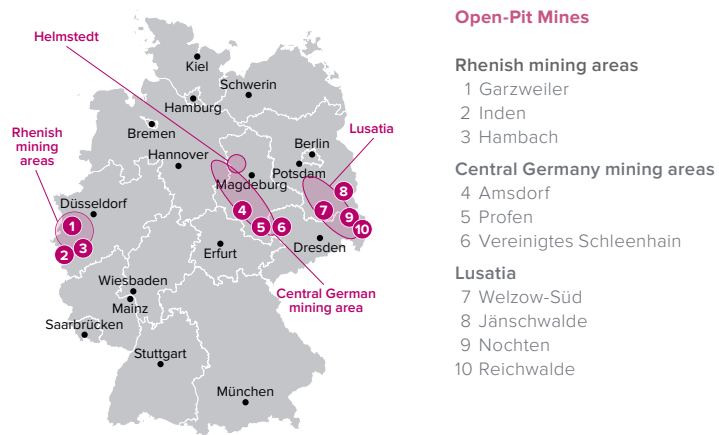
Germany has not been immune to the global shift away from industrial policies, including PBIP, since the 1980s ([Schneider 2023](#)). Furthermore, the country’s so-called “ordo-liberal” approach, characterized by the state’s role being confined to the creation of a framework for market competition, has continued to exert influence ([Kattel et al. 2020](#)). However, mirroring the global trend, recent years have witnessed a resurgence in both industrial policy and PBIP in Germany, accompanied by the emergence of explicit JTPs.

The country has established various initiatives aimed at supporting coal regions impacted by the energy transition through PBIP. Among these, the most recent and significant is the Structural Strengthening Act (*Strukturstärkungsgesetz*), allocating 40 billion euros to the remaining lignite regions (Lusatia, Rhenish mining area, and Central German mining area) by 2038 (see Figure 1). Additionally, the act provides up to €1 billion for particularly affected hard coal power plant sites and up to €90 million each for the former coal regions of Helmstedt and Altenburger. Furthermore, European funding is accessible through the Just Transition Fund, which allocates €375 million to Lusatia, €200 million to the Central German mining area, and €70 million to the city of Chemnitz.

This policy has been formulated not only as a response to the adverse effects associated with the green industrial transformation, particularly Germany’s green energy transition policy process (the *Energiewende*), but also as a proactive implementation of PBIP. According to the government, the Structural Strengthening Act “is not only intended to mitigate the consequences of the phase-out of coal-fired power generation. Rather, the coal regions should be given a real chance to be in a better position after the coal phase-out than before” ([BMWK 2020](#)).

The subsequent sections illustrate important aspects of Germany’s approach to connecting both JTPs and PBIPs.

Figure 1. Brown Coal Mining Regions



Source: Adapted from braunkohle.de

Educational and Research Investments

One aspect that has been central to the German approach to achieving both economic growth and just transition objectives, and which has been relatively stable over time, is the focus on educational and research investments from a place-based perspective. In the historical policies aimed at supporting economically struggling coal regions, especially in the Ruhr region, public support for local universities and research institutions played a pivotal role (Keil and Wetterau 2013). Today, “with 22 universities and colleges, the Ruhr region has the highest density of further education establishments anywhere in Europe” (Metropoleruhr 2021).

The focus on funding existing and supporting new educational and research institutions persists in contemporary PBIP to support coal regions, for example with funds to set up new applied science and research institutions that can contribute to innovation efforts ([Sächsisches Staatsministerium für Regionalentwicklung n.d.b.](#); [Lausitz Staatskanzlei 2020](#)). Germany is known internationally for its focus on state-directed funding to nonuniversity research institutions and applied sciences, something that has scarcely changed in the past three decades ([EFI 2022](#); [Kattel et al. 2020](#)). Per Südekum (2021b), education within PBIP serves as a potential win-win approach, aligning regional and national economic growth with social equity objectives. Investments in education yield significant returns, both individually and societally, by enhancing productivity, boosting output, increasing wages and tax revenue, and creating future economic value that would otherwise remain unrealized without these investments.

Balancing Support for Incumbent and Emerging Sectors

Soete and Stierna (2023) argue that Europe’s current regional development and cohesion strategies, exemplified by regional smart specialization strategies, tend to prioritize “incremental” improvements, shying away from more disruptive changes (Soete and Stierna 2023). The extent to which investments supporting coal regions in Germany should follow a similar approach remains a subject of open debate in the country (Pomp 2023).

The Investment Act for Coal Regions, a complementary regulation to the Structural Strengthening Act, does not offer a rigidly defined framework for the types of investments that should receive support. It outlines two main investment criteria: (i) create and maintain jobs and training positions in the regions and (ii) diversify the economic structure of the region and improve its attractiveness as a business location (BJM 2020). This Act, however, incorporates comprehensive plans for the three lignite regions, explicitly stating the goal of preserving their role as “energy” regions or areas (BJM 2020). In practice, investment plans have prominently targeted hydrogen, renewables, and electricity storage projects, capitalizing on existing energy sector expertise and infrastructure. Furthermore, the coal phase-out policy has prompted the establishment of new centers for applied research in these technologies ([Sächsisches Staatsministerium für Regionalentwicklung](#)

[n.d.b.](#); [Lausitz Staatskanzlei 2020](#)). These decisions are not only based on economic reasons but also influenced by political factors, as the shift from “coal regions” to “energy regions” garners more local support, boosting both economic and representational path dependency in the transition process. However, it is not always clear whether this focus on energy investment truly reflects the best local competitive capacities ([Pomp 2023](#)).

Anticipatory and Proactive Planning

A key aspect of the German Coal Phase-Out Act is the allocation of substantial funds to compensate regions for the phase-out of coal. This provision is contingent upon the successful execution of the phase-out agenda that sets 2038 as the latest year possible for coal extraction and power production ([German Federal Government n.d.](#)). This anticipatory approach is characterized by a proactive preparation for an anticipated decline in regional economic activities rather than a reactive response.

Having a phase-out schedule was not solely a decarbonization goal for German policymakers but also a planning strategy. The notion of ensuring “planning security” (*Planungssicherheit*) was often raised in public discussions by trade unions, local politicians, and industry representatives. This involves allowing sufficient time for planning the integration of clean energies and the phase-out of coal electricity into the system, reducing energy supply risks as well as ensuring enough time to plan and execute the retraining or conversion of workers to capitalize on their skills. Proactive planning can help reduce the risk of some PBIPs substituting local labor with increased capital gains for firms without necessarily, or to the same extent, raising local wages—a problem that limits the capacity of these policies to effectively address regional economic growth and disparity ([Lang et al. 2022](#)). While the planning capacity of the German coal exit process has faced criticism from various actors,³³ from an international standpoint, it stands as a noteworthy example of forward planning for the decline of a dominant industry.

Spatial Governance

A significant challenge that arises for regions that aspire to implement industrial policies is that they may lack the necessary regulatory and financial capacities.³⁴ The rebirth of PBIP and the emergence of JTP are not taking place in a vacuum but in a context in which in many countries’ local governments have been underfunded because of long-term austerity policies ([Featherstone et al. 2012](#)). In the case of the EU, [McNamara \(2023\)](#) highlights the need to question the EU’s ability to execute industrial policy, given its limited fiscal capacity and lack of traditional state governance and control mechanisms. This limitation could potentially challenge Europe’s efforts, particularly in matching the Biden administration’s industrial policy and green transition financing.

Germany has partially addressed this issue in its JTP and PBIP by trying to promote the financial and technical capabilities of local governments. Both historical and contemporary JTPs have directly provided economic assistance to local governments ([Furnaro et al. 2021](#)).

Within the Structural Strengthening Act, program implementation is supervised by a committee comprising the national government and the federal states (or *Länder*) in which the lignite regions are situated (Brandenburg, Saxony, Saxony-Anhalt, and North Rhine-Westphalia). All measures to be funded under Pillar 2 (see Table 3) must receive approval from this committee. Decisions are made through a voting process

³³ This includes, for example, representatives of environmental organizations arguing that it doesn’t provide enough planning capacity to ensure a rapid incorporation of renewable energies ([Mieritz 2019](#)) and representatives from the steel industry and the right-wing populist party Alternative für Deutschland who have argued that these laws don’t protect planning security to avoid future energy supply disruptions ([Home of Welding 2020](#); [Deutscher Bundestag 2020](#)).

³⁴ For instance, in the United States, despite former Los Angeles Mayor Eric Garcetti’s use of Green New Deal rhetoric to characterize the city’s sustainability plan, regulatory and financial limitations constrain the city’s ability to raise and allocate sufficient funds for a robust PBIP ([Furnaro and Kay 2022](#)).

involving the federal government and at least half of the *Länder* votes. Each *Länder* holds one vote, and a recommendation cannot be made against the vote of the national federal department or *Länder* involved. The definition of specific projects must align with the framework outlined in the Coal Regions Investment Act and the mission statements and regional development concepts of the *Länder*, regions, and municipalities ([BMWK 2020](#)).

Municipalities tend to play an active role by having the ability to propose and seek funding for specific investment projects. In various coal regions, municipal and other local stakeholders have engaged in dialogue processes to formulate project proposals ([MHKBD 2022](#); [WRL 2023](#)). The utilization of competitive mechanisms for allocating grants among local participants is a central feature of this policy, promoting local cooperation and networking (see [Muro et al. 2022](#)).

There are significant differences in the types of projects selected and procedures in different regions, especially under Pillar 1 of this policy, with, for example, a more top-down selection process in Brandenburg and a more bottom-up approach in Saxony-Anhalt in comparison with other *Länder* ([IWH 2023](#)).

Technical advisory centers have been established to assist local stakeholders in bridging capacity gaps related to the successful submission and management of projects. These centers aim to address issues such as insufficient municipal staffing or a lack of personnel with the required competencies ([MHKBD 2022](#)), helping overcome common barriers faced by local stakeholders with less economic resources, such as limited knowledge about policies and administrative procedures ([Bailey et al. 2015](#)). Furthermore, the offices of new and existing national and *Länder*-level authorities are often established in these regions to create local jobs and decentralization. This approach also promotes vertical coordination among various levels of government by having their offices located in proximity ([BMWi 2021](#)).

However, the multilevel governance of the policies to support lignite regions has faced criticism for not adequately involving local representatives, with predominant roles still played by representatives from both the *Länder* and the national level in defining funding priorities. Additionally, there have been concerns about the limited inclusion of less heard local voices, such as those of women or migrants (Walk et al. forthcoming).

Constraints imposed by EU state aid and competition rules have been central to discussions on how to effectively utilize the funds allocated by the Structural Strengthening Act. Policymakers have sought to tackle this challenge through various strategies, including a focus on direct investments in business-related infrastructure (such as industrial land-efficient and energy-efficient building renovations), public infrastructure (including transportation, digitalization, urban development, health and cultural facilities, and tourist infrastructure), and research and education ([BMJ 2020](#)). One of the projects financed through this approach is the construction of the largest railway in Europe in Lusatia, although it has faced criticism due to its high costs and unclear benefits ([Wüpper 2021](#)).

Table 3. Distribution of Funds from the Structural Strengthening Act

	Coal region	<i>Länder</i>
Pillar 1 allocates \$14 billion to the <i>Länder</i> and their municipalities, with the <i>Länder</i> having decision-making authority over the projects.	Lusatia (43%)	Brandenburg (60%) Saxony (40%)
	Rhenish mining area (37%)	North Rhine-Westphalia (100%)
Pillar 2 allocates \$26 billion from the federal government, and project decisions are made by the national- <i>Länder</i> coordination committee.	Central German mining area (20%)	Saxony-Anhalt (60%) Saxony (60%)

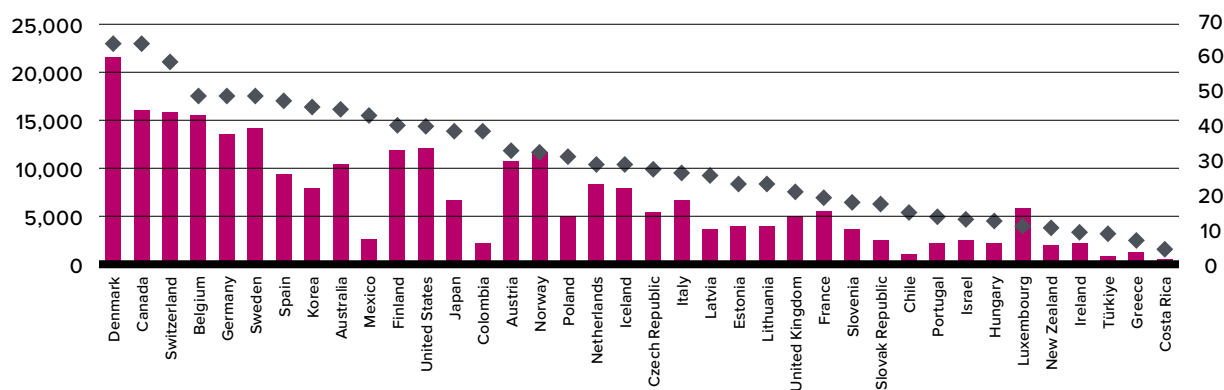
Source: [BMJ 2020](#).

The Baselines

The recent resurgence of PBIP in the United States has prompted questions about whether Germany and Europe are lagging behind in similar efforts (MacKinnon et al. 2023). But it's important to take into account the totality of PBIPs that have long been in place (IWH 2023). This is particularly important in Germany, where the aim of achieving equitable living standards across regions is explicitly included in the constitution. In the German context, the social security system, labor system, and system for regional fiscal equalization should be seen as the baseline for additional PBIPs and JTPs (Furnaro et al. 2021). Following Kattel et al. (2020), some of these can be better described as a form of “stealth’ industrial policy that tends to fly under the radar of domestic and international policy discussions.”

In 2020 alone, the federal government provided over €1.7 billion to structurally weak regions throughout Germany through the programs of the All-German Support System (*Gesamtdeutschen Fördersystems*). This amount is not significantly less than the approximately €2.3 billion provided annually to the coal regions by the Structural Strengthening Act (BMWi 2021). This aligns with data indicating that Germany is one of the five OECD countries in which subnational government expenditures accounted for the largest share of general government expenditures in 2020, a trend that has been consistently observed in previous years (see Figure 2).

Figure 2. Subnational Government Expenditures in OECD Countries



Source: OECD 2023.

Key ■ Per capita (US Dollar) ◆ As a percentage of general government, same transaction

5. Conclusion

The recent increase in both PBIP and JTP reactivates important policy questions about the capacity of large-scale financial support for specific regions to stimulate both regional and national economic growth. From a policy perspective, it is crucial to analyze the challenges and opportunities in balancing the relationship between PBIP and JTP. Potential trade-offs can arise concerning resources allocated in promoting regions with growth potential or regions in or under risk of economic decline, in promoting equity or efficiency in PBIPs, and in prioritizing short-term relief or long-term growth and sustainability regionally. In this context, the relevant question isn't solely about how to make PBIP more equitable, but rather how to integrate PBIP and JTP to enhance the effectiveness of both.

The relevant question isn't solely about how to make PBIP more equitable, but rather how to integrate PBIP and JTP to enhance the effectiveness of both.

While JTP is commonly viewed as a patch to address some of the negative impacts of green industrial transformations, often from an equity perspective, the German case demonstrates an attempt to integrate PBIP and JTP approaches more closely. Different elements of the approach used in the Structural Strengthening Act, which explicitly attempts to incorporate both approaches, were highlighted in this essay. Most of the results, however, are still to be seen.

The German model of prioritizing educational and research investments in PBIP and JTP, with a special focus on nonuniversity research institutions and applied sciences, offers valuable insights, although its direct application in the US would require adaptations to the local context. This includes considering, for example, the role of private-sector innovation, the need for integration with broader economic strategies, and the alignment of these investments with the specific needs of transitioning regions, which requires integration with regional economic strategies and labor markets.

The issue of the degree to which path dependencies and disruptions should be promoted is critical in this regard and is not a settled conclusion in Germany, although we see today a tendency to promote the transition from coal to energy regions. However, this approach can limit the scope for diversification. A critical concern to take into account in Germany and beyond is how to promote a correct balance between a strategy that might reinforce existing economic structures at the expense of hindered adaptability and the introduction of emerging industries without causing undue disruption to existing labor markets and community structures.

The German Coal Phase-Out Act emphasizes the importance of the active role of the state in regulating exnovation (the divestment from old energy technologies and production structures) (David 2018) with an anticipatory approach as part of this green industrial policy framework. From this perspective, phase-out agendas can help manage the transition and create economic gains, an anticipatory approach that underscores a fundamental aspect of how Germany is trying to harmonize JTP with PBIP. The applicability of a similar approach in the US depends on complex issues such as political will, regulatory challenges for the central planning of industry declines, and federal-state dynamics in decision-making.

Germany provides numerous examples of the complexities involved in navigating multilevel governance within PBIP. This particularly pertains to how to effectively support regions in implementing investment projects by promoting administrative decentralization and financial and technical support for local governments, although many questions about how to prevent elite capture of benefits remain unanswered. The US capacity to address these issues depends not only on the level of decentralizing decision-making but also of the ability to equip local governments with the necessary resources and expertise. While local governments in Germany have the freedom to propose and seek funding for projects, these must align with broader national and state objectives. The US can learn from this model to ensure that local initiatives contribute to national industrial strategies without stifling local innovation and priorities and the need for collaboration and coordination mechanisms that respect the autonomy of states and local governments while pursuing shared national economic goals.

Finally, relying on robust baselines, which are far from perfect in Germany, rather than solely on hyper-targeted just transition interventions, is crucial, especially as numerous processes of green industrial disruption are anticipated in the near future. They can enhance resilience, foster greater regional cohesion, and ultimately mitigate some of the social and political implications associated with overlooking regional economic decline. The implementation of such policies, however, would require significant structural reforms in countries like the US, which could face political and fiscal challenges in addition to the complexities due to higher decentralization in key policy areas that underpin these baselines.

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Fair Transition Funds, Employer Neutrality, and Card Checks: How Industrial Policy Could Relaunch Labor Unions in the United States

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1. Introduction

Over the past 70 years, United States union membership has declined steadily to record lows ([Tucker 2018](#)). Changes in US industrial composition (Farber and Western 2002) and ossified labor laws that limit labor's capacity to adapt to new realities ([Estlund 2007](#)) have significantly contributed to the decrease in union membership. Union density, or the percentage of wage and salary workers who are members of unions, peaked in the 1950s ([Tucker 2018](#)). At that point, about one in three US workers were members of unions and were covered by collective bargaining agreements (Rosenfeld 2014, 1). Today, less than 6 percent of private-sector workers are members of unions or covered by collective bargaining agreements ([Hirsch, Macpherson, and Even 2023](#)). Union decline, in turn, has significantly contributed to US income inequality (Western and Rosenfeld 2011; Farber et al. 2021). Union decline thus threatens the US middle class as we have known it—which came into being because of unions. Without a robust middle class, US democracy is also at risk (Sitaraman 2017), as unions directly shape democratic governance (Cornell 2022). Democracy—defined either as popular participation in elections and protest events ([Kerrisey and Schofer 2013](#)), or as observed in historical coalitions that strive for political equality (Rueschemeyer, Huber Stephens, and Stephens 1992, 245) or that combat authoritarian regimes (Berins Collier 1999)—is directly linked to robust labor unions (See also [Tucker 2018](#)).

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Given the importance of unions for democracy and for a strong middle class, this essay describes how US industrial policy can reinvigorate US unions. It focuses on industrial policy rather than on labor law because federal labor law reform has proven an almost impossible task ([Estlund 2007](#)). On the other hand, in light of the 2021 Infrastructure Investment and Jobs Act, the 2022 CHIPS³⁵ and Science Act, and the 2022 Inflation Reduction Act (IRA), industrial policy has become a more tangible reality. However, as the US has only had episodic and rare experiences of industrial and labor policies being woven together, this essay begins with lessons we can draw from places where industrial policy has been used effectively to promote both industry and unions. The first example is the Swedish “Rehn-Meidner” model, perhaps the gold standard of how to weave industrial and labor policy. The Rehn-Meidner model’s main goals were to promote full employment while curbing inflation. It did so by imposing wage restraint for highly paid workers, mostly employed in high-productivity and export-based industries (Pontusson 1992, 96). But it is difficult to transplant policy ideas directly from Sweden to the US given the stark differences between the countries. Therefore, this essay also explores examples from Puerto Rico, a US territory with many similarities with the rest of the US, including a collective bargaining scheme structured by the National Labor Relations Act (NLRA). Key elements of the scheme included centralized wage bargaining through wage boards and neutrality and card check recognition voluntarily granted by employers. Neutrality refers to when employers take no public position—neither in favor of nor against—regarding employee choice of joining a union and collective bargaining. Card checks refer to the practice by which employers voluntarily recognize a union when it proves majority employee support through a showing of employee-signed union cards rather than through the more formal process of a government-administered union election.

After discussing the cases of Sweden and Puerto Rico, this essay then reflects on how contemporary US industrial policy could help sustain new worker organizing and reinvigorate unions. Neutrality and card checks can help curb employer opposition to unions. Congress can also help create labor and employer comanaged “Fair Transition Funds” to develop workers’ skills and to match workers to jobs for a new, green economy.

2. The Gold Standard: Rehn-Meidner

The Rehn-Meidner model of wage solidarity is perhaps one of the best-regarded government programs that used industrial policy to, in part, also give unions leading roles in economic transition. Rehn-Meidner was a comprehensive economic and wage policy program in Sweden ([Erixon 2021](#)) that started in 1951 to 1952 and prevailed until 1983, when some of Sweden’s white-collar unions withdrew from the plan ([Quintas and Janoni 2021](#)). It aimed to promote full employment while curbing inflation ([Erixon 2021](#)). Overall, it succeeded in meeting its deflationary and employment goals, developing more productive industry in Sweden and giving unions a leading role in shaping and implementing the plan.

Until about the Korean War, Sweden’s main ruling party, *Socialdemokraterna* (the Social Democratic Party, or SDP), a left-wing party tied to the country’s strong labor unions, promoted full employment through a combination of low interest rates and high government expenditures. However, the Korean War spurred inflation globally, including in Sweden. In response to Swedish policymakers’ concerns about rising inflation, the SDP and the leading labor union in Sweden, *Landsorganisationen i Sverige* (LO, or the Swedish Federation of Trade Unions), which represented blue-collar workers, put forward a plan aiming to curb inflation by limiting wage growth at the top of the income pyramid ([Erixon 2021](#)). But unions were willing to exert wage restraint at the top only if they could promote wage increases at the bottom of pay scales. Employers that could not afford higher wages, likely because of their poor productivity, would be forced out of business (Pontusson 1992, 96). In this manner, Rehn-Meidner expressly sacrificed low-productivity, low-wage employers. It promoted efficiency and tried to improve Sweden’s economic performance by combating inflation and compressing wages ([Hibbs and Locking 2000](#)). The policy expressly favored capital concentration in large corporate entities that were “highly competitive internationally” ([Quintas and Janoni 2021](#)). Rehn-Meidner thus picked losers and winners.

35 “CHIPS” stands for “Creating Helpful Incentives to Produce Semiconductors.” Pub. Law No. 117–167, §102 (2022).

As described by Felipe Quintas and Marcus Ianoni (2021), two contemporary students of the Rehn-Meidner system: “The [Rehn-Meidner] plan operated an economic policy of artificial selection of companies so that only those that favor accumulation, social welfare and competitiveness in international trade would survive.”

The wage solidarity scheme was intended to impact all workers; the higher the wages of the workers concerned, the less wage growth they would experience. One study looking at wage growth in 1972 through 1982 among blue-collar workers found that workers in the bottom decile of the distribution experienced increases that were three times higher than those at the median of the wage scale. Workers at the median of the wage scale experienced wage growth that was 50 percent higher than that of workers in the top decile (Albrecht, Bjorklund, and Vroman 2011).

Moreover, two different unions not directly privy to Rehn-Meidner, the *Tjänstemännens Centralorganisation* (Central Organization of Salaried Employees, or TCO) and the *Sveriges akademikers centralorganisation* (Swedish Confederation of Professional Associations, or SACO), both representing white-collar workers, also negotiated framework agreements that provided for higher wage growth at the bottom of the pay scale (Albrecht, Bjorklund, and Vroman 2011). Therefore, at least for some time, wage solidarity became a significantly institutionalized practice in Sweden.

Because wage growth at the bottom would put many less productive firms out of business, the LO advocated for—and employers agreed to set up—funds to provide unemployment benefits to workers who might lose their jobs, to retrain workers who lost jobs, and to match these workers to new jobs being created in more productive sectors of the economy, especially in export industries (Pontusson 1992, 64–68). These activities constituted so-called “active labor market policies” that are typical in Nordic countries and in some continental European countries (Pontusson 2005, 125–126) classified as “coordinated market economies” (Hall and Soskice 2001, 8).³⁶ Unions played a critical part in managing unemployment, retraining, and job matching schemes; they were crucial for workers in the transition to high productivity. While difficult to prove causation, it was also true that during the decades Rehn-Meidner was in operation, Swedish union density increased until it reached a peak of 83 percent during around the 1980s (Albrecht, Bjorklund, and Vroman 2011).

The Swedish Rehn-Meidner model came to an end in 1986. One reason for its demise included an inability of the system to keep high-paying employers from exercising wage moderation; these employers wanted to pay workers higher wages to better attract and retain talent and remain internationally competitive. The largest industrial union, LO, felt compelled to bargain agreements outside the scheme with large employers in the “engineering” industry, including Volvo, Saab, and ABB, among others, and with the Swedish Employers’ Confederation (*Svenska Arbetsgivareföreningen*, or SAF) (Edin and Topel 1997, 160).³⁷

36 Coordinated market economies are those in which firms are said to make decisions and take actions based on “insider information” gained through relationships between firms and their stakeholders (Hall and Soskice 2001, 8). Denmark, Germany, Japan, the Netherlands, Norway, and Sweden are said to be coordinated market economies (Hall and Soskice 2001, 20). Liberal market economies are those in which firms principally make decisions and take actions based on market information, such as prices, interest rates, and unemployment levels, and relate to other actors through formal contracting (Hall and Soskice 2001, 10). Political scientists Hall and Soskice (2001, 20, 30) have classified the United States, the United Kingdom, Australia, New Zealand, and Canada as liberal market economies.

37 According to some scholars, the Bretton Woods international monetary rules provided the background and global norms that helped to finance Rehn-Meidner. The end of Bretton Woods in 1971 contributed to the demise of Rehn-Meidner (Quintas and Ianoni 2021; Erixon 2010, 684). Bretton Woods attempted to create an international monetary system that was “rules-based and not manipulable by powerful states for mercantilist advantage” (Gowan 1999, 16). It pegged the US dollar, the strongest currency, to the price of gold. All other currencies had to set their value to the dollar, and governments could not unilaterally change their currencies’ prices. The goal was to provide price stability to currencies and promote fair trade. Additionally, Bretton Woods placed strict controls on international capital flows. It permitted financing for trade and for foreign production investment, but “repressed” most other types of international capital movements. These controls gave national state governments institutional heft to subsume their financial sectors to their national development goals, as Sweden could do during the period of Rehn-Meidner (Gowan 1999, 17). Indeed, Rehn-Meidner was made possible by strict capital controls placed on finance. As Quintas and Ianoni (2021) recount, “Swedish capital [was] basically dependent on production, not speculation.” Its central bank was subordinate to the government, and not to capital markets. When capital markets were liberalized globally, a result of the collapse of Bretton Woods, Sweden, like other countries, also had to liberalize its capital markets. That liberalization introduced financial problems to the Rehn-Meidner scheme (Quintas and Ianoni 2021).

But despite the end of Rehn-Meidner, there is no question that the legacy of the model was, and continues to be, profound. Swedish unions control significant unemployment funds. National and industrial bargaining schemes strengthened by Rehn-Meidner still prevail, even if not all the time or in every industry ([Dimick 2012](#)). Sweden has one of the highest levels of union density in the OECD region, with rates fluctuating between 65 and 80 percent over the past 20 years ([OECD 2023a](#)). Despite growing inequality in Sweden during the past two decades, the country remains one of the least unequal countries on earth. Its citizens are part of a robust middle class and enjoy some of the planet's highest standards of living (see [OECD 2023b](#)). Despite contemporary challenges, including the rise of a far-right party ([Asbrink 2022](#)), it is a rich and equitable country overall.

But the US is not Sweden, and blindly transplanting Swedish law and policy to the US is likely doomed to fail. Sweden, as stated earlier, is a prime example of a “coordinated market economy” built in great part on bargaining relations between large, organized actors such as national unions and employer organizations. These organized groups coordinate activities to build markets (Hall and Soskice 2001, 8). As one of the starkest models of a “liberal market economy,” the US is its opposite (Hall and Soskice 2001, 10). Liberal market economies prize arm's-length transactions and market competition. Additionally, in the US, national union and employer groups do not bargain substantially at the national level. Industrial relations are decentralized, and if they exist at all, unions typically bargain at the plant or employer level. While Sweden currently has about 65 percent union density, the US has about 10 percent ([OECD 2023a](#)). In the private sector, US union density has all but collapsed, and is at about 6 percent ([Hirsch, Macpherson, and Even 2023](#)).

The next part of this essay discusses the case of Puerto Rico, a US territory that, despite being similar to the rest of the US in certain ways, was able to weave industrial and labor policies in the 1950s to 1970s in its garment industry.

3. Puerto Rico: A Case of Promoting Industry and Unions in the US

At various times and places in US history, unions acted as players with influence over national policy, including over industrial policy, which in turn helped unions retain an institutional role and build organizational capacity. Union participation in the National Defense Mediation Board (NDMB) and its successor, the National War Labor Board (NWLB), are perhaps the clearest examples of US union relevance in national industrial promotion. Historian Nelson Lichtenstein described the importance of these tripartite government agencies for the maintenance of labor peace during wartime in industries involved in the production of arms, equipment, and other materials. Both the American Federation of Labor (AFL) and the Congress of Industrial Organizations (CIO) accepted—after some controversy and false starts—the authority of those bodies and participated in them. Heads of unions were also appointed to them as labor representatives (Lichtenstein 2003, 51).

Like Swedish unions, which conceded to employers by agreeing to restrain wages for workers at the top of the income scale, during World War II US unions agreed to limit wage demands and militancy when they participated in the NMB-NWLB. In return for moderation and labor peace, labor leaders demanded “union security,” or union shops. Union shops are arrangements in which all employees employed by an employer must be automatically enrolled to the union after their hiring. In response to this demand, the NWLB enacted a policy in 1942 called “standard of maintenance-of-membership formula,” in which any newly employed war employee, or war employee covered by a new collective bargaining agreement, had 15 days to declare their intent not to enroll in the union. After those 15 days expired, the employee would be automatically enrolled in the union, had to pay union dues, and had to otherwise follow union rules (Lichtenstein 2003, 79-80). According to Lichtenstein (2003, 51), these union shops “automatically applied to any union whose leaders agreed to enforce the no-strike pledge and otherwise cooperate with the production effort.”³⁸

³⁸ As discussed by Professor Kenneth Dau Schmidt (1990), the Taft-Hartley Act banned the closed shop, which requires pre-employment union membership. In 1963, the US Supreme Court also effectively outlawed the union shop. As Dau Schmidt described it, “In the Taft-Hartley Act, Congress outlawed the closed shop . . . The Supreme Court has also interpreted the second proviso of section 8(a)(3) to prohibit enforcement or observance of the membership requirement of a union shop agreement” (*NLRB v. General Motors Corp.*, 373 U.S. 734 (1963)).

The policy filled union coffers, and with more money at their disposal, US unions launched organizing efforts in places where they lacked significant presence, including in Texas and Southern California (Lichtenstein 2003, 81).

Some may argue that wartimes are exceptional periods with limited generalizability. But tripartite boards in the US have not been exclusive to wartime. Perhaps one of the most successful US peacetime sectoral experiments in which unions promoted industry while also gaining organizational leverage was in Puerto Rico. There, US unions participated in a wage board scheme that helped them to significantly unionize the garment sector while at the same time contributing to Puerto Rico's export-led economic strategy in the 1950s through 1970s ([Rosado Marzán 2020](#)).

Puerto Rico is not a US state. It is a US territory. As such, the island has been under the plenary powers of the US Congress since the US claimed it as war booty in 1898. Congress granted Puerto Rico some local government powers in 1952. Even if not a state, its local government, ill-termed in English a “Commonwealth,” and in Spanish “Estado Libre Asociado” (Free Associated State) is subject to all federal laws “that are not locally inapplicable.”³⁹ Federal labor and employment laws have thus been binding in Puerto Rico unless otherwise explicitly excluded by the US Congress. This means that Puerto Rico has been subject to US labor and employment laws, including the NLRA.⁴⁰ However, the Fair Labor Standards Act (FLSA) was one such law that did not always apply to Puerto Rico. Congress excepted it from the FLSA's provisions until around the 1970s to promote a low-wage policy that could attract US industry to Puerto Rico. As such, in the 1950s to 1970s, the island was a landing pad for US “runaway industry” seeking lower labor costs and taxes (Galvin 1979, 132-133).

Puerto Rico posed a real threat to US union members employed in industries eyeing the island's low-cost lure. Therefore, once the AFL-CIO formed in 1955, it declared the island a “haven for runaway industry” and began a campaign to curb its low-wage policy (Galvin 1979, 157). It first tried to have Congress extend the FLSA to Puerto Rico. This alarmed Puerto Rican elected leaders and policymakers who were waging bets for Puerto Rico's economic development based on attracting US light industry through low wages and tax breaks. Puerto Rico lacks political power in Washington, DC—it has no voting members in Congress nor can it vote for the US President⁴¹—and so the AFL-CIO, with many allies in DC, was a formidable foe ([Rosado Marzán 2020](#)). However, Congress was not too eager to extend the FLSA to Puerto Rico. The territory served valuable strategic and symbolic goals during the Cold War: It was showcased as an alternative to anti-colonial and communist insurgency, and the US federal government gave Puerto Rico special treatment to enhance its showcase potential (Grosfoguel 2003).

Once extending the FLSA became difficult, the AFL-CIO switched gears and started to engage with the government of Puerto Rico to see how it could promote unionization in the island's nascent industry. The government of Puerto Rico was willing to engage if US unions stopped insisting on their plans for FLSA extension. Considering that pact, the government of Puerto Rico supported AFL-CIO unions, including the International Ladies and Garment Workers Union (ILGWU), having a seat on the wage committees of its Minimum Wage Board, a tripartite board with authority to set minimum wages in Puerto Rican industry. Under federal and Puerto Rico law, the Board acted as a substitute of Washington, DC's FLSA. The ILGWU learned how to use the Board to set minimum wages in all garment shops in Puerto Rico. Given the reality of low wages in Puerto Rico, the Board's minimum wages became the prevailing wages for workers in the garment industry—indeed, in all manufacturing (Galvin 1979, 134).

39 As the US Federal Relations Act with Puerto Rico states, “[t]he statutory laws of the United States not locally inapplicable . . . shall have the same force and effect in Puerto Rico as in the United States” (48 U.S.C. § 734 [2012]). The meaning of “locally inapplicable” has been the subject of intense litigation and remains an open question ([Harvard Law Review 2017](#)).

40 See *NLRB v. Gonzalez Padín Co.*, 161 F.2d 353, 355 (1947) (the NLRA applies to Puerto Rico).

41 Residents of Puerto Rico can participate in party primaries, however. They can thus influence the choice of party candidates for the US presidency.

But the ILGWU did not stop at the Board. It persuaded employers to grant neutrality and card check agreements and, if a majority of the workers requested union representation, to extend all noneconomic terms in their US mainland collective bargaining agreements to those contracts bargained on the island. One reason employers were willing to make these concessions to the ILGWU was that wages had been dealt with by the Board. But a second reason was that the garment plants were mostly US-based and dealt with the ILGWU on the mainland. In essence, the union was seeking the same terms it bargained for with employers in the US, excluding economic terms bargained through the Board and marginally at the plant level. Finally, the ILGWU was successful in negotiating for slightly better wages at the plant level than those mandated by the Board (Galvin 1979, 151). It was also adept in negotiating fringe benefits for their members (Galvin 1979, 151).

The result of the ILGWU's scheme was a compromise that, among other impacts, kept the garment industry growing into the 1970s and increased union membership until it reached about 30 percent of the garment workforce. Despite being almost completely disorganized in the late 1950s, in the 1970s the union reported 13,000 members ([Rosado Marzán 2020](#)).

While Puerto Rico did not create a generally encompassing bargaining scheme accompanied by training, job matching, and benefits funds for all workers, such as in Sweden, industrial policy set wages centrally through the Board. Not only did unions find a foothold there but they also created an institutional role for themselves by further moderating wage demands to bargain for benefits through single employer or workplace-based collective bargaining. Employers were willing to extend neutrality and card checks since wages were dealt at the Board level, and the ILGWU had preexisting relationships with the same employers in the United States. As a result, the union grew. We now turn to the question: Can something like that be replicated in the United States today via industrial policy?

4. Promoting Unions with Industrial Policy in the United States Today

The US federal government is spending significantly to promote specific industries, including green industry ([Bivens 2023](#)). Some important beneficiaries of federal programs include Tesla, the wind turbine industry, the electric automaker Rivian, electric bus automaker Lion Electric, and battery makers supplying the “Big 3” unionized automakers ([Gallucci 2023](#); [Jin 2023](#); [Harris 2022](#)). All of these green firms are nonunion, as are most firms in the US today. As described above, an important reason union membership has declined in the US is that historically unionized industries have been declining in relative importance, giving way to industries that are nonunion. A shift to green industry will thus further erode union membership in the US unless unions can make inroads in these new industries.

Industrial policy could bolster industries and unions in the service economy, in which many women and people of color—historically policy afterthoughts and at the margins of labor protective legislation and union representation—work.

As demonstrated by the Swedish and Puerto Rican examples, government-orchestrated industrialization can help unions grow. Organized labor and the Biden administration know this. For example, the Service Employees International Union's (SEIU's) chief economist and policy director, Janelle Jones, has argued that industrial policy could bolster industries and unions in the service economy, in which many women and people of color—historically policy afterthoughts and at the margins of labor protective legislation and union representation—work ([Tucker et al. 2023](#)). Indeed, the IRA includes some pro-labor conditions, such as incentives to promote union apprenticeship programs and mandating prevailing wages ([US Department of Treasury 2023](#)). Some parts of “Bidenomics” place conditions on firms so that they do not use government money to oppose unions. Indeed, some companies that receive direct federal subsidies are required to remain neutral during a union election and/or voluntarily recognize a union ([Weisman 2023](#)). These are positive steps, but they remain insufficient to build a significant new union presence in new industry (See [Harris 2022](#)). Currently, and for several decades now, US federal labor law lets employers mount anti-union campaigns that have proven highly effective in thwarting unionization ([Weiler 1983](#)). Thus, a more robust policy would include mandating employer neutrality *and* card checks in all green firms profiting from federal subsidies, tax breaks, grants, and other benefits. Neutrality and card checks were central in the Puerto Rican experience. They seem equally necessary today in the US. While there were discussions of including such broad conditions on firms benefiting from the IRA and CHIPS, they never made it past the political tug of war that legislation normally involves ([Harris 2022](#)).

The federal government could also help promote what this essay calls “Fair Transition Funds,” which can help unions lead in the transition to a green and fair economy. These funds, like Taft Hartley funds, would be comanaged by labor and management representatives. Green, profitable firms benefiting from industrial policy—e.g., the Teslas, Rivians, and the Lion Electrics of the US—should play a principal role in funding them. The funds could institute supplementary unemployment benefits,⁴² retraining, and job matching programs—active labor market plans—to help move workers from non-green to green jobs, and thus better guarantee them as being “winners” of the green transition. US workers would be more apt to perceive union membership as important if unions can provide transition benefits to their members. Fair Transition Funds would thus provide a visible and influential institutional role for unions to lead in the green transition.

Different from the bargains in both Sweden and Puerto Rico, in which wage moderation was key for unions to receive the benefits of industrial policy, the deal today in the US would be between promoted green industry—e.g., solar and wind industries, electric car manufacturers, etc.—and the US government.⁴³ Industries would be federally supported if they can better guarantee quality union jobs for those who will lose in the transition, such as workers in the fossil fuel industry, and for new worker entrants into green industry.

The public would benefit from Fair Transition Funds, employer neutrality, and card checks because of the important supports unions provide to the US middle class and to American democracy—all public goods. A green economy devoid of a middle class and threatened by oligarchy and autocratic government is not the bright future we hope for.

However, time is running out for the federal government to enact such changes. Once green industry takes off, becoming self-sufficient and profitable—which should be the goal—government incentives will be less attractive to green industry. And once government incentives are no longer attractive, using those incentives to promote unions would no longer be viable. Unions would have to sustain themselves in a different industrial context, in which they might be even less relevant than today.

42 Supplementary unemployment benefits should help sustain workers and their families during workers' retraining and job matching periods. These funds would go beyond typical unemployment benefits to better guarantee that workers and their families are able to maintain dignified lives during the transition to a green economy.

43 Inflation has been one of the hallmarks of “Bidenomics.” Hence, sectoral wage boards such as those prevailing in Puerto Rico could also be used as anti-inflationary tools, like in Sweden, if inflation experts determine that high wages are a leading cause of inflation in the US.

5. Addressing Some Skeptics

The ideas outlined here—neutrality, card checks, and Fair Transition Funds—may raise questions.

First, the Biden administration already tried to include neutrality and card checks in its prior industrial policies, with limited success. Can it, or a successor administration, succeed despite past failures? It is hard to answer this question, but given the current structure of US labor law, union organizing rules, and collective bargaining, neutrality and card checks are necessary to significantly promote union membership growth. Absent labor law overhaul, the federal government must better guarantee neutrality and card checks, and it could do so through a spending bill.

Second, some may question the constitutionality of mandated neutrality and card check recognition. Wouldn't the federal government be infringing on the first amendment rights of employers if it places conditions on their speech? This is a complex constitutional question with an answer beyond the space limits of this short piece. But the brief answer is that there should be no constitutional bar to a federal spending bill that includes neutrality and card check conditions for employers who voluntarily accept those benefits. The US Supreme Court has long established the right of the federal government to use the power of its purse to pursue policy objectives even if these objectives result in favoring some points of views over others.⁴⁴ The government may also provide tax benefits based on different viewpoints without violating the first or fifth amendments.⁴⁵ Moreover, neutrality and card checks would not force any employer to voice any particular view on unions. These mechanisms simply require employers to remain neutral—to essentially refrain from voicing their opinion—during the power-sensitive process of a union election in which employer speech is recognized by workers to be more than just an expressive act.

Third, which unions and employers would be part of the Fair Transition Funds? How will the federal government compel these parties to participate in them? How will the funds be underwritten? How would workers qualify to participate in them? Which schools or institutes will retrain and job match the workers? Hasn't the US federal government and many state and local governments already toyed with retraining programs, with varied measures of success? Shouldn't we first learn from those experiences before attempting to create new training programs?

These are certainly essential questions that we must answer to craft a viable policy for Fair Transition Funds. But before we discuss those details, we should agree, in principle, that unions and employers should collaborate in a body that sets up these funds to help workers transition to a green and fair economy. Once we reach that threshold agreement, we can discuss the details.

⁴⁴ *Rust v. Sullivan*, 500 U.S. 173, 193 (1991).

⁴⁵ *Regan v. Taxation With Representation of Washington*, 461 U.S. 540, 549–550 (1983).

6. Conclusion

US workers have not been equal recipients of US economic vitality and its bounty. Over the past 50 years, they have seen their economic conditions deteriorate, while individuals at the top income levels have seen their fortunes expand exponentially. Union decline has been a major reason for the worsening conditions of worker incomes and a direct contributor to economic inequality. Changes in industrial composition have contributed to union decline. The shift to a green economy shepherded by US industrial policy could give labor an opportunity to gain some lost ground, but only if US industrial policy includes express provisions that help unions grow. Other countries, such as Sweden, have been able to build unions through industrial policy experiments. Puerto Rico, a small US territory, was also able to do so for its garment sector. The key ingredients in Sweden were centralized collective bargaining and robust institutional roles for unions to help lead the transition to high productivity. In Puerto Rico, centralized bargaining came through wage boards and institutional roles for unions to bargain for employee benefits at the plant level. Employer neutrality and card checks were also important to build union membership at the plant level. In the US today, Fair Transition Funds could promote some form of centralized authority for unions. These funds can smooth workers' shift to green jobs through training, job placement, and unemployment benefits for those who are between jobs. Workers would find that unions can be relevant in making them winners in the new green economy. Unions, in turn, will be better able to seize on the opportunity afforded to them by workers' improved perception and desirability for unions with the tools provided by employer neutrality and card checks. The federal government should act quickly while it still has an opportunity to help support unions as we move toward a green transition.

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Electric Vehicles: How Corporate Guardrails Can Improve Industrial Policy Outcomes

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1. Introduction

Transforming the auto industry is a top goal for decarbonization: Transportation is the leading cause of greenhouse gas emissions in the United States, and cars emit half of transportation-related emissions ([Cole et al. 2021](#)). A major focus of US industrial policy, therefore, is shifting the auto industry from gas-powered to electric vehicles: The Biden administration has announced an ambitious target of 50 percent of new vehicle sales in the United States being zero-emission by 2030, and has put in place significant industrial policy efforts to redirect the US auto industry toward electric vehicle production ([White House 2022](#)). Public efforts require private auto manufacturers to change their production processes, but do not necessarily challenge their focus on shareholder value maximization, which has been detrimental to productivity, worker power, and the public interest for decades. This essay considers how past public policy toward the auto industry has supported the industry—even saving it from financial collapse—without shifting corporate practices, and how industrial policy should include corporate guardrails to maximize its success in the future.⁴⁶ I make a set of discrete policy recommendations (which complement the focus on labor rights of the United Auto Workers [UAW] and other scholars) for worker voice in the production process, public equity stakes, and limits on corporate extraction.

The auto industry is a central force in the US economy. There are roughly 3 million workers employed throughout the US motor vehicles supply chain. The auto sector has been an oligopolistic sector for decades—its structure has been “a group of large firms using similar technologies to produce new cars as competing products,” while also always relying on a system of suppliers and dealers ([Froud et al. 2002](#)). While the “Big Three” auto manufacturers—Ford, General Motors, and Stellantis—recognized the need for a transition to electric vehicles in the 2010s, the transition was sluggish (despite an Obama administration tax credit). The Biden administration has sought to dramatically speed up the transition. In January 2021, the day after the newly inaugurated President Biden signed a series of executive orders on climate change, General Motors announced its plan to exclusively offer electric vehicles by 2035 ([Wayland 2021](#)). The Inflation Reduction Act (IRA) included consumer tax credits for electric vehicles linked to domestic content requirements, stimulating demand as well as creating federal financing programs for auto companies to transition their manufacturing

⁴⁶ This essay builds on the analysis that Isabel Estevez and I offered in a 2022 Roosevelt Institute issue brief, “[The Need for Corporate Guardrails in Industrial Policy](#).”

processes and build battery production facilities ([Internal Revenue Service n.d.](#)). The landmark industrial policy package that the Biden administration passed through Congress included \$135 billion “to build America’s electric vehicle future, including critical minerals sourcing and processing and battery manufacturing” ([White House 2022](#)).⁴⁷ The Department of Energy (DOE) announced the Domestic Conversion Grants Program—a \$15.5 billion package of funding and loans “primarily focused on retooling existing factories for the transition to electric vehicles—supporting good jobs and a just transition to EVs,” which included \$2 billion in grants and \$10 billion in loans from the Inflation Reduction Act and \$3.5 billion from the Bipartisan Infrastructure Law for domestic battery manufacturing (as well as funds to build out rapid charging infrastructure) ([Department of Energy 2023a](#); [Department of Energy 2023b](#)).⁴⁸ All of this support flows directly to the major auto manufacturers.

While public investment is necessary for such a complex and urgent transformation of a major sector of the economy, the government’s engagement with the auto sector runs into a profound challenge: the shareholder primacy orientation in US corporate governance. In previous work, I have described in detail how shareholder primacy is a flawed legal and economic theory for the corporation and how the decisions justified by corporate boards and managers have negatively impacted real investment, workers, and the public interest ([Palladino 2019](#); [Palladino 2021](#)). Shareholder primacy, based on the neoclassical conception of perfectly competitive markets, defines the purpose of corporations as maximizing shareholder wealth, rather than producing goods and services for the benefit of multiple stakeholders ([Froud et al. 2002](#); [Ireland 2009](#); [Lazonick and O’Sullivan 2000](#); [Van der Zwan 2014](#)). Rather than being a theory of production, it is a theory of allocation—the purpose of productive activity is to increase the wealth of shareholders. Over the last century, it grew various theoretical branches: As shareholders changed, the justification for shareholder primacy had to change as well. It answers the political economy question of who should have power over decision-making—shareholders—and who should control distribution and receive the gains of profits—also shareholders.⁴⁹ For auto manufacturers, it has meant massive spending on stock buybacks. For example, GM announced a \$10 billion authorization for stock buybacks in late November 2023 (about a quarter of its total market value), despite claiming in October that it could “not afford” the wage increases that striking auto workers were demanding ([Shepardson 2023](#)).⁵⁰ This points to the challenges faced by an administration funding GM and other auto companies for the electric vehicle transition: There are currently no limits in place to ensure that companies do not simply use the public funding to increase their payments to shareholders.

While public investment is necessary for such a complex and urgent transformation of a major sector of the economy, the government’s engagement with the auto sector runs into a profound challenge: the shareholder primacy orientation in US corporate governance.

47 The Environmental Protection Agency (EPA) has also proposed sweeping regulation to ensure that new cars produced and sold in the United States will be electric ([Meyer and Pontecorvo 2023](#)).

48 The triumvirate of industrial policy projects include many efforts related to electric vehicles that are not discussed in this essay. For example, the Bipartisan Infrastructure Law invested \$5 billion over five years in supporting states to develop the EV charging network through the National Electric Vehicle Charging Infrastructure Program ([Joint Office of Energy and Transportation 2023](#)). Other initiatives focus on reshoring the critical minerals—mainly lithium—required for electric vehicle production.

49 While this essay focuses on corporate guardrails in industrial policy, I have written elsewhere about the need to transform corporate and financial law across the entire economy, including in: “[Towards ‘Accountable Capitalism’](#)”; “[The Potential Benefits of a Public Asset Manager](#)”; “[Responsible Asset Managers](#)”; and “[Regulating Stock Buybacks](#).” The premise here is that while these broader changes are necessary, the political will is lacking, and industrial policy will be stronger if it includes changes that should eventually be applied economy-wide.

50 This is after a 2015 fight with activist shareholder Harry Wilson in which GM committed to \$5 billion in stock buybacks to keep Wilson off the GM board ([Hopkins and Lazonick 2023](#)).

Industrial policy has the ability to pair financial support for companies with “conditionalities” or “guardrails” to make sure that the public-interest purpose of public financial investment is met ([Mazzucato and Rodrik 2023](#)). In this essay, I first describe how the auto industry bailouts that occurred during the financial crisis of 2008–2010 did not shift the company’s later behavior away from shareholder primacy but instead extracted concessions from the workforce at a substantial financial cost to the public—the opposite of how today’s proactive industrial policy should work. I then describe specific guardrails that complement the focus on maintaining a strong unionized workforce that the UAW and the administration have prioritized, including limits on corporate extraction, and mechanisms to bring worker voice into the “zone of entrepreneurial control,” i.e., business decisions, which unions cannot engage in under US labor law. Worker participation on corporate boards is standard in German auto manufacturing and also has a brief history in the US; I describe how encouraging such participation could again be a focus of US policymakers. Finally, I reflect on the public equity stake that the US government took during the auto sector bailout and how a proactive approach to holding an equity stake could support the goals of industrial policy moving forward.

Industrial policy has the ability to pair financial support for companies with “conditionalities” or “guardrails” to make sure that the public-interest purpose of public financial investment is met.

While this essay focuses more narrowly on policy that affects auto manufacturers, it supports the premise that industrial policy should reduce individual vehicle dependence by supporting a strengthened public transit infrastructure. The market structure of the auto sector requires placing America’s dependence on cars within the broader context of our transportation infrastructure: As [Freemark et al. \(2022\)](#) have noted, “Americans collectively drive more than three trillion vehicle miles per year, most of those as a single driver in an automobile.” Public policy at all levels of government has created and sustained a car-based country, and the Bipartisan Infrastructure Law put substantial funds toward highway expansion even as it also sought to improve public transit. Though it is imperative to phase out gas-powered cars, it is also critical to reduce US household dependence on individual vehicles and build a robust public transportation infrastructure.⁵¹

2. Auto Bailouts during the Financial Crisis

During the financial crisis and its recessionary aftermath, the federal government took equity stakes in troubled auto companies along with financial institutions.⁵² The Emergency Economic Stabilization Act of 2008 (EESA) Section 113 established the Troubled Asset Relief Program (TARP) and empowered the Treasury Secretary to purchase corporate equity in the interest of “stabiliz[ing] the financial system and restor[ing] confidence”; the \$700 billion TARP asset purchase program included \$125 billion of public equity stakes. TARP made the federal government a significant shareholder in GM, Chrysler, and GMAC ([Black 2010](#)).⁵³ The GM bailout proceeded in several stages: First, the US Treasury provided \$13.4 billion to GM in late 2008 as a loan, on the condition that GM restructure in exchange for warrants for 19.99 percent of GM’s outstanding common stock at the end of 2008 (with GM retaining the right to redeem the warrants or shares issued for the warrants once the loan was repaid) ([Klingsberg, Tiger, and Bashman 2020](#)). This loan did not turn out to be sufficient: By mid 2009, GM filed for bankruptcy. The US Treasury’s outstanding loans and warrants were converted into a

⁵¹ The Climate & Community Project’s “Toward a Green New Deal in Transportation” has an important set of recommendations to equitably decarbonize our transportation infrastructure ([Freemark et al. 2022](#)).

⁵² For a complete description of public equity stakes taken during the financial crisis, see [GAO 2010](#).

⁵³ For details on the actual number of shares held, see [Black 2010](#).

60.8 percent holding of GM's outstanding stock, making it the majority shareholder, and GM delisted from the New York Stock Exchange. As the crisis abated, the federal government wound down its position as GM went public again through an initial public offering (IPO) in 2010, with GM using the proceeds of sales of stock in its IPO to repurchase shares from the US Treasury.

GM offers just one example of how the federal government could have approached the last decade differently with respect to companies bailed out during the financial crisis: the government could have been an active shareholder promoting the public interest. The federal government became the majority shareholder in GM during the collapse (bailouts to GM totalled \$51 billion), and despite its enormous commitment to the company and its employees, sold the shares at a loss of \$11 billion. By 2019, GM announced major closures⁵⁴ despite robust profits. If the federal government had held onto its stake throughout the decade, it could have had a seat at the internal table for such discussions. GM has continued to spend billions of dollars on stock buybacks throughout the decade even while its efforts to transition to electric vehicles proceeded slowly (as described below) ([Gilpin 2018](#); [Bryant 2018](#)).

The reality was that instead, the US Treasury described itself during the financial crisis as “reluctant shareholders,” (Office of Financial Research report cited in Black [[2010](#)], fn 19).⁵⁵ As Black ([2010](#)) says, “there is no rule book for how the government should act as a shareholder,” so why has it acted as such an unwilling one even when its role was arguably far more crucial than other shareholders in times of crisis? Then-Treasury Secretary Larry Summers stated in 2007 that when the government acted as a shareholder, it would not necessarily act with pure shareholder primacy motivations—stating this as a reason for the government to not hold stakes ([Backer 2008](#)).⁵⁶ By 2009, the Obama administration had pivoted from a formal, totally hands-off approach, as stated by Diana Farrell of the National Economic Council, to saying that “where the US government feels it is necessary to respond to a company's request for substantial assistance, the government will reserve the right to set upfront conditions to protect taxpayers, promote financial stability and encourage growth,” ([Davidoff 2010](#), p. 1757). Yet the goal was still to exit quickly.

The deals conducted by members of the Obama administration were largely made by officials who had previously worked as dealmakers in the financial sector ([Davidoff and Zaring 2009](#)). This dealmaking approach to the crisis meant that different institutions were dealt with differently and there was no consistent approach to what it actually meant for the government to take an equity stake—that is, how it would behave as a shareholder ([Davidoff and Zaring 2009](#)).⁵⁷ While the EESA specified that the government could not vote as if it were a private shareholder, Davidoff ([2010](#)) concludes that the government did not make as strong a deal as a private entity would have. Likely because of political concerns, the federal government left economic returns on the table, enabling them to accrue privately rather than to the public interest. In other words, this meant that the government did not act, even though it was a significant shareholder, to make sure that the companies actually did the kinds of home loan modifications and small business investments that were necessary for the economic recovery and the public interest.

54 The announcement of plant closures made its stock price soar, in a clear example of the lack of a focus on production in the logic of shareholder primacy.

55 Davidoff and Zaring ([2009](#)) describe the government's role in the JPMorgan/Bear Stearns merger as “a deal-making middleman, a traditional role for investment bankers.”

56 The Treasury Managing Guiding Principles state, “we want to see the capital base of our financial system return to private hands as quickly as possible, while preserving financial stability and promoting economic recovery.” Guiding principles include:

- Protect taxpayer investments and maximize overall investment returns within competing constraints;
- Promote stability for, and prevent disruption of, financial markets and economy;
- Bolster market confidence to increase private market investment; and
- Dispose of investments as soon as practicable in a timely and orderly manner that minimizes financial market and economic impact ([Black 2010](#)).

57 This was not the first time the US government took public equity stakes: In 1984, “the FDIC took an 80 percent stake in a troubled bank, Continental Illinois, and held the stock for seven years before it divested. The FDIC was an active shareholder, though it was careful to distinguish its role as an active shareholder from nationalization: it recruited and selected the new CEO and Chair of the Board. The stock had no voting rights though they did have veto power over directors. The bailout cost the FDIC \$1.1 billion” ([Black 2010](#)).

Labor was involved in the bankruptcy negotiations as a stakeholder, though the framework was not about improving conditions for the production workforce but instead about stabilizing the company in the interest of international competitiveness. The UAW agreed to concessions as part of the restructuring, including layoffs, wage freezes, and giving up cost-of-living adjustments; such concessions allowed GM to save \$11 billion on labor costs ([Hopkins and Lazonick 2023](#)). In the 1980s and 1990s, unionized auto workers bargained for regular wage increases of 2.25 to 3 percent (or equivalent lump sum payments), but the 2003 agreement contained a two-year wage freeze and changes to cost-of-living adjustments to deal with rising health-care costs. In the next regular round of bargaining in 2007, the UAW traded off a pension increase for current members for the ability of the auto companies to create a new “tier” of workers whose wages were roughly half of the current workforce. By 2009, the UAW agreed to another round of concessions as part of bankruptcy negotiations with the federal government. According to economist Kristin Dziczek ([2023](#)) of the Federal Reserve:

A condition of the government assistance to Chrysler and GM was that they become “cost-competitive” with the international automakers that also produced light vehicles in the United States; this required closing a roughly \$10 per hour labor cost gap with their international competitors. To do that, the UAW agreed to suspend the 2007 lump sums, COLA, and job security programs. Workers lost a holiday and their legal aid benefits, and older workers were offered buyouts and early retirement packages to make room for younger (and less costly) workers to be hired. The companies restructured their VEBA obligations by replacing cash commitments with equity. An additional provision mandated by the government was that the UAW could not strike until 2015.

In other words, the UAW became a significant shareholder of GM via its VEBA trust post-bailout. The negotiations set the stage for the next decade, because without the ability to strike, the 2011 contract contained few gains. By 2015, the top-tier legacy auto workforce received their first wage increases since 2006, while the entire workforce earned back some of the concessions made in earlier contracts. The 2019 bargaining led to a 40-day strike, resulting in another round of wage increases and increases for the second-tier workforce to bring them closer to parity with the top tier. Still, the concessions during the financial crisis are still felt by the long-term workforce; workers in 2023 remembered what happened in 2009: “We gave up a lot of concessions to help the corporation out,” Nick, a 17-year UAW member at a Detroit plant, told me. “They promised us all these things back when brighter days came. It’s been a decade later and they still haven’t given us them back” ([Facundo 2023](#)).

3. Policy Recommendations for Corporate Guardrails in the Electric Vehicle Transition

The industrial policy programs included incentives for high-road labor standards. For example, in the Domestic Conversion Grant Program, “higher scores will be given to projects that are likely to retain collective bargaining agreements and/or those that have an existing high-quality, high-wage hourly production workforce, such as applicants that currently pay top quartile wages in their industry,” which earned approval from the UAW ([Department of Energy 2023a](#)). The administration’s public statements about funding availability include consistent reference to “quality auto sector jobs” that remain in the communities in which they are currently located, in an explicit focus on the unionized facilities in the Midwest ([Department of Energy 2023b](#)). There is, in other words, an explicit focus on ensuring that factory conversions do not result in lower job quality.⁵⁸

⁵⁸ From the DOE Loan Program Office’s description of its criteria: “In the event that an applicant seeks LPO financing for a project that converts or directly replaces an existing factory that has high-quality jobs, LPO will also assess the projected economic impacts of the facility conversion relative to the existing facility, including factors such as contribution to the local economy, employment history, anticipated employment, and duration of its existence. For these projects, LPO will assess the degree to which the proposed project is likely to preserve high-quality jobs, prioritizing applicants that currently pay top quartile wages in their industry as reported by the US Bureau of Labor Statistics, as well as commensurate non-wage compensation benefits, as applicable. LPO will also consider the degree to which the proposed project, or group of projects, are in communities with a 20+ year history of producing vehicles or supplying parts for vehicles” ([Department of Energy 2023b](#)).

Works Councils and Worker Voice on Corporate Boards

The federal government could make a condition for financing that auto companies include a worker representative on their boards of directors and that they form worker councils at minimum for the purposes of considering health and safety issues.⁵⁹ While industrial relations and worker representation on corporate boards—or “codetermination”—in the German auto sector have been the subject of extensive research, US labor and corporate law together shape consideration for how workers could participate directly in business decisions, in which labor unions are unable to engage under current law. “Works councils,” which also have an established presence in the international auto sector, are largely prohibited under US labor law in a well-intended restriction on company unions. However, former National Labor Relations Board (NLRB) Chair Wilma Liebman has clarified that such committees can be established for health and safety purposes ([Liebman 2017](#)). Policymakers should work in collaboration with the UAW to pursue appropriate mechanisms for workers to bring their expertise to the table for the benefit of the electric vehicles transition. In doing so, they can draw on previous US experience of auto union representation on the Chrysler board of directors.

The UAW negotiated for board representation at Chrysler in 1976 but was rebuffed by management until an economic crisis hit the company in 1980 ([Fraser 1982](#); [McGaughey 2019](#)). In a 1982 article, Douglas Fraser, president of the UAW, outlined the experience that he had serving on the Chrysler board of directors as a representative of management: Because Chrysler had offered worker representation on the board to its unionized workforce in the UK, UAW workers in the US demanded it as well. As Fraser put it, the demand resonated among union employees because:

They reached the conclusion that they don't have a voice in their own destiny and their own future unless they have representation at the point the decisions are made or before the decisions are made. Because once the decisions are made and once they are irreversible, you really can't do anything about it. You can complain about it. But you can't challenge it effectively. You have to be there, and you have to be a party to a decision or at least have a voice in the process of making the decision. ([Fraser 1982](#)).⁶⁰

Chrysler rebuffed the demand until the 1979 union negotiations, when it nominated Fraser to the board of directors, to which he was elected with a statement to shareholders saying that he viewed his position as representing the workforce. He was able to bring the perspective of the workforce to the board on, for example, issues of the impacts of economic dislocation from plant closures, which “so many of the Board members ha[d] . . . never thought about before” ([Fraser 1982](#)).

Limits on Corporate Extraction

The administration should use its bargaining power vis-à-vis auto manufacturers to obtain commitments that funds will not be used for shareholder payments in the form of stock buybacks or excessive executive compensation, which is largely stock-based and affected by stock buybacks ([Palladino 2019](#); [Shilon 2021](#)). The CHIPS and Science Act recognizes that restricting stock buybacks is important for taxpayer protection to fulfill the purposes of the Act. While the CHIPS Act stated that public funds could not be used for stock buybacks directly, money is fungible, so in order to make the restrictions meaningful, the CHIPS program office gives preference to companies that commit to not engage in stock buybacks. This is a clear model that should be used regarding IRA funds invested in the auto industry.

⁵⁹ For a complete analysis of how worker representation on corporate boards and works councils could function in the United States, see [Palladino 2021](#).

⁶⁰ Fraser goes on to say: “I think representation on the Board, representation on all levels of the decision-making process will come about, will grow, because it's the true spirit of democracy. In the final analysis, the companies are going to realize, as some of them have now, it's good for all of us” ([Fraser 1982](#)).

One agency that will play a key role in funding companies with IRA funds is the Department of Energy. Section 50142 of the IRA appropriates \$3 billion to the Department of Energy to issue direct loans under §136(d) of the Energy Independence and Security Act of 2007.⁶¹ The loans are intended for the purpose of:

Reequipping, expanding, or establishing a manufacturing facility in the United States to produce . . . [or for] engineering integration performed in the United States of, advanced technology vehicles . . . [as defined in 42 U.S.C. § 17013(a)(1)] . . . only if such advanced technology vehicles emit, under any possible operational mode or condition, low or zero exhaust emissions of greenhouse gasses.

As the Department of Commerce did in the CHIPS Program Office Notice of Funding, the Department of Energy should preference corporations that commit to not conducting stock buybacks over the life of the loan (or at least commit to maintain them below certain predefined limits)—because this mitigates the risk that federal funds in effect subsidize stock buybacks. This would be in direct contravention of the purpose of the IRA ([Dobbs-Allsopp, Palladino, and Shaw 2022](#)). Other agencies engaged in grantmaking can use the same approach, given the overall productive purposes of the IRA. As in the CHIPS Act, once loans are granted there remains the question of what would keep companies from renegeing on their commitments, in terms of their commitments to not engage in practices like stock buybacks or pay executive compensation based on stock price manipulation,⁶² and to actually make the long-term investments necessary to meet the productive goals of the public investment. While clawback mechanisms (i.e., enabling the government to recoup funds if the terms of the agreement are not met) may be difficult for conditional promises, companies that violate their commitments know that such behavior will be part of future federal funding evaluations.

Public Equity Stakes

Public equity stakes can be held by the federal government to engage directly in corporate decision-making. Acting as a shareholder, the federal government can vote on corporate decisions alongside other shareholders, and can in certain cases take a board seat, as many “activist” shareholders advocate for when they take major stakes. As described above in the case of the auto sector bailout during the financial crisis, historically, public equity stakes have been used in the United States for crisis management, when the federal government takes stakes in failing enterprises that are creating systemic risks (usually exiting the equity holdings as quickly as possible). The effects of government investment in businesses can never be predicted with certainty—by nature, the innovation process is full of risk. A public equity stake would function differently from a loan or grant in that it would enable the public to remain involved in the key choice points as businesses produce and innovate when a public investment has been made, making it possible—though not certain—that the public stakes contribute to the kinds of organizational capabilities that companies need to produce, rather than extractive corporate practices. A public equity stake gives the public a meaningful way to continue to engage when companies and projects have been deemed in the public interest such that they are worth public investment.

Public equity can contribute to changes in US corporate behavior and move companies away from the flawed decisions resulting from an excessive focus on shareholder primacy, though the substantive implementation questions for proactive public participation in corporate decision-making are manifold and likely would vary given the public policy goals of a given equity stake. When the government makes a financial investment in a business corporation, the government should participate in corporate governance by voting on major corporate decisions and holding a seat on the corporate board to ensure the public-interest goals of the investment are met. Public equity stakes could enable involvement in governance as a shareholder even without a board seat, including the ability to veto certain company actions, and accompany both economic and governance rights. Public equity stakes could mean the federal government receives a variable financial return on an investment.

61 Inflation Reduction Act of 2022, Pub. L. No. 117-169, § 50142, 136 Stat. 1818, 2044 (2022); Energy and Independence and Security Act of 2007, Pub. L. No. 110-140 § 136(d) (2007) (current version at 42 U.S.C. § 17013).

62 See Hopkins and Lazonick ([2023](#)) for a full overview of executive compensation at GM and how CEO Mary Barra’s pay is actually influenced by the company’s moves to affect GM stock price.

Shares could be held as a “golden share”—specific types of equity that only grant the government the right to vote on major corporate decisions such as dissolutions or mergers (Omarova 2017). The federal government could also hold shares as preferred stock, common stock, or a blend of the two. Equity stakes enable the government to fund a company while not adding liabilities to the government budget, and financial gains from a stake could be allocated to specific related projects or to the general fund.

4. Conclusion

As the foreword to this series of essays discusses, a more active economic “statecraft” is necessary for future industrial policy to be successful. The auto industry is central to the US decarbonization agenda and to the fortunes of the US manufacturing workforce. This essay addresses a question posed by Tucker: What institutions and strategies are missing from US industrial policy that could help it be more successful? It does so through looking at the history of US engagement with US auto companies and proposing a new institutional relationship moving forward. The Obama administration made major investments in the auto industry to stabilize it during the financial crisis, and the Biden administration has prioritized the transition of the auto industry in its industrial policy efforts. In order to ensure that public investment results in public gain, policymakers should use policy interventions to make the state an active participant in shaping the industry going forward by limiting extractive corporate financial practices, empowering the workforce in productive decisions, and participating directly in corporate governance.

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