ANNUAL REVIEWS

Annual Review of Economics

The New Economics of Industrial Policy

Réka Juhász,[1] Nathan Lane,[2] and Dani Rodrik[3]

[1]Vancouver School of Economics, University of British Columbia, Vancouver, British Columbia, Canada

[2]Department of Economics, University of Oxford, Oxford, United Kingdom

[3]John F. Kennedy School of Government, Harvard University, Cambridge, Massachusetts, USA; email: dani_rodrik@harvard.edu

Annu. Rev. Econ. 2024. 16:213–42

First published as a Review in Advance on May 1, 2024

The *Annual Review of Economics* is online at economics.annualreviews.org

https://doi.org/10.1146/annurev-economics-081023-024638

JEL codes: L5, H41, H25

OPEN ACCESS CC BY

Keywords

industrial policy, place-based policies

Abstract

We discuss the considerable literature that has developed in recent years providing rigorous evidence on how industrial policies work. This literature is a significant improvement over the earlier generation of empirical work, which was largely correlational and marred by interpretational problems. On the whole, the recent crop of papers offers a more positive take on industrial policy. We review the standard rationales and critiques of industrial policy and provide a broad overview of new empirical approaches to measurement. We discuss how the recent literature, paying close attention to measurement, causal inference, and economic structure, is offering a nuanced and contextual understanding of the effects of industrial policy. We re-evaluate the East Asian experience with industrial policy in light of recent results. Finally, we conclude by reviewing how industrial policy is being reshaped by a new understanding of governance, a richer set of policy instruments beyond subsidies, and the reality of deindustrialization.

1. INTRODUCTION

There are few economic policies that generate more knee-jerk opposition from economists than industrial policy. This has not stopped governments from making abundant use of it, even when they seem ideologically hostile to it.[1] The salience of industrial policy has risen greatly in recent years, as governments have increasingly engaged in self-conscious industrial policies as they address a variety of problems—the green transition, the resilience of supply chains, the challenge of good jobs, and geopolitical competition with China. Academic economists have often acted as bystanders (and often naysayers) as policies such as the Creating Helpful Incentives to Produce Semiconductors (CHIPS) Act and the Inflation Reduction Act (IRA) have been developed and implemented in the United States.

The good news is that there is much to be learned from the variety of industrial policies around the world.[2] A considerable literature has developed in recent years providing rigorous evidence on how industrial policy really works and how it shapes economic activity. This literature is a significant improvement over the earlier generation of empirical work, which was largely correlational and marred by interpretational problems. The recent crop of papers offers in general a more positive take on industrial policy. More importantly, it provides a much more nuanced and contextual understanding of industrial policy.

We summarize the outline and main conclusions of this article as follows. We begin in Section 2 by providing our definition of industrial policy and presenting the standard arguments both in favor of and against the use of industrial policy. We argue that there is a generic and powerful economic case for industrial policy and that the usual critiques rely on practical rather than principled objections. In light of this, it is curious that the debate on industrial policy in economics has focused on the whether (i.e., whether governments should carry out industrial policy) rather than on the how (i.e., how industrial policy should be carried out).

In Section 3, we turn to the actual practice of industrial policy. We discuss the difficulties of measuring industrial policy and then focus on recent systematic efforts to overcome these difficulties. We provide a summary characterization of current industrial policies. First, it is no longer appropriate, if it ever was, to identify industrial policy with inward-looking, protectionist trade policies; contemporary industrial policies typically target outward orientation and export promotion. Second, industrial policy has been ubiquitous, and its prevalence predates the recent rise in its use and prominence in public discussions. Third, it appears that advanced economies are heavier users of industrial policies than developing countries.

Section 4 focuses on the evidence of how industrial policy works. There is an inherent difficulty in ascertaining the causal effects of industrial policy since, by design, policy intervention is nonrandom and targets certain industries for a mix of economic, political, or administrative reasons that cannot be perfectly observed. We show that correlational work of the type that was the norm until recently cannot distinguish between the polar cases of rent seeking and developmental governments—and anything in between—as these cases are observationally equivalent. We further show that standard identification techniques can be useful but will not resolve the debate on whether systematic use of industrial policy works or not.

---

[1] President Reagan, famous for labeling government as the problem rather than the solution, protected the US steel, auto, and motorcycle industries from import competition to encourage them to invest in technological upgrading. President Pinochet of Chile, as close to an avatar of free market liberalism as one can imagine, subsidized the forestry sector and promoted its exports. Margaret Thatcher actively courted Japanese auto makers and promoted their UK investments with financial incentives.

[2] Juhász & Steinwender (2024; in this volume) provide a discussion of the use and effects of industrial policy in the nineteenth century.

The new generation of work we discuss has less ambitious aims and focuses on evaluating whether industrial policy elicited the desired behavioral response in specific settings. We focus on three types of cases: episodes of infant industry promotion (e.g., in textiles, shipbuilding, and heavy industries), large-scale public R&D efforts (as in the space race between the United States and Soviet Union), and selective place-based policies targeting specific industries (as in the US manufacturing drive during World War II and contemporary regional European subsidies). Interestingly, the most recent vintage of papers, paying serious attention to identification and observability difficulties, produces results that are much more favorable to industrial policy. These papers tend to find that industrial policy has typically shifted resources in the desired direction, often producing large long-term effects in the structure of economic activity.

Section 5 revisits the industrial policy experience in East Asia. The East Asian miracle not only constitutes one of the most important episodes of modern economic development but also remains the focal point of debates surrounding the efficacy and desirability of industrial policy. Early literature on the East Asian experience was sharply divided. Many regional specialists, mostly sociologists and political scientists along with a few economists, ascribed at least part of the region's success to the strong hand of the state in driving industrialization. Most mainstream economists, meanwhile, have held the view that industrial policies were at best ineffective and at worst harmful. A new generation of work on the region's industrial transformation is beginning to paint a more nuanced picture. This work, often using disaggregated data, pays careful attention to the diversity of policies in question and the structure of linkages and production networks. It shows that certain types of industrial policy were powerful in driving structural change in countries such as Japan, South Korea, and China; but it also suggests that it is very difficult to derive broad generalizations for other countries and time periods from this experience without taking institutional differences into consideration.

Nevertheless, it would be a mistake to see the East Asian experience as idiosyncratic and exotic. As we emphasize in Section 5, there are some useful lessons to be drawn. The region's experience calls for a broadly strategic and dynamic approach to the practice of industrial policy. The instruments used, the relative emphasis placed on domestic firms versus foreign direct investment (FDI), and the balance between import substitution and export promotion varied both across countries and over time, depending on local opportunities and constraints. Furthermore, while East Asian states have traditionally been characterized as hard, in contrast with the soft states prevailing elsewhere, East Asian models of industrial policy are a precursor of today's successful practices and provide useful guidance on the design of future industrial policy.

We end the article in Section 6 with a discussion of the new economic context, which is reshaping our traditional conceptions of industrial policy. We focus on three challenges in particular. First, we suggest that the actual practice of industrial policy often departs from the top-down model of regulation that economists typically adopt when they think of such policies. We use the concept of embedded autonomy, borrowed from sociologist Peter Evans, to characterize an alternative model of regulation based on iterative collaboration between government and firms. Second, we suggest that successful industrial policy often uses a broader range of policies that can be more effective than the classic instrument of subsidies (or of trade policy). These include, importantly, customized public services and inputs that are tailored to the firms' needs and target specific obstacles to productivity-enhancing investments. Third, we argue that deindustrialization will necessarily reshape the practice of industrial policy, as manufacturing continues to employ fewer workers relative to the rest of the economy. Policy makers will have to pay more attention to productivity in services and come up with industrial policies that are more suited to services.

2. THE INDUSTRIAL POLICY DEBATE: DEFINITIONS, RATIONALES, AND CRITIQUES

2.1. Definitions

We define industrial policies as those government policies that explicitly target the transformation of the structure of economic activity in pursuit of some public goal. The goal is typically to stimulate innovation, productivity, and economic growth, but it could also be to promote climate transition, good jobs, lagging regions, exports, or import substitution. Since industrial policy targets structural change, a key characteristic is the exercise of choice and discretion by the public authorities, as in "We promote *X* but not *Y*," though the latter part of this statement is typically left implicit.

Industrial policy has traditionally focused on promoting manufacturing industries such as steel, autos, shipbuilding, aircraft, or semiconductors—hence the name. Our definition, by contrast, is open-ended and includes support for services as well as particular types of R&D. Hence industrial policies overlap with what in other contexts might be called regional policies (Slattery & Zidar 2020), place-based policies (Neumark & Simpson 2015), or innovation policies (Mazzucato 2014). In developing countries, industrial policies are often called productive development policies (Fernández-Arias et al. 2016) or structural transformation policies—in part because of the negative connotation the term "industrial policy" has acquired, but also to reflect the reality that similar policies have to be deployed for a wider array of developmental challenges going beyond industrialization.

Industrial policies can take various forms but always create incentives for private-sector actor—firms, innovators, investors—to act in ways that are consistent with the intended direction of structural change. Subsidies (on specific types of exports, investment, R&D, etc.) are the most obvious type of industrial policy, but the gamut runs from import protection to exemptions from specific regulations to public provision of key inputs such as land or training. Since government attention is a scarce good, public–private collaborations focused on alleviating the constraints faced by specific sectors or groups of firms, such as deliberation councils or business–government roundtables, also count as industrial policy.

Since industrial policy, by design, favors certain types of economic behavior, it typically comes with some kind of conditionality. Conditionality can be of a limited kind, restricted to ex-ante eligibility criteria. For example, only firms with less than a certain number of employees in a particular sector or region might be able to receive the proffered subsidy. Alternatively, the incentives may be delivered ex post conditioned on some behavioral changes, such as the undertaking of specific investment or the employment of a target number of workers. In the latter case, there might be explicit, quantitative performance criteria or a softer, iterative form of monitoring to ensure broad compliance (Mazzucato & Rodrik 2023).

2.2. Rationales

There is no shortage of well-grounded economic rationales for industrial policies. We can summarize them under three broad headings: externalities, coordination (or agglomeration) failures, and public input provision. The first two are related to well-known market failures, while the third has to do with the specificity of public inputs to particular economic activities. We say a few words about each rationale.

2.2.1. Externalities. Economic activity produces positive externalities when it generates benefits elsewhere in society that are not recouped in the revenues generated for those who carry out the activity. Learning externalities are common and widely recognized in the economics

literature. The learning in question may be about how to produce a good or service more efficiently, as in the case of R&D or learning-by-doing spillovers across producers. It may also be about general cost and demand conditions for new goods in which such conditions are uncertain and initial entrants produce valuable information to subsequent entrants (e.g., cost-discovery externalities à la Hausmann & Rodrik 2003). But externalities can take other forms as well. There are national security externalities when reducing dependence on a foreign source of supply—e.g., rare earth or semiconductor inputs—makes a country as a whole more secure. This is a social benefit that is not fully internalized in the input sourcing decisions of individual firms. Similarly, there are good-jobs externalities when creating middle-class jobs produces greater social cohesion and alleviates social ills such as crime and drug addiction (Rodrik & Sabel 2022).

2.2.2. Coordination (or agglomeration) failures. This category of market failure refers to situations in which the profitability of an individual producer depends on the level of related economic activities undertaken by others. The related activities may be goods and services that are complements in demand or production or downstream and upstream activities. Coordination failures typically require scale economies of some sort. Such situations may produce multiple equilibria in the absence of government intervention. Consider a case in which it would be profitable to produce good *A* when good *B* is also produced and not otherwise. Assume that the same situation holds true symmetrically for good *B* as well. In one equilibrium, neither good is produced. In the other, both goods are. If the social value of production of the two goods exceeds their opportunity costs, an economy can get stuck in what is a suboptimal equilibrium. Government policy can help push producers to the superior equilibrium.

2.2.3. Activity-specific public inputs. Private production depends on the provision of public goods, such as law and order, appropriate regulation, education, and infrastructure. Economists generally think of such public goods as horizontal policies that do not prioritize certain activities, do not entail choice and discretion, and produce across-the-board benefits. Often public goods are indeed so. However, in many real-world contexts, the needs of producers are highly specific to the nature or location of their activity. To take a simple example, infrastructure dollars can be spent on building/enlarging a port or on expanding the road transport network. Depending on the choice that is made, different kinds of producers reap the benefit. If the decision is to build a port, it can be located close to the copper mine, the steel complex, or a prospective green hydrogen facility. Similarly, worker skills are highly specific to the needs of different sectors, and the government has to decide what kind of professional training it should prioritize. In such situations, governments are essentially "doomed to choose" (Hausmann & Rodrik 2006)—that is, obliged to select which activities are more deserving of public goods. When the choice is made consciously, the result is industrial policy as we have defined it.

These three rationales call for different types of remedies. Externalities are best handled by Pigovian subsidies that are targeted at the source and induce firms to internalize the value of the spillovers they produce. Coordination failures in principle do not need subsidies or financial incentives to be addressed: Governments could simply bring the different groups of firms together and call on them to make simultaneous investment commitments. Alternatively, prospective investors could be provided with public guarantees (that will not need to be paid out if, as predicted by the logic of the problem at hand, the investments turn out to be profitable ex post). Finally, public inputs require the provision of specific investments by the government itself. These first-best remedies aside, there is an almost endless list of second-best instruments that could tackle these problems at least partially, even if not equally, well.

2.3. The Critique

As this discussion makes clear, the theoretical case for industrial policy is broad and strong. The controversy over industrial policy generally revolves not around these rationales, but around two practical objections: informational shortcomings and political capture. The informational critique asserts that even if the market failures on which governments could act are widespread, real-world governments are unlikely to know enough about the location and magnitude of these failures to make the correct decisions. The political capture critique asserts that even if governments have (or could acquire) the relevant information, industrial policy opens the door to self-interested lobbying and political influence activities, diverting the government into activities that enrich private interests without enlarging the social pie. For either or both reasons, the argument goes, governments cannot pick winners.

This is the kind of debate that empirical analysis might have helped resolve. Indeed, proponents and opponents of industrial policy have relied on their favorite examples to make their case. The task of providing more systematic evidence on whether industrial policy works has been stymied by a number of complications. First, there is a dearth of cross-nationally comparable quantitative measures on industrial policy interventions. Traditionally, empirical studies have tended to focus on straightforward measures such as import tariffs or credit subsidies, which may be only one component of industrial policies and may serve many other objectives besides structural transformation. This shortcoming of measurement is gradually being remedied in more recent studies, as we discuss below.

Second, there is the difficulty of ascertaining success. Most studies focus on whether an intervention moved the needle on a quantity of interest, such as investment, exports, or total factor productivity (TFP). This is a test of effectiveness and at best captures only part of the picture when it comes to determining success. Successful industrial policy needs not only to accomplish the targeted structural change but also to do so (*a*) in a way that truly alleviates the underlying market failures, and (*b*) without causing too many distortions elsewhere in the economy. If, say, investment in steel is boosted but the market failures are in pharmaceuticals instead, industrial policy will be effective but inefficient. Performing the complete analysis is quite difficult in practice, even ex post, since market failures are rarely observable directly.

Ultimately what is required for industrial policy to work is far less than a consistent ability to pick winners. In the presence of uncertainty about both the effectiveness of policies and the location/magnitude of externalities, the ultimate test is not whether governments can pick winners, but whether they have (or can develop) the ability to let losers go. As with any portfolio decision, it would be an indication of suboptimal policy if the government did not back some ventures that end up as failures ex post. In the United States, Department of Energy loan guarantees to Solyndra, a solar cell manufacturer, failed miserably, but a similar loan guarantee to Tesla enabled the company to avert failure and become the behemoth it is today. In Chile, successes in four projects supported by Fundación Chile—including, most spectacularly, salmon—are said to have paid the costs of all other ventures.

Letting losers go may still be a hard task in light of the political pressures that inevitably develop. Indeed, Solyndra, for example, was backed by the government long after it became clear that the company would not become financially viable. However, avoiding the problem of supporting failures requires much less than governmental omniscience. Ensuring that governments can stop backing evident losers requires a set of institutional safeguards that include clear benchmarks, close monitoring, and explicit mechanisms for reversing course. We return to the institutional underpinnings of successful industrial policy below.

Beyond the practical critiques of industrial policy, there have also been some more technical critiques. Bartelme et al. (2019) reconsiders the textbook Pigovian case for intervention in a

quantitative trade model with increasing returns to scale. Although the authors find sizeable external economies of scale across sectors, their framework suggests that production subsidies may only promote modest aggregate welfare gains. The quantitatively small effects are driven by inelastic demand, which implies that industrial policy produces little structural change. (Incorporating input-output linkages produces larger aggregate effects.) Related work by Lashkaripour & Lugovsky (2023) uses a quantitative trade framework to highlight another potential trade-off: The allocative gains from unilateral interventions may be undone by terms-of-trade losses. Globally coordinated industrial policies, on the other hand, can potentially promote large gains.[3]

2.4. Where Does This Leave Us?

Industrial policy is not that different from many other domains of policy where there exist clear theoretical justifications for government intervention, but where evidence on what works is not that clearcut. Consider education policy (human capital externalities), health policy (moral hazard, adverse selection), social insurance and safety nets (incomplete risk markets, behavioral factors), infrastructure policy (natural monopoly), or stabilization policy (Keynesian rigidities). In all these areas, it is recognized that the market failure arguments for intervention can be exploited by powerful insiders and overwhelmed by informational asymmetries. Similarly, the efficacy of different remedies remains contested, despite rich empirical literatures in each domain. However, policy discussions in these areas typically focus not on whether the government should do something, but on how it should do it. The debates revolve around what works and under what conditions.

Theory-driven quantitative work can provide a richer analysis beyond the traditional either/or debate. The study of industrial policy requires a combination of both careful empirics and theory, as we discuss in the remainder of the article.

3. WHAT DO WE KNOW ABOUT THE PRACTICE OF INDUSTRIAL POLICY?

Until recently, we lacked a systematic understanding of industrial policy practice, and data played a key role in this deficit. This section discusses why measuring industrial policy is difficult and shows how new work has overcome many well-known challenges. We then characterize broad features of current industrial policy practice globally.

3.1. Dilemmas of Measurement

Industrial policies are complex, and measuring them in the wild can be complicated. Consider the complexity of a single policy: China's push in the shipbuilding industry. China's eleventh Five-Year Plan for National Economic and Social Development of 2006–2010 identified shipbuilding as a "strategic industry"[4] and deployed a multitude of policy instruments, including production subsidies, investment subsidies, and entry subsidies. In 2009, China's Plan on Adjusting and Revitalizing the Shipbuilding Industry turned policy away from promoting entry and focused instead on industry consolidation, and from 2013, the government periodically considered which firms met the standards to receive priority incentives.

This example reveals why measuring industrial policy can be difficult, especially at scale. A single sectoral strategy may entail many tools, and the composition of these tools can change

[3]Readers are referred to Itskhoki & Moll (2019) and Liu (2019), who formalize the classic case for industrial policies in distorted economies in a quantitative setting.
[4]This description is based on work by Kalouptsidi (2018) and Barwick et al. (2019).

over time. Observing these different levers is challenging. Industrial policy may consist of flows of government funding in the form of subsidies and financial grants. Such policy flows may be tracked through fiscal expenditures subject to data availability. Alternatively, industrial policy may also be conducted through tools such as tariffs or export restrictions. Rather than spending, these levers try to shift relative prices in favor of some activity and require different types of data. Moreover, other industrial policies may attempt to shape expectations and coordinate the behavior of firms through administrative guidance. Such guidance may be a fixture of national industrial strategies (Johnson 1982), yet these may be some of the most difficult policies to quantify.

A related challenge arises when researchers assume that a specific policy tool is always used as an industrial policy; in fact, doing so can conflate various policies. For example, while a tariff can and is used for industrial policy purposes, there are many other motivations for deploying tariffs, from raising revenue (Cagé & Gadenne 2018) to special interest politics (Goldberg & Maggi 1999) and terms-of-trade rationales (Broda et al. 2008). Thus, even if we could track all policy levers potentially used as industrial policy, only a subset would actually be used for industrial policy.

Given these issues, the literature has struggled to quantify the practice of industrial policy, especially beyond individual episodes. In particular, some scholars have mistakenly taken industrial policy to be synonymous with protectionist trade policy, that is, with an overt protection of domestic markets. While there are historical examples of inward-looking industrial policy [e.g., import substituting industrialization (ISI)], identifying industrial policy with inward-facing policies blinkers us to contemporary forms of industrial policy making in open economies.

3.2. Accounting for Contemporary Industrial Policy Practice

The return of industrial policy has brought attention to the paucity of systematic data, and scholarship has started to take stock of global practice. A number of ambitious efforts measure industrial policies through deep accounting of government activity (Criscuolo et al. 2022, DiPippo et al. 2022, Hanson & Rodrik 2024). A central mission of these projects is distinguishing government expenditures allocated for industrial policy aims. For example, efforts by the Center for Strategic and International Studies (DiPippo et al. 2022) has produced quantitative descriptions of industrial policy for China and seven other economies (Brazil, France, Germany, Japan, South Korea, Taiwan, and the United States). DiPippo et al. (2022) estimate that in these countries, industrial policy is an important part of the policy maker's tool kit, accounting for 0.3–1.5% of GDP in terms of government spending.

Likewise, the Organisation for Economic Co-operation and Development (OECD) (Criscuolo et al. 2022) has developed cross-country methodologies to quantify industrial policy using government expenditure data for a sample of OECD member countries. In addition to quantifying financial flows, Hanson & Rodrik (2024) provide comparative evidence across US regions on the organizational landscape of place-based policies, tracking single-purpose entities such as workforce development agencies as well as coordinating agencies such as local economic development agencies. Such efforts go far beyond the early accounts of industrial policy, highlighting the depth and variation of industrial practice in major economies.

Another approach, taken by Juhász et al. (2022), uses natural language processing to classify industrial policies at a high resolution (country-industry-year level) using a publicly available policy inventory [the Global Trade Alert (GTA) database; Evenett 2009].[5] The core idea of Juhász and

[5]Rather than taking a more macro accounting approach, the outputs of this method are similar to coverage ratios used by trade scholars. Thus, this approach shares commonalities with a literature measuring nontariff measures.

colleagues is that textual descriptions of policy often convey information about the objectives of political actors and thus allow researchers to identify whether a policy has industrial policy goals or alternative objectives.

Juhász et al. (2022) apply a supervised machine learning algorithm to classify policy descriptions from the GTA, which allows them to construct a global data set of industrial policies from 2010 to 2022. The authors train both simple logistic regression models and large language models [specifically, different versions of the Bidirectional Encoder Representations from Transformers (BERT)] and find that both types of models perform well, but the large language model receives a performance boost from its ability to pick up nuance and context.

This text-based approach overcomes a number of the measurement challenges reviewed in Section 3.1. First, the broad range of policy measures covered by the GTA allows researchers to capture subsidies and policies that do not require spending (e.g., tariffs). Likewise, examples of coordination policy, such as the Chinese consolidation policy in shipbuilding described above, appear in the data and are classified as industrial policy. Second, within policy measures, it is possible to distinguish industrial policy from other reasons for intervention (e.g., subsidies used for industrial policy purposes versus those used to manage macroeconomic shocks). Third, the model is able to classify policies at scale using off-the-shelf textual data. However, a limitation of this approach is that it yields count-based measures of industrial policy interventions. This means that a subsidy to a single firm and to a major sectoral policy such as China's consolidation of its shipbuilding sector can both count as one policy in the GTA. Nevertheless, a nontariff measure literature in trade policy has illustrated how count-based nontariff measures can be transformed into ad valorem equivalencies (AVEs) using various methods.[6]

3.3. A First Look at International Industrial Policy Practice

The findings from Juhász et al. (2022) give us an initial glance at the global practice of industrial policy, with particularly good coverage of G20 nations.[7] First, industrial policy has indeed returned and is on the rise. **Figure 1** shows an increase in the total count of industrial policy interventions through the 2010s, with major accelerations in 2018 and 2021. This trend does not seem to be driven by data coverage from the GTA improving over time, as the share of industrial policies among all policies in the GTA also increased.

Second, higher-income countries are major users of industrial policy. **Figure 2** plots the breakdown of industrial policies by income quintile (based on GDP per capita in 2010) and region. The figure makes clear that advanced economies account for the overwhelming majority of industrial policy interventions. Given that most of DiPippo et al.'s (2022) sample measuring industrial policy spending overlaps with where Juhász et al. (2022) find the most intensive use of industrial policy interventions, we have a rough way of benchmarking how much fiscal expenditure industrial policy interventions may entail. Of the seven economies outside of China examined by DiPippo et al. (2022), all except South Korea and Taiwan are on the list of the top 10 users of industrial policy based on Juhász and colleagues' count-based measure. This suggests that the fiscal expenditure of industrial policy for some of the heaviest users is in the ballpark of 0.3–0.7% of GDP.

The results in **Figure 2** suggest that the number of industrial policy interventions increases with income per capita. This relationship may be explained by a number of factors. For instance, the authors also find that contemporary industrial policy is typically conducted through costly

[6]Readers are referred to the recent gravity-based methods proposed by Heid et al. (2021) and Herman (2022).
[7]The data presented here are from version 2 (v2) of Juhász et al. (2022). Notes on v2 are available at **https://osf.io/tp6ak**.

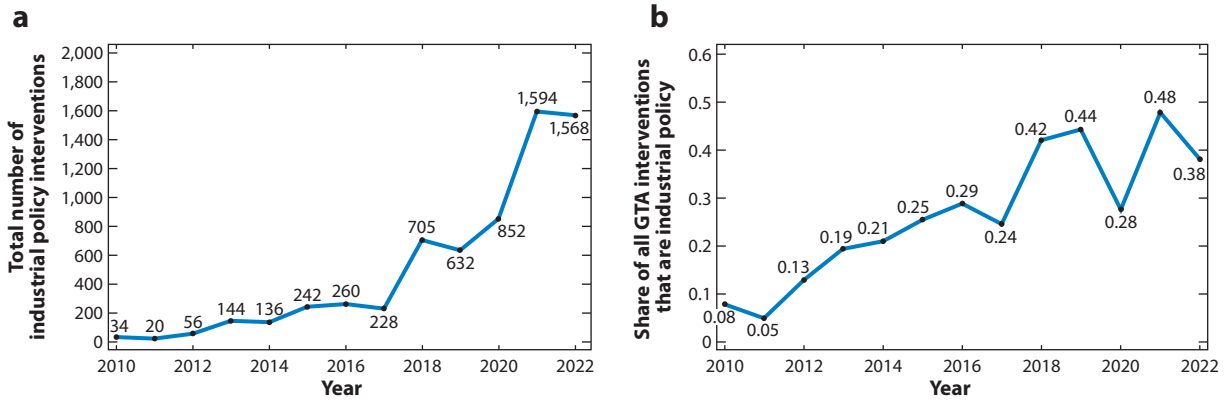

Figure 1

Time trend of industrial policies. (*a*) Total number of industrial policy interventions globally by year. (*b*) Share of all interventions classified as industrial policy among all interventions in the Global Trade Alert (GTA) database. Following guidance from GTA, only policies entered in the same calendar year are included to ensure comparability across time. Data from Juhász et al. (2022) (data update July 2023).

subsidies and export promotion measures (see below). In lower-income economies, fiscal constraints will bind fast if industrial policy is deployed through government spending. However, cross-country comparisons using a count-based measure tell only a partial story, and the GTA sample may be incomplete.

Juhász et al.'s (2022) findings also support the idea that modern industrial policy is complex and often composed of many distinct policy levers that are outward oriented; this finding is perhaps most relevant to the discussion in Section 3.2. Different forms of subsidies and export-related measures, together, account for most industrial policy interventions across the income distribution, constituting almost 90% of all interventions. Notably, based on these data, import tariffs are not a prominent industrial policy tool, accounting for less than 1.2% of industrial policy interventions.

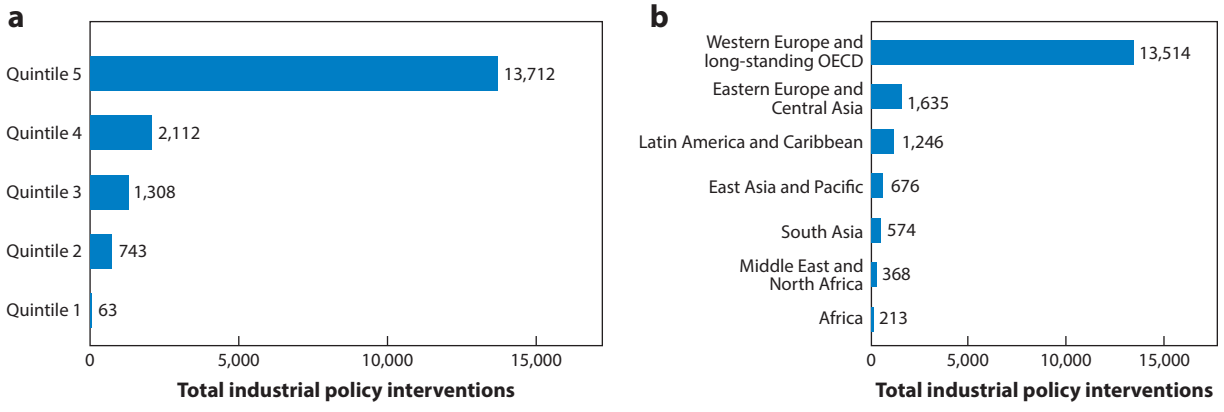

Figure 2

Incidence of industrial policies by group, 2010–2022. (*a*) Total number of industrial policy interventions by income quintile based on GDP per capita in 2010. Quintile 5 is the highest-income group; quintile 1 is the lowest-income group. (*b*) Total number of industrial policy interventions by region. Data from Juhász et al. (2022) (data update July 2023).

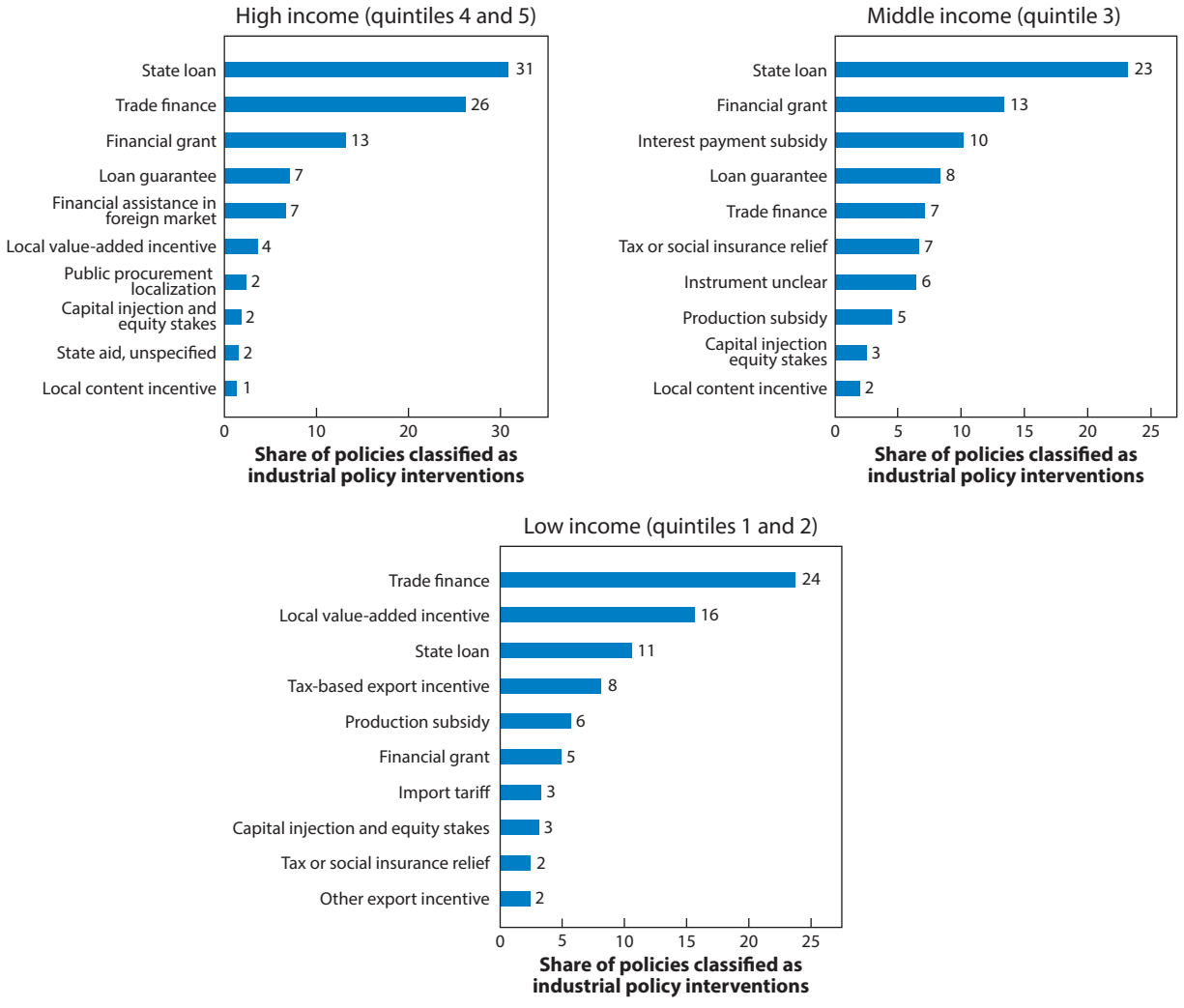

Figure 3

Share of industrial policies by measure type. The figure plots the share of industrial policies accounted for by each measure type within a particular income group (top 10 measures reported). Income quintiles based on GDP per capita in 2010. Quintile 5 is the highest-income group; quintile 1 is the lowest-income group. Data from Juhász et al. (2022) (data update July 2023).

Interestingly, countries across the income distribution tend to use many of the same policy levers. **Figure 3** shows the type of industrial policies used across different income groups and plots the 10 most frequently used policy tools in high-, middle-, and low-income countries. Trade financing, a policy measure that facilitates exporting, is ubiquitous across the income distribution. Local value-added incentives (a trade-related investment measure) are the second most used tool in low-income countries, accounting for 16% of industrial policy interventions. Developing countries seem to harness FDI in ways that would increase local linkages within the domestic country; this is compatible with the literature on FDI and industrial policy (see Harding et al. 2019).

How do these findings inform research and thinking about industrial policy? First, despite the skepticism and lack of empirical study among academic economists, industrial policies are not

uncommon—possibly far from it. As of this study, Juhász et al. (2022) find that over a third of policies in the GTA commercial policy database qualify as industrial policies. In their studies of higher-income countries and China, DiPippo et al. (2022) and Criscuolo et al. (2022) estimate that a substantial share of GDP goes toward industrial policy. **Figure 1** and recent evidence suggest that these trends may have been in motion before the 2020 revival of industrial policy. Even if the current embrace of large-scale industrial policy proves to be a temporary fad, it is unlikely to fade into obscurity anytime soon.

Second, the picture of industrial policy that emerges brings systematic data to the assertion that industrial policy and outward-oriented development strategies can go hand in hand. While in the past industrial policy may have been more closely associated with import tariffs and trade protection, these results portray a considerably more variegated picture. Moreover, the evidence reinforces a point made repeatedly in the trade policy literature (Goldberg & Pavcnik 2016): that research needs to move away from policy instruments that can be readily measured (tariffs), toward other measures that may be harder to capture but that reflect actual current practice. For industrial policy, this rings particularly true.

4. INDUSTRIAL POLICY MEETS CAUSAL IDENTIFICATION

Until very recently, credible empirical evidence on the effects of industrial policy was virtually nonexistent. However, the past few years have seen a proliferation of papers that use careful research designs to evaluate different forms of industrial policy. Though long overdue, the credibility revolution (Angrist & Pischke 2010) has finally arrived to research on industrial policy.

In this section, we introduce the empirical challenges associated with evaluating industrial policy using a simple model of government behavior that embeds different hypotheses about the nature of externalities as well as government motivations and capabilities (the framework is adapted from Rodrik 2012). We discuss the issues that arise with traditional correlational approaches as well as modern causal identification techniques. We then turn to discussing how new empirical work has tackled these challenges and what insights it has yielded.

4.1. The Empirical Challenge of Evaluating Industrial Policy

We express the underlying level of economic performance (g) as a negative function of a market failure parameter θ (which lies between 0 and 1). We have

$$g(\theta) = (1 - \theta)A,$$

where A stands for some state variable that affects performance. For example, in a linear endogenous growth model (where g would stand for the rate of economic growth), A would be the level of productivity. Alternatively, g could be the rate of investment and A some variable linked to the (social) profitability of capital accumulation. The basic point here is that the greater the market failure θ, the larger the gap between social and private returns, and the lower the level of economic performance (growth) absent government intervention. The basic unit of observation could be a firm, a group of firms, an industry, or an entire country. We will omit labels to denote different units (industries) to avoid excess notation.

Let the government's policy be a subsidy $s \in [0, 1]$,which alleviates the distortion by closing the gap between private and social returns to $(1 - \theta)[1 - s]$. We assume the use of the subsidy comes with some fiscal or agency cost $\varphi\alpha(s)$, where $\alpha(s)$ is a rising and convex function of s [$\alpha(0) = 0$, $\alpha'(s) > 0$ and $\alpha''(s) > 0$]. The parameter φ is meant to capture the ability of the government to intervene effectively (government capacity), with higher values of φ indicating lower government

capacity. With the policy in place, the modified expression for growth is

$$g(s,\theta,\varphi) = (1-\theta(1-s))A - \varphi\alpha(s).$$

The socially optimal level of the subsidy is denoted s^{soc} and is given by the value of s that solves $g_s(s,\theta,\varphi) = \theta A - \varphi'\alpha(s) = 0$. Note that it would not be socially optimal to set the subsidy at a level that would fully offset the market failure (which is given by $s = 1$). The cost term $\varphi\alpha(s)$ and its convexity ensure that $s^{soc} < 1$.

So far we have considered only the economic motives for the subsidy. The government can also have political motives. The subsidy can be used, for example, to channel public resources to favored or politically connected groups. We use the function $\pi(s)$ to represent the purely political benefits to the government of using the subsidy. This is a single-peaked, concave function with $\pi(s)$ rising for small s and maximum-value defined by $\pi(s^{pol})$.

We model government behavior by assuming it maximizes a value function $u(s;\theta,\varphi)$ where economic and political objectives both enter. Denoting by λ the relative weight placed on the economic motive, the decision problem is

$$u(s;\theta,\varphi) = \lambda g(s,\theta,\varphi) + \pi(s).$$

The government chooses level of subsidy s^{gov}, which is the solution to the first-order condition

$$\lambda g_s(s,\theta,\varphi) + \pi'(s) = \lambda[\theta A - \varphi\alpha'(s)] + \pi'(s) = 0.$$

With this theoretical background in place, let us now consider how observational data on government behavior and economic outcomes can inform us about how and whether industrial policy works. Ideally, empirical evidence ought to help us distinguish among three different, contending positions on industrial policy:

- the developmentalist view: Governments can successfully identify and support growth/efficiency-enhancing firms/industries;
- the inefficacy view: Governments seek growth/efficiency but do a poor job of supporting appropriate activities;
- the rent-seeking view: Governments are beholden to special interests and do not seek desirable economic outcomes.

Remember that we do not directly observe the critical parameters θ, φ, and λ—the market failures, government capabilities, and relative importance of political motives, respectively. What we do observe is how economic performance (g) varies with the level of government intervention (s).

4.2. Conceptual Issues with Early Evidence on Industrial Policy

The first generation of empirical studies on industrial policy used this correlation to infer industrial policies had been generally ineffective or counterproductive: The level of subsidies or protection, these studies found, was generally negatively correlated with measures of performance such as productivity across industries (e.g., Krueger & Tuncer 1982, Harrison 1994, World Bank 1993, Beason & Weinstein 1996, Lee 1996, Lawrence & Weinstein 2001). Moreover, this was true even in countries like Japan and South Korea—countries where a wide range of qualitative evidence suggested industrial policies had been put to good use.

However, as our theoretical framework makes clear, the level of government intervention is endogenous, responding to a variety of economic, administrative, and political determinants. When this endogeneity is not explicitly taken into account, the inferences can be misleading. To isolate the effects of these determinants, let us consider each in turn.

Suppose first that the sole driver of the subsidies is the varying importance that the government places on political motives across different industries (λ). This would epitomize the case of

the purely rent-seeking government. Using the model just sketched out, it can be checked that $\frac{ds^{gov}}{d\lambda} < 0$ and $\frac{dg}{d\lambda} > 0$. In words, the greater the weight on politics (the lower the λ), the larger the subsidy and the lower the rate of economic growth. An analyst who can observe only s^{gov} and g would note a negative correlation across industries between these two. This result would be consistent with the hypothesis that the government is operating in a rent-seeking mode.

Next, consider the alternative hypothesis that the sole determinant of subsidies is the presence of market failures (θ). Under this hypothesis the government is a social-welfare maximizer, and differences in the government's exercise of industrial policy are driven by the variation in the importance of market failures across industries. The comparative statics with respect to θ yields the following results:

$$\frac{ds^{gov}}{d\theta} = \frac{A}{\varphi\alpha''(s^{gov})} > 0,$$

$$\frac{dg}{d\theta} = -(1 - s^{gov})A < 0.$$

(Since the government is emulating the social maximizer in this case, we have that $s^{gov} = s^{soc} < 1$.) The first of these results states that intervention levels are higher where the market failures are greater, as expected. The second result is that growth rates are lower where the market failures are larger. This follows from the fact that socially optimal policy does not fully offset the market failures, and performance still lags in firms/industries that are subject to larger market failures. Putting the two results together, we find that subsidies would be larger for those activities that are doing worse. Subsidies and performance are negatively correlated even though the government acts as a social-welfare maximizer! This is exactly the same pattern of correlation as in the case of the purely rent-seeking government. (Note that the use of industrial policy is clearly welfare enhancing in this case, in the sense that an ex-ante rule that forced the government to give up on subsidies and set $s^{gov} = 0$ would leave the economy worse off.)

For completeness, consider the pure efficacy case in which the sole driver of industrial policy is government capacity. In this instance, differences in the use of subsidies would be due entirely to differences in the ability to implement them, captured by φ. It can be checked in similar fashion that $\frac{ds^{gov}}{d\varphi} < 0$ and $\frac{dg}{d\varphi} < 0$. In words, the level of subsidies and growth are both decreasing in government capacity. This would produce a cross-sectional correlation between subsidies and growth in observational data that is positive. Discovering a negative correlation could refute the hypothesis that governments respond systematically and optimally to capacity constraints, but only under the extreme assumption that those constraints are the only variation in the data that could be driving government behavior and that other fundamental political and economic motives can be ignored.

To summarize, the two polar cases of rent-seeking and developmental governments—and anything in between—are observationally equivalent. It is not possible to say anything about the merits of industrial policy from the pattern of correlation between the extent of policy intervention and economic performance. We need explicit models of government behavior to evaluate industrial policy. Observational data can be quite misleading absent structural models that can be otherwise verified.

4.3. Challenges for Empirical Evaluation

Since the problem here is the endogeneity of government policy, one alternative is to focus on identifying causality through exogenous or random sources of variation in government action, which is the focus of this section. However, researchers need to proceed with caution. Consider

the canonical empirical exercise whereby the researcher is able to extract an exogenous component of subsidies. In terms of the model above, we could express s^{gov} as $s^{gov} = s^{gov*} + \varepsilon_s$, where the first component is the systematic part that responds to unobservable economic, political, and administrative determinants that may also influence growth, while the second term is the orthogonal component. The analysis would now focus on correlations between ε_s and g. Since ε_s is by definition orthogonal to any factors that may simultaneously affect s^{gov} and g, this exercise would yield the causal effects of subsidy shocks on economic performance.

In essence, what we will be uncovering in this instance are the consequences of the government randomly sprinkling subsidies of varying sizes on different parts of the economy. This hardly resolves the question of whether subsidies are likely to work under real-world circumstances. As an illustration, consider a well-identified study that finds a positive result in the sense that (the exogenous component of) industrial policy produces desirable economic outcomes. An opponent of industrial policy could justifiably argue, "Yes, I can see that the results were favorable in this instance, but in practice the selection of projects/industries/regions by industrial policy will hardly be random; it will be driven by politics, lobbying, and rent seeking, and these results do not speak at all to these difficulties." Conversely, suppose the study yields a negative finding, with (random) interventions producing adverse economic results. Now the proponent of industrial policy can legitimately argue, "Yes, but those of us who favor industrial policy never advocated that the subsidies should be deployed randomly! We always said the selection of projects/industries/regions should be done after careful economic analysis and consultations with stakeholders, and these results say very little about the likely consequences when such processes are followed." Statistically well-designed studies might not convince critics of either kind.[8]

Nevertheless, the modern empiricist's tool kit can still be helpful in evaluating industrial policy. New, well-identified empirical work deals with the tension between the search for exogenous variation and real-world relevance by isolating different layers of treatment. One layer is the question of whether the justification for intervention is valid. For example, is it really the case that external economies of scale are present and prevent the industry from developing under laissez-faire (i.e., is $\theta > 0$)? We think of this as evaluating the economic mechanism, which may or may not be at work. These papers typically evaluate narrow, often stylized settings where supporting narrative evidence points to the potential for industrial policy. Consider Juhász (2018), who evaluates the famous infant industry argument using the disruption to trade resulting from a blockade against Britain in the nineteenth century. The paper is obviously of little direct use to a policy maker trying to understand how to effectively promote infant industry. However, what the paper shows is that infant industry can be a powerful economic mechanism in the real world. In the language of the model above, it suggests that the market failure can be large.

A second set of questions involves evaluating the efficacy of implementation: Was the policy maker able to identify the right unit to treat? Were the instruments used to promote the desired activity effective? Was implementation undermined by rent seeking or other political economy problems (which would speak to the size of φ and λ—government capabilities and the relative importance of political motives, respectively)? Broadly speaking, the modern empirical tool kit is better suited to answering the first set of questions, which is where new work has been most informative. We now turn to discussing this new body of work.

[8]In Criscuolo et al.'s (2019) paper, for example, causal inference is premised on the exogeneity of the eligibility criteria for British regions (the criteria having been determined in Brussels). One set of critics might argue that those eligibility criteria are precisely what political logic suggests will be manipulated in other instances. Another might argue that the eligibility criteria will be set endogenously to target deserving regions/firms, producing better results than the ones the paper finds.

4.4. New Evidence on Sectoral Industrial Policies

Sectoral industrial policies are one of the most controversial forms of industrial policy. An early empirical literature generally dismissed their effects based on a thin, and at times only tangentially relevant, literature (see Harrison & Rodríguez-Clare 2010 and Lane 2020 for a discussion). Much of this early empirical work suffered not only from the endogeneity problems we laid out above but also from the observability problem we discussed in Section 3—a particularly large challenge when evaluating sectoral industrial policies (Rodriguez & Rodrik 2001, Harrison & Rodríguez-Clare 2010). Recently, new work has made headway along both these dimensions.

This recent crop of papers examines episodes that look a lot like textbook cases of infant industry: textiles, shipbuilding, and heavy industry promotion in technological follower countries (Juhász 2018, Hanlon 2020, Lane 2022). Moreover, Juhász (2018) and Hanlon (2020) examine episodes in which the industry needed to adopt a new technology to remain competitive. As such, they speak to theoretical concerns that sectoral industrial policies may simply boost traditional, cottage industry production methods and in this way undermine the objective of the policy maker (Sauré 2007).

Each paper tackles thorny issues of identification by leveraging the external and more or less exogenous (to the structure of the economy) reasons for deploying the industrial policy. In Juhász's (2018) article, there is no industrial policy lever at all. Instead, the paper relies on the regionally varying level of natural protection that the Napoleonic blockade (1806–1813) against Britain afforded to French cotton spinners. Hanlon (2020) argues that North American shipbuilders were differentially protected from British competition by natural barriers (the inaccessibility of the Great Lakes) and protective policies (that varied across the Atlantic United States and Canada, the latter being part of the British Empire and lacking access to independent policy levers such as tariffs).

Lane (2022) argues that the heavy chemicals and industry (HCI) push materialized because a changing military security environment convinced South Korean leadership that they needed to strive for domestic capabilities in arms construction. Importantly, up to its implementation, no one was willing to fund HCI projects in Korea, including the World Bank, suggesting that few people believed Korea could become competitive in this sector.

Each of these studies finds some support for behavioral responses consistent with the infant industry hypothesis, though with qualifications. In Juhász's (2018) work, French regions that became better protected from trade increased capacity in mechanized cotton spinning during the blockade, and the economic geography of the industry persisted even after the blockade ended. This suggests that temporary protection changed the long-term profitability of production across different regions within France. At the country level, France switched from being a net importer of cotton textiles to being a net exporter, though these effects are not well identified.

Hanlon (2020) finds more mixed results. On the positive side, the study finds that better protected areas of North American shipbuilding transitioned from wood to metal ships in the late nineteenth century. This suggests that protection played a role in technology adoption. However, there is little to suggest that protected North American producers became competitive in global markets, making it unlikely that American producers had a latent comparative advantage in metal ships.

Across a number of different specifications, Lane (2022) finds that targeted sectors increased their output, productivity, and comparative advantage over time, while downstream sectors also benefited through network effects. This study provides the clearest example of an economy drastically shifting its comparative advantage with the use of industrial policy tools.

Each study raises the question of what exactly the underlying mechanisms at work are. Put differently, what is the market failure? All studies appeal to external dynamic learning-by-doing

economies, and many provide extensive historical evidence consistent with this. In follow-up work, Juhász et al. (2023) find empirical support for another channel in the context of the French mechanized cotton spinning industry: costly experimentation across plants about complementary organizational practices. Using detailed plant level data on productivity and organizational practices such as the layout of the factory floor, the study finds that at initial stages of technology adoption, many plants were operating the new technology with extremely low efficiency and a wide array of organizational practices. Over time the industry converged on the best-practice factory layout. This is consistent with work by Giorcelli & Li (2023), who find using plant level data that tacit knowledge was an important component of technology transfer from the Soviets to the Chinese in the mid-twentieth century.

The findings of Juhász et al. (2023) highlight a further important point when evaluating sectoral industrial policy. In particular, their results suggest that, unlike in most simple models, the external economies of scale used to justify infant industry promotion can be costly to attain, with gains and losses very unevenly distributed across firms. In this study, many first-generation cotton mills got certain aspects of experimentation, such as the layout of the factory floor, wrong. These early entrants paid the cost of industry-wide experimentation, while later entrants reaped all the benefits [as in the cost-discovery model of Hausmann & Rodrik (2003)]. This is an important point to keep in mind as the literature moves toward evaluating industrial policies at the micro (firm or plant) level. Depending on the context, evaluating the effect of sectoral industrial policy for individual treated units may make little sense if the costs and benefits of developing the industry are distributed heterogeneously. In these cases, ex post it may look like the policy maker is targeting producers inefficiently, as some targeted firms do not produce with high productivity. This may miss the fact that through their experimentation or mistakes, these low productivity producers actually generate knowledge (positive externalities) for the entire industry.

Alongside the benefits that leveraging natural experiments entail, it is also important to highlight their limitations. In our view, by far their greatest limitation is that because of their highly synthetic nature, they are too abstract to inform policy making in any realistic way. The only exception to this is the HCI drive in South Korea, where a vast array of modern industrial policy levers were deployed: preferential tax policy and financing and low input tariffs for targeted sectors. While not losing sight of careful identification, we believe the literature needs to move toward questions of implementation. The HCI drive in South Korea, for example, was almost certainly exceptionally effective. In a cross-country study of steel industrial policies, Blonigen (2016) finds that the downstream sector's export performance worsens in developing countries, which is the opposite of the result found by Lane (2022). We urgently need more work informing questions of what makes for effective sectoral industrial policies.

A second question the literature needs to grapple with is how to evaluate the efficiency of industrial policy beyond the scope of what reduced-form methods can speak to. While it is clear that such an evaluation needs to be conducted through the lens of a model, it is less clear what aspects of reality the model should focus on. Should we consider the linkage/network effects of a policy, as Lane (2022) highlights? For a strategic industry like shipbuilding, how should we account for the national security benefits? If the United States had embarked on its historic shipbuilding effort during World War II (decades after the study period) without relevant expertise in metal shipbuilding, could they have achieved such astounding levels of production and productivity? How do we think about evaluating industrial policy at the plant or firm level when external economies of scale may be costly to develop and heterogeneously distributed, as discussed by Juhász et al. (2023)? At the end of the day, a researcher will obviously need to trade off parsimony for realism, but careful empirical work should inform modeling choices on a case-by-case basis.

4.5. New Evidence on Public R&D Policies

Among economists, there is fairly widespread consensus that governments should use innovation policy to change incentives on the margin (see Bloom et al. 2019 for a recent discussion). These microinnovation policies contrast with more ambitious and less well-understood public R&D policies that focus on particular technologies or places. These large-scale policies are different from the microinnovation policies both in the scale of spending involved and in the extent of government activism they entail in choosing which activities to promote. Such programs are also more ambitious in targeting transformational outcomes. While long out of fashion among most economists, these moonshot or mission-oriented policies have made a recent comeback. The productivity slowdown among advanced economies, increased regional inequalities in these same countries, and the climate crisis have led some to argue that the government needs to embrace innovation policies that do more than simply alter incentives on the margin (Mazzucato 2014, 2021; Gruber & Johnson 2019).

Two recent, highly timely papers (Gross & Sampat 2023, Kantor & Whalley 2023) show that this type of public R&D may have fairly large effects locally and, more suggestively, also at the aggregate level. Both papers examine canonical episodes of applied public R&D moonshots: the US government's massive R&D effort during World War II and the US Apollo mission in the 1960s that culminated in the moon landing. In both cases, the level of public investment was massive. For example, NASA received 0.7% of GDP in the mid-1960s (Kantor & Whalley 2023), and the government was actively involved in picking which technologies would receive support (e.g., radar technology, mass-produced penicillin, or the guidance computer for the lunar landing module).

In terms of identification, both papers' research design builds on the fact that the public R&D windfall was exogenous to previous aggregate technology trends. The papers then compare local outcomes between places more and less treated by these public R&D windfalls. Gross & Sampat (2023) find that public R&D shaped the geographic pattern of innovation in the United States for decades after the postwar period. Suggestive of some form of aggregate effects, the authors also show that the long-term direction of US innovation shifted toward electronics and communications. Kantor & Whalley (2023) find positive effects on local manufacturing value added, both during and after the Apollo mission.

These papers raise the question of what drives the positive effects, and particularly the large positive effects in Gross & Sampat's (2023) paper. Partly, this could be due to displacement (as opposed to growth) effects,[9] though Kantor & Whalley (2023) account for many forms of possible spillovers and continue to find large effects. It may be that public R&D creates technological spillovers into the private sector. This is in line with other recent work that has found large and broad-based technology spillovers from (typically smaller-scale) public R&D into the private sector (Azoulay et al. 2019, Moretti et al. 2019, Myers & Lanahan 2022).

However, another possible reason is that places were not targeted at random but rather based on their perceived ability to succeed. Indeed, Kantor & Whalley (2023) show that NASA targeted spending toward locations that already specialized in pre-Sputnik space technology. Gross & Sampat (2023) find that the entire long-run effect is driven by 5% of clusters that were most innovative in 1930 (prior to receiving the government contracts). In this regard, it is interesting to contrast these findings with those of Schweiger et al. (2022), who study a similar R&D policy in Soviet Russia, but one in which a subset of the treated locations were built from scratch in

[9]Readers are referred to Redding & Turner (2015) for a discussion of displacement and growth effects in spatial settings.

sparsely populated areas. Similar to the previous papers, this study also finds effects on innovation, productivity, skill composition, and wages, often lasting to the present day.

While more work is certainly needed in this area, the findings from this literature suggest that public R&D may have a place in the policy makers' tool kit. However, a lingering question with much of the current work is its limited ability to speak to economy-wide counterfactuals. Moreover, it is not clear if public R&D policies would have similar effects in normal times. Yet another explanation for the positive effects of the Apollo mission is that the space race engendered superhuman efforts from those involved (Mazzucato 2021)—an aspect that would be difficult to sustain consistently. Finally, the fact that Gross & Sampat (2023) find long-lasting effects only for the most productive of an already highly selected set of initial locations is a sobering insight for initiatives that envisage similar public R&D investment in less auspicious locations today (Gruber & Johnson 2019). These open questions aside, it seems that careful, systematic work is casting doubt on many long-held assertions that have not previously been put to the empirical test. In times of national crisis, the US government seemed capable of picking technologies, places, and firms that could deliver the desired outcomes, often with long-lasting positive local effects.

4.6. New Evidence on Place-Based Industrial Policy

Increasing regional inequality and the persistence of economic distress in space have led to a resurgence of interest in place-based industrial policies. Broadly speaking, place-based policies target particular areas with the goal of improving economic conditions in that area along some margins. Here, we focus on place-based industrial policies that are targeted at places, but in a selective way.[10] Typically, this means trying to boost manufacturing activity in lagging regions or, similarly, to alleviate the decline of manufacturing in a distressed region. A number of recent papers use credible identification strategies to evaluate the effects of these place-based industrial policies.

Mitrunen (2021) and Garin & Rothbaum (2022) both use historical natural experiments to examine the effects of public industrial investment on local outcomes. Garin & Rothbaum (2022) exploit the extraordinary industrial mobilization undertaken in the United States during World War II. In particular, they use the fact that where private firms could not be subsidized to undertake investment, the US government built plants from scratch in places outside of established manufacturing hubs. In contrast, Mitrunen (2021) studies the effects of Finnish war reparations paid in kind to the Soviet Union in the twentieth century. They forced Finland to embark on a drastic switch into complex metalworking products (ships, locomotives, cables, and engines), skill-intensive industries in which the country had little prior experience.

Both papers find sizable effects on long-run measures of industrial development. Strikingly, Garin & Rothbaum (2022) find that the local effect on manufacturing employment is not only large but also highly persistent, lasting into the twenty-first century. Likewise, Mitrunen (2021) finds that treated municipalities experienced broad-based structural transformation, expanding into industries upstream and downstream of the initially treated sectors.

The historical nature of these episodes allows the researchers to examine the intergenerational effects of treatment. Both studies find that children living in treated areas before treatment experienced upward economic mobility later in life, though through different mechanisms. Garin & Rothbaum (2022) find that this is likely driven by the fact that children living in treated areas had access to high-paying manufacturing jobs in their own community later in life. In contrast, Mitrunen (2021) finds that the effects were primarily driven by increased educational attainment.

[10]The literature on place-based policy in general is well-surveyed (Kline & Moretti 2014, Neumark & Simpson 2015, Duranton & Venables 2019) and beyond the scope of our discussion.

A key strength of these historical natural experiments is their strong claim to credible identification. However, in recent years, this literature has also seen the emergence of papers that evaluate the second layer of treatment: implementation, alongside a credible identification strategy. A number of recent papers (Criscuolo et al. 2019, Cingano et al. 2022, Incoronato & Lattanzio 2023) leverage quasi-random variation in which places and firms received investment subsidies in economically distressed or lagging areas of the United Kingdom and Italy. In the United Kingdom, Criscuolo et al. 2019 find that the policy targeting economically distressed areas was effective in increasing jobs and reducing unemployment, but it had no effect on TFP, and the effect operated solely through small firms. Similarly, in Italy, Cingano et al. 2022 find that a similar policy had a positive effect on job creation, increasing employment by 17% over a 6-year period.

Incoronato & Lattanzio 2023 study the long-run effects of a decades-long Italian policy which was aimed at jump-starting development in the South. Strikingly, the authors find not only that the policy succeeded in creating increased agglomeration of workers and firms locally in the long run, as intended, but also that the effect increased after the policy was terminated. This was because the growth of high-skill manufacturing created demand for knowledge-intensive local services. Echoing the findings from the recent literature on public R&D, the authors show suggestive evidence that this is likely due to the fact that treated areas were high-potential locations within the South. Again, this should temper our expectations for the potential to achieve similar outcomes in more peripheral places.

While all the papers discussed above test for displacement effects in neighboring geographies (and typically find that they are negligible), LaPoint & Sakabe (2021) show evidence for leakages through a distinct channel: multiplant firms. The authors examine Japan's Technopolis program in the 1980s, which had the goal of promoting high-tech manufacturing outside of the main metropolises through a bonus depreciation. Similar to other work, the authors find that the policy was successful at generating both investment and employment growth in treated areas. However, the authors also find that for multiplant firms with a plant in a treated area, the employment response was over six times larger for plants in untreated regions relative to the treated plants.

The findings from these recent papers highlight a few important points. Most significantly, there is evidence that place-based industrial policies can shift the composition of local economic outcomes both in lagging and declining areas, consistent with the desires of the policy maker. Importantly, as the goal of these policies is to improve outcomes for those living in these areas, a particularly striking finding is the increase in upward mobility for children that grew up in treated areas. While a full general equilibrium analysis of the effects is outside the scope of these papers, many show that there is little evidence of displacement effects in neighboring locations. In contrast, however, some papers do show that one margin through which leakages occur is through multiplant firms. This suggests that looking for (positive or negative) spillovers in nearby places may be insufficient when testing for displacement effects.

5. INDUSTRIAL POLICY AND THE EAST ASIAN MIRACLE: NEW EMPIRICS

The East Asian miracle is one of the most important episodes of modern economic development and the focal point of debates surrounding industrial policy. The miracle economies, such as Hong Kong, Singapore, South Korea, Taiwan, and, earlier, Japan, experienced rapid structural transformation and joined the club of high-income economies. Given the ubiquity of industrial policy across postwar Asia, what role did industrial policy play? Within economics, the episode remains controversial, and one with remarkably little empirical research that meets the standards of contemporary economics. New research, however, is changing this picture. This section reviews how

contemporary empirical work is updating our view of industrial policy, considering the empirical issues highlighted in Section 4.

The new empirical explorations of the East Asian miracle paint a more varied landscape. This emerging picture is more precise, granular, and pragmatic than the one drawn by first-generation empirical work. East Asia is a heterogeneous region, from city polities, such as Singapore, to countries with robust domestic markets, like Japan. Strategies varied too, from the focus on macrostability and entrepôt trade of Hong Kong to the dirigisme of South Korea under General Park Chung-hee. Even among the developmental states, industrial policies were varied (Vittas & Cho 1996). South Korea and Taiwan are often mentioned in the same breath, yet the favored policy instrument was credit subsidies in the first case and tax incentives in the second. Given such diversity in experiences, one quickly runs into difficulty when trying to generalize, unconditionally, the policy experience of the region. Recent empirical work has attempted to make sense of this experience by using higher-resolution data and making use of deep institutional details.

Consider the case of South Korea's HCI drive, a landmark (and controversial) industrial policy pursued by President Park Chung-hee's military autocracy. New research has updated earlier, pessimistic perceptions of this push (Yoo 1990, Lee 1996). Lane (2022) was the first to use the HCI episode as a natural experiment to consider the impact of the bundle of HCI policies on South Korean industrial development. Using variation from the episode, he found that these policies increased short- and long-run growth in treated HCI industries—effects that seemed to persist and weakly improved TFP. Lane also finds support for the role of industrial policy in shifting the comparative advantage of HCI industry.

Follow-up work using the HCI natural experiment adds richness to our understanding of this episode. Using administrative data, Lee et al. (2002) find similar patterns for plant growth and output but make a plausible argument that the policy contributed to misallocation and may have changed the network structure of the economy by making HCI sectors more central. Choi & Levchenko (2023) take a slightly different approach, emphasizing the impact of foreign investment. The authors find a positive impact of the HCI policy on industrial development and considerable long-run welfare gains through the lens of a quantitative model. These studies all update our understanding of the controversial episode.

The early work on East Asia argued that industrial policies failed to target the appropriate sectors, as governments did not possess the information required to target market failures (Pack & Saggi 2006). Yet more recent research by Liu (2019) formally explores this issue, using a model network economy populated by imperfections. In such a setting, where would a planner without complete knowledge optimally target industrial policy interventions? Liu's analysis shows that optimal sectors to target are those where imperfections are most consequential given their impact through input-output linkages. Accordingly, Liu provides a theoretically motivated sufficient statistic, "distortion centrality," which conveys the extent of misallocation associated with each sector and provides a potential guide for policy making. Importantly, he shows that the policies used in China and South Korea's HCI drive (from Lane 2022) correspond to sectors with high distortion centrality.[11] Thus, Liu demonstrates that, far from having to possess perfect knowledge of market failures, distortion centrality corresponds to observable features of the input-output network. Related work on R&D networks by Liu & Ma (2023) provides a measure of "innovation centrality" by considering the spillovers associated with innovation. Interestingly, Liu & Ma find that Japan has the most efficient allocation of R&D, superior to the one in the United

[11] These economies have hierarchical production networks, which make this calculation feasible.

States. Similar work, like König et al.'s (2019), has considered how subtle network features and competitive behavior could inform optimal R&D policy.

Such research demonstrates that we should be cautious of early empirical tests of how well policies aligned with market failures. Optimal targeting in networks may look a lot different from the arbitrary criteria chosen by the econometrician—for example, the largest sectors or those with the highest number of links. Likewise, early tests of optimal targeting that consider the correlation between policy and static economies of scale may be similarly incomplete, especially where classic theories of optimal policy also consider targeting dynamic economies of scale (Corden 1997).[12]

There are other, important reasons explaining why early studies uncovered a negative relationship between East Asian industrial policy and sectoral performance. For example, institutional features of the Japanese industrial policy system explain this negative relationship. Alongside promoting infant sunrise industry, scholars have long noted that Japanese policies dedicated large resources to assist declining or sunset industry (Saxonhouse 1979, Teranishi 1986). Empirical research will likely have to consider the objectives of policies and deploy higher-resolution data on policy levers. Institutional details not only help interpret earlier episodes but also help parse and contextualize recent ones, like China and Vietnam. For instance, FDI is an essential feature of both Chinese and Vietnamese industrial policy, and one that is distinct from its East Asian predecessors (Huang 2000, Ye 2009). While postwar Korea, and in particular Japan, carefully controlled foreign-directed credit, aspects of the Chinese political economy made FDI an integral tool (Thun 2004). On one hand, the lingering prominence of state-owned enterprise in China and Vietnam may make it difficult to directly map the lesson from policies centered on state-owned enterprises to other economies. The incentive issues, social objectives, and environments surrounding such policies may be quite different from those of most capitalist economies. On the other hand, the region's use of FDI as industrial policy may offer more generalizable insights for developing economies.

The automobile sector exemplifies FDI as a tool of Chinese industrial policy (Thun 2006). Bai et al. (2022) explore the impact of Chinese quid-pro-quo FDI policies, which require foreign producers to enter joint ventures with Chinese automakers to produce and sell cars domestically. Spillovers from FDI to domestic markets are a critical rationale for these policies. The authors' results point to knowledge spillovers from foreign joint ventures to local affiliates, and these effects take time to manifest, which is evidence of learning. These spillovers are driven by worker flows (e.g., from joint ventures to affiliated domestic firms) and are embodied in high-quality, shared components. Through the lens of a model, the authors estimate that, relative to unrestricted FDI, quid pro quo improved the quality of affiliated domestic models by 3.8–12.7% and raised their sales by 0.9–3.9% between 2007 and 2014.

In general, the literature on Chinese industrial policy is scant relative to its scale and notoriety, though recent papers have made some headway. Aghion et al. (2015) use firm-level data to consider the relationship between Chinese industrial policies and the level of competition within industries. They find that subsidies and tax holidays promote productivity when directed at more competitive industries; tariffs and loans do not. These results point to important potential lessons in policy design. Careful work on Chinese shipbuilding by Barwick et al. (2019) specifically considers the nuances of industrial policy design. Barwick and colleagues show that not all policy levers were efficacious in promoting Chinese shipbuilding. They find that production subsidies and investment subsidies were relatively effective. Meanwhile, entry subsidies lead to inefficiencies, and policies targeted toward more productive firms would have likely been more beneficial.

[12] Work by Pons-Benaiges (2017) considers evidence that sectors with dynamic learning economies in Japan may be different from sectors with static economies of scale during the miracle period.

East Asian policies were a hint of development policy to come. Along with scholars of South Korea, Lane (2022) notes that throughout South Korea's miracle, even during its most interventionist period, formal measures of effective protection were decreasing. Japan liberalized as it joined the General Agreement on Tariffs and Trade (GATT) in the 1960s and, eventually, the OECD in the 1970s. However, industrial policies never (fully) went away; rather, they evolved with the globalizing world. The importance of export and trade facilitation among East Asian tigers echoes the preponderance of export-oriented policies discussed in Section 3 and of trade finance (Juhász et al. 2022). Understanding how East Asian miracle economies were able to pull off such astounding increases in exports may hold lessons for other countries (see Barteska & Lee 2023 for a recent contribution on the role of bureaucratic capacity). In addition, the governance mechanisms behind East Asia's industrial policies were not so different from today's successful examples. Rather than being idiosyncratic and exotic, the region's experience calls for a broadly strategic and dynamic approach to the practice of industrial policy and, as we show in the next section, informs us about the direction of future policy.

6. NEW THINKING ON (AND CONTEXT OF) INDUSTRIAL POLICY

In recent years, industrial policy has also been transformed by the demands of a new economy. Manufacturing still occupies center stage in many government initiatives (as in creating local supply chains and promoting advanced manufacturing). However, digitalization, the green transition, the middle-class squeeze (and the associated good-jobs challenge), and geopolitical imperatives have multiplied the objectives that industrial policy is tasked with. This creates inevitable tensions and trade-offs. For example, requiring domestic content in supply chains to spur local economic development makes green investments more costly. Subsidizing advanced semiconductor manufacturing—which is highly capital- and skill-intensive—may be what is required for geopolitical competition with China, but it is not an effective way of generating good jobs where they are most needed. Multiple goals require multiple instruments, a lesson that many governments have yet to internalize. They also require thinking of industrial policies in ways that are somewhat different from what economists are accustomed to.

6.1. Iterative Public–Private Collaboration Versus Top-Down Regulation

The image that economists have of industrial policy goes something like this: A group of bureaucrats (*a*) design some incentives that favored activities or sectors are to receive (e.g., export subsidies, import protection, cheap credit, etc.) and (*b*) select the sectors and activities that are to be incentivized in this fashion. They may then formulate some additional rules regarding what kind of firms qualify for the incentives, the specific firm actions or performance criteria on which the incentives are conditioned, and the consequences (or penalties) for nonperformance. Ideally, the bureaucrats keep firms at arm's length throughout the process and thereafter to provide them with insulation against political manipulation and rent seeking. East Asian governments are supposed to have done an especially good job at disciplining private firms, and they serve as the example to emulate (though economists remain generally skeptical that this is possible outside the context of a few East Asian countries).

However, this description of the hard, insulated state does not quite do justice to the reality of East Asian industrial policy. As the sociologist Peter Evans (1995) has argued, successful East Asian governments like South Korea combined autonomy from private interest groups with "embeddedness" in social ties that provided "institutionalized channels for the continual negotiation and renegotiation of goals and policies" (Evans 1995, p. 12). "A state that was only autonomous," Evans wrote, "would lack both sources of intelligence and the ability to rely on decentralized private implementation" (Evans 1995, p. 12). Evans called this system embedded autonomy and

wrote that South Korea exemplified it. Economists might worry that such close relationships with private firms could have made the government more prone to capture, but Evans argued that these links were essential to ensure that governments had access to the information needed to design workable policies, could adjust to changing circumstances, and would prod firms along new technological trajectories in the most effective ways possible. The difference with India and Brazil—the other, less successful cases Evans analyzed—was less in the formal aspects of the policies (the tariffs or subsidies) and more in the manner in which this cooperative relation was managed dynamically over time.

Evans's discussion highlights that embeddedness can be as important as autonomy to successful industrial policy. Following Wright (1996), this argument can be summarized in the form of a 2 × 2 matrix where state characteristics can vary along both dimensions (Mazzucato & Rodrik 2023). The Weberian ideal of an autonomous, competent state engaged in top-down regulation combines high autonomy with low embeddedness. The mirror opposite is the clientelist state, with low autonomy but high embeddedness. The predatory state has neither autonomy nor embeddedness, while the developmental state combines both attributes.

At first sight, embedded autonomy might appear to be a feature of East Asian states that other countries have been unable to emulate, but there are many examples from other settings that suggest this is not the case.

One of the most successful cases of industrial policy in advanced countries is the Advanced Research Project Agency (ARPA) model of the United States, which operates along lines quite similar to embedded autonomy. (In the ARPA language, the approach is called active program management.) The model originates with DARPA, the Defense Advanced Research Projects Agency, which was set up in the late 1950s to counter a perceived lag in missile technology vis-à-vis the Soviet Union. As the name implies, DARPA's focus was on promoting defense-related frontier technologies, though this mission has been interpreted very broadly. The agency has played a key role in the development of some breakthrough technologies such as the Internet, Global Positioning System (GPS), and Graphical User Interface (GUI), which have transformed the economy. The model has been subsequently emulated at smaller scale in energy (ARPA-E, set up in 2009) and health sciences (ARPA-H, set up in 2022).

The central figure in the ARPA model is the program director, who is not a career government official, but a professional from academia or industry who is recruited for a 3-year term. The program director works in a designated area and selects a portfolio of projects to support with grants. The selection process and the associated performance milestones are designed following intense consultations and workshops involving the program director and the relevant stakeholders of researchers and firms. The program director works closely with the grantees as the projects unfold, reviewing and revising targets as needed. Performance criteria are coupled with a considerable amount of flexibility. Specific milestones, like much else in these programs, are provisional: They are added or deleted in nearly half of the projects. Similarly, budgets can be expanded or decreased in light of project developments. In short, the model is based on continuous iterative collaboration with the private sector and is quite different from the hands-off, arm's length, strict ex-ante-rules regulatory approach favored by economists (Azoulay et al. 2018, Rodrik & Sabel 2022; see also Sabel & Victor 2022 for a general discussion of what the authors call experimental governance in the domain of green technologies).

For a different example of industrial policy from another part of the world but with many of the same features, consider the Mesas Ejecutivas of Peru. These were a system of sectoral roundtables established during the mid-2010s by Peru's then Economy Minister Piero Ghezzi to enhance productivity in selected sectors. The sectors included forestry, aquaculture, creative industries, textiles, logistics, and agricultural exports (Ghezzi 2017). The objective of the roundtables was to

institutionalize public–private dialog aimed at addressing coordination failures among firms and between the firms and the government, and thereby encourage productivity-increasing investments. The roundtables started as open-ended conversations to share information and uncover constraints. Instead of lengthy industry reports, the focus was on developing an initial list of blockages or obstacles to productivity and of means of removing them, to be revised as needed as more knowledge was acquired in the process. The responsibilities for action were divided into separate categories of "my problems" and "your problems." The former category refers to government responsibilities (e.g., removing red tape for exports or establishing a national phytosanitary agency); the latter refers to firms' actions (e.g., making specific investments in quality upgrading). When removing identified constraints required action on the part of higher-level government bodies, the matter was bumped up to interministerial or presidential levels.

Not all sectoral roundtables were effective or successful, but where they did work, as in forestry, they did lead to some policy action and private sector buy-in. An important feature of the conversations was that the focus was on solving coordination failures and providing public inputs; subsidies and other types of financial incentives were generally off the table. This helped firms concentrate directly on productivity rather than receiving handouts from the government.

6.2. Customized Public Services and Inputs Versus Subsidies

This focus on specific constraints and productivity-enhancing public inputs instead of subsidies is another important feature of modern industrial policies. In the United States, this approach is best exemplified in the work of Tim Bartik, who has carried out extensive analyses of local economic development policies geared toward job creation (Bartik 2019, 2020, 2022). State and local governments spend large amounts of resources annually in the form of tax credits, often competing with each other, to attract firms, establish industrial clusters, and create employment opportunities (Slattery & Zidar 2020). While these subsidies generally lead to increased jobs, they do so at large fiscal cost. Bartik has argued that it would be far more effective to provide current and prospective investors with customized business services and inputs rather than subsidies. He estimates that public spending on infrastructure, manufacturing extension, specialized training, and brownfield development creates new jobs at a fraction of the cost. For example, customized job training and manufacturing extension services cost $34,000 per new job, compared to $196,000 per job for tax incentives (Bartik 2020). Yet total spending on tax and other financial subsidies are in the range of $50 billion per year compared to roughly $1 billion in total for manufacturing extension and customized training.

An additional advantage of customized public inputs is that they directly target shortcomings in the local business environment. Hence they are productivity enhancing in addition to employment creating. But this makes it imperative that these inputs be adequately geared to the real needs of existing businesses or likely investors. Otherwise the resources could be wasted, as it so often happens, for example, with generic training or infrastructure investments. This makes the kind of dynamic public–private dialog and information exchange we have discussed a critical component of this type of industrial policy.

6.3. Manufacturing Versus Services

Industrial policy has traditionally focused on manufacturing, as the name indicates. However, the economic rationales for industrial policy—externalities, coordination failures, specialized public inputs—are general and do not apply only to manufacturing industries per se. Moreover, manufacturing's importance in the economy has generally shrunk in all advanced countries, when computed at current prices. Employment deindustrialization has been even starker: in the United

States, the share of manufacturing in total employment now stands below 10%. A reduction in the share of manufacturing employment has been a common feature of all advanced economies, even those (such as Germany, South Korea, and Taiwan) that have maintained globally competitive manufacturing sectors. As manufacturing technologies have become more capital and skill intensive and global competition has intensified, lower-income countries have also found it difficult to grow their manufacturing industries, experiencing premature deindustrialization (Rodrik 2016).

One consequence is that governments are likely to look beyond manufacturing as they consider productivity-enhancing industrial policies in the future. This is especially the case when the focus is on good jobs—that is, those that act as career ladders into the middle class (Rodrik 2022). It is almost a statistical certainty that the bulk of such jobs will have to be generated in services. So the question becomes whether the productive development policies typically applied to manufacturing can also be appropriate for sectors such as retail, hospitality, education, health care, or long-term care. There is very little experience and evidence on the benefits of sectoral policy in these areas [work by Manelici & Pantea (2021) is a notable exception]. However, good-jobs externalities are rampant in such services, and we know that these activities can benefit from complementary investments in new work practices, job-specific training, technologies that complement and empower workers, better-tailored regulations, and improved organizational culture. Public–private initiatives that promote such investments can enhance labor productivity, enabling the provision of better jobs (see Rodrik 2022 for further discussion and examples).

In sum, the actual practice of industrial policy looks quite different from the way economists have traditionally conceptualized it. It entails dynamic, iterative collaboration between the government and firms in the pursuit of a more diffuse set of goals. We summarize in **Table 1** the main differences between these traditional and modern conceptions of industrial policy.

Table 1 Traditional and new industrial policies

	Traditional industrial policy	New industrial policy
Market failures targeted	R&D, innovation, learning externalities; coordination failures in investment	Traditional market failures plus good-jobs externalities, direction of innovation, and missing public inputs
Sectors	Manufacturing, tradable sectors	Services in addition to manufacturing
Firms	Large, globally competitive firms	All sizes of firms, including small and medium-sized enterprises
Assumptions about the government	Government can identify market failures ex ante and is sufficiently insulated from capture	Knowledge about location and magnitude of market failures is widely dispersed; government faces substantial uncertainty; state capacity is endogenous
Types of incentives	Tax, credit subsidies	A portfolio of business services, including marketing, management and tech assistance, customized training, infrastructure, and seed capital/loans for directed technologies
Application of incentives	Fixed schedule of incentives, except for incentive packages for large firms that may be negotiated	Customized to firms' needs and adapted to context
Selection criteria	Prespecified	Voluntary buy-in and participation
Conditionality	Hard; rigid ex-ante criteria	Soft; provisional, open-ended, and evolving
Relationship with recipients	Arm's length	Collaborative, iterative; active project management

Source: Rodrik (2022).

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

ACKNOWLEDGMENTS

We thank Jessica De Simone for her expert editorial assistance. A lengthier version of this article, with a more complete set of references, is available at **https://drodrik.scholar.harvard.edu/publications/new-economics-industrial-policy**.

LITERATURE CITED

Aghion P, Cai J, Dewatripont M, Du L, Harrison A, Legros P. 2015. Industrial policy and competition. *Am. Econ. J. Macroecon.* 7(4):1–32

Angrist JD, Pischke J-S. 2010. The credibility revolution in empirical economics: how better research design is taking the con out of econometrics. *J. Econ. Perspect.* 24(2):3–30

Azoulay P, Fuchs E, Goldstein A, Kearney M. 2018. *Funding breakthrough research: promises and challenges of the "ARPA model."* NBER Work. Pap. 24674

Azoulay P, Graff Zivin JS, Li D, Sampat BN. 2019. Public R&D investments and private-sector patenting: evidence from NIH funding rules. *Rev. Econ. Stud.* 86(1):117–52

Bai J, Barwick P, Cao S, Li S. 2022. *Quid pro quo, knowledge spillover and industrial quality upgrading*. NBER Work. Pap. 27644

Barteska P, Lee JE. 2023. *Bureaucrats and the Korean export miracle*. Unpublished manuscript

Bartelme D, Costinot A, Donaldson D, Rodríguez-Clare A. 2019. *The textbook case for industrial policy: theory meets data*. NBER Work. Pap. 26193

Bartik T. 2019. *Should place-based jobs policies be used to help distressed communities?* Work. Pap. 19-308, W.E. Upjohn Inst. Employ. Res., Kalamazoo, MI

Bartik T. 2020. *Bringing jobs to people: improving local economic development policies*. Work. Pap., Aspen Inst., Washington, DC

Bartik T. 2022. *How state governments can target job opportunities to distressed places*. Tech. Rep. 22-044, W.E. Upjohn Inst. Employ. Res., Kalamazoo, MI

Barwick PJ, Kalouptsidi M, Zahur NB. 2019. *China's industrial policy: an empirical evaluation*. NBER Work. Pap. 26075

Beason R, Weinstein DE. 1996. Growth, economies of scale, and targeting in Japan (1955–1990). *Rev. Econ. Stat.* 78(2):286–95

Blonigen BA. 2016. Industrial policy and downstream export performance. *Econ. J.* 126(595):1635–59

Bloom N, Van Reenen J, Williams H. 2019. A toolkit of policies to promote innovation. *J. Econ. Perspect.* 33(3):163–84

Broda C, Limao N, Weinstein DE. 2008. Optimal tariffs and market power: the evidence. *Am. Econ. Rev.* 98(5):2032–65

Cagé J, Gadenne L. 2018. Tax revenues and the fiscal cost of trade liberalization, 1792–2006. *Explor. Econ. Hist.* 70:1–24

Choi J, Levchenko AA. 2023. *The long-term effects of industrial policy*. NBER Work. Pap. 29263

Cingano F, Palomba F, Pinotti P, Rettore E. 2022. *Making subsidies work: rules versus discretion*. IZA Discuss. Pap. 15172, Inst. Labor Econ., Bonn, Ger.

Corden WM. 1997. *Trade Policy and Economic Welfare*. Oxford, UK: Oxford Univ. Press

Criscuolo C, Lalanne G, Díaz L. 2022. *Quantifying industrial strategies (QuIS): measuring industrial policy expenditures*. Pap., Organ. Econ. Coop. Dev., Paris

Criscuolo C, Martin R, Overman HG, Van Reenen J. 2019. Some causal effects of an industrial policy. *Am. Econ. Rev.* 109(1):48–85

DiPippo G, Mazzocco I, Kennedy S, Goodman MP. 2022. *Red ink: estimating Chinese industrial policy spending in comparative perspective*. Rep., Cent. Strateg. Int. Stud., Washington, DC

Duranton G, Venables AJ. 2019. *Place-based policies: principles and developing country applications*. Econ. Ser. Work. Pap. 893, Univ. Oxford, Oxford, UK
Evans PB. 1995. *Embedded Autonomy: States and Industrial Transformation*. Princeton, NJ: Princeton Univ. Press
Evenett SJ. 2009. Global trade alert: motivation and launch. *World Trade Rev.* 8(4):607–9
Fernández-Arias E, Sabel C, Stein EH, Trejos A. 2016. *Two to Tango: Public-Private Collaboration for Productive Development Policies*. Washington, DC: Inter-Am. Dev. Bank
Garin A, Rothbaum J. 2022. *The long-run impacts of public industrial investment on regional development and economic mobility: evidence from World War II*. Unpublished manuscript
Ghezzi P. 2017. Mesas ejecutivas in Peru: lessons for productive development policies. *Glob. Policy* 8(3):369–80
Giorcelli M, Li B. 2023. *Technology transfer and early industrial development: evidence from the Sino-Soviet alliance*. NBER Work. Pap. 29455
Goldberg PK, Maggi G. 1999. Protection for sale: an empirical investigation. *Am. Econ. Rev.* 89(5):1135–55
Goldberg PK, Pavcnik N. 2016. The effects of trade policy. In *Handbook of Commercial Policy*, Vol. 1, ed. K Bagwell, RW Staiger, pp. 161–206. Amsterdam: Elsevier
Gross DP, Sampat BN. 2023. *America, jump-started: World War II R&D and the takeoff of the U.S. innovation system*. NBER Work. Pap. 27375
Gruber J, Johnson S. 2019. *Jump-Starting America: How Breakthrough Science Can Revive Economic Growth and the American Dream*. New York: Public Aff.
Hanlon WW. 2020. The persistent effect of temporary input cost advantages in shipbuilding, 1850 to 1911. *J. Eur. Econ. Assoc.* 18(6):3173–209
Hanson G, Rodrik D. 2024. *How does place based policy work? Reimagining the Economy Program*. Pap., Harvard Kennedy Sch., Cambridge, MA
Harding T, Javorcik BS, Maggioni D. 2019. *FDI promotion and comparative advantage*. Unpublished manuscript
Harrison A, Rodríguez-Clare A. 2010. Trade, foreign investment, and industrial policy for developing countries. In *Handbook of Development Economics*, Vol. 5, ed. D Rodrik, M Rosenzweig, pp. 4093–214. Amsterdam: Elsevier
Harrison AAE. 1994. An empirical test of the infant industry argument: comment. *Am. Econ. Rev.* 84(4):1090–95
Hausmann R, Rodrik D. 2003. Economic development as self-discovery. *J. Dev. Econ.* 72:603–33
Hausmann R, Rodrik D. 2006. *Doomed to choose: industrial policy as predicament*. Work. Pap., John F. Kennedy Sch. Gov., Harvard Univ., Cambridge, MA
Heid B, Larch M, Yotov YV. 2021. Estimating the effects of non-discriminatory trade policies within structural gravity models. *Can. J. Econ. Rev. Can. Econ.* 54(1):376–409
Herman PR. 2022. A pragmatic approach to estimating nondiscriminatory non-tariff trade costs. *Rev. Int. Econ.* 30(4):1258–87
Huang Y. 2000. An institutional and policy approach to the demand for foreign direct investment in China. *China Rev.* 2000:249–84
Incoronato L, Lattanzio S. 2023. *Place-based industrial policies and local agglomeration in the long-run*. Unpublished manuscript
Itskhoki O, Moll B. 2019. Optimal development policies with financial frictions. *Econometrica* 87(1):139–73
Johnson C. 1982. *MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925–1975*. Stanford, CA: Stanford Univ. Press
Juhász R. 2018. Temporary protection and technology adoption: evidence from the Napoleonic blockade. *Am. Econ. Rev.* 108(11):3339–76
Juhász R, Lane N, Oehlsen E, Pérez VC. 2022. The who, what, when, and how of industrial policy: a text-based approach. SocArXiv, Aug. 25
Juhász R, Squicciarini M, Voigtländer N. 2023. *Technology adoption and productivity growth: evidence from industrialization in France*. NBER Work. Pap. 27503
Juhász R, Steinwender C. 2024. Industrial policy and the great divergence. *Annu. Rev. Econ.* 16:27–54
Kalouptsidi M. 2018. Detection and impact of industrial subsidies: the case of Chinese shipbuilding. *Rev. Econ. Stud.* 85(2):1111–58
Kantor S, Whalley AT. 2023. *Moonshot: public R&D and growth*. NBER Work. Pap. 31471

Kline P, Moretti E. 2014. People, places, and public policy: some simple welfare economics of local economic development programs. *Annu. Rev. Econ.* 6:629–62
König MD, Liu X, Zenou Y. 2019. R&D networks: theory, empirics, and policy implications. *Rev. Econ. Stat.* 101(3):476–91
Krueger AO, Tuncer B. 1982. An empirical test of the infant industry argument. *Am. Econ. Rev.* 72(5):1142–52
Lane N. 2020. The new empirics of industrial policy. *J. Ind. Compet. Trade* 20(2):209–34
Lane N. 2022. *Manufacturing revolutions: industrial policy and industrialization in South Korea*. CSAE Work. Pap. Ser., Cent. Stud. Afr. Econ., Univ. Oxford, Oxford, UK
LaPoint C, Sakabe S. 2021. *Place-based policies and the geography of corporate investment*. Unpublished manuscript
Lashkaripour A, Lugovskyy V. 2023. *Profits, scale economies, and the gains from trade and industrial policy*. Unpublished manuscript
Lawrence RZ, Weinstein DE. 2001. Trade and growth: import led or export led? Evidence from Japan and Korea. In *Rethinking the East Asian Miracle*, ed. JE Stiglitz, S Yusuf, pp. 379–408. Oxford: Oxford Univ. Press
Lee J-W. 1996. Government interventions and economic growth. *J. Econ. Growth* 1(3):391–414
Lee K, Hahn D, Lin J. 2002. Is China following the East Asian model? A "comparative institutional analysis" perspective. *China Rev.* 2(1):85–120
Liu E. 2019. Industrial policies in production networks. *Q. J. Econ.* 134(4):1883–948
Liu E, Ma S. 2023. *Innovation networks and R&D allocation*. NBER Work. Pap. 29607
Manelici I, Pantea S. 2021. Industrial policy at work: evidence from Romania's income tax break for workers in IT. *Eur. Econ. Rev.* 133:103674
Mazzucato M. 2014. *The Entrepreneurial State: Debunking Public Versus Private Sector Myths*. New York: Anthem Press. Rev. ed.
Mazzucato M. 2021. *Mission Economy: A Moonshot Guide to Changing Capitalism*. New York: Harper Bus.
Mazzucato M, Rodrik D. 2023. *Industrial policy with conditionality: a taxonomy and sample cases*. Work. Pap. 2023/07, Inst. Innov. Public Purp., Univ. College Lond., London
Mitrunen M. 2021. *Industrial policy, structural change and intergenerational mobility: evidence from the Finnish war reparations*. Unpublished manuscript
Moretti E, Steinwender C, Van Reenen J. 2019. *The intellectual spoils of war? Defense R&D, productivity and international technology spillovers*. NBER Work. Pap. 26483
Myers KR, Lanahan L. 2022. Estimating spillovers from publicly funded R&D: evidence from the US department of energy. *Am. Econ. Rev.* 112(7):2393–423
Neumark D, Simpson H. 2015. Place-based policies. In *Handbook of Regional and Urban Economics*, Vol. 5, ed. G Duranton, JV Henderson, WC Strange, pp. 1197–287. Amsterdam: Elsevier
Pack H, Saggi K. 2006. Is there a case for industrial policy? A critical survey. *World Bank Res. Obs.* 21(2):267–97
Pons-Benaiges O. 2017. *Did government intervention target technological externalities? Industrial policy and economic growth in postwar Japan, 1964–1983*. Unpublished manuscript
Redding SJ, Turner MA. 2015. Transportation costs and the spatial organization of economic activity. In *Handbook of Regional and Urban Economics*, Vol. 5, ed. G Duranton, JV Henderson, WC Strange, pp. 1339–98. Amsterdam: Elsevier
Rodriguez F, Rodrik D. 2001. Trade policy and economic growth: a skeptic's guide to the cross-national evidence. *NBER Macroecon. Annu.* 15:261–325
Rodrik D. 2012. Why we learn nothing from regressing economic growth on policies. *Seoul J. Econ.* 25(2):137–51
Rodrik D. 2016. Premature deindustrialization. *J. Econ. Growth* 21(1):1–33
Rodrik D. 2022. *An industrial policy for good jobs*. Policy Propos., Hamilton Proj., Brook. Inst., Washington, DC
Rodrik D, Sabel CF. 2022. Building a good jobs economy. In *A Political Economy of Justice*, ed. D Allen, Y Benkler, L Downey, R Henderson, J Simons, pp. 61–98. Chicago: Univ. Chicago Press
Sabel CF, Victor DG. 2022. *Fixing the Climate: Strategies for an Uncertain World*. Princeton, NJ: Princeton Univ. Press
Sauré P. 2007. Revisiting the infant industry argument. *J. Dev. Econ.* 84(1):104–17
Saxonhouse GR. 1979. Industrial restructuring in Japan. *J. Jpn. Stud.* 5(2):273–320

Schweiger H, Stepanov A, Zacchia P. 2022. The long-run effects of R&D place-based policies: evidence from Russian science cities. *Am. Econ. J. Econ. Policy* 14(3):322–51
Slattery C, Zidar O. 2020. Evaluating state and local business incentives. *J. Econ. Perspect.* 34(2):90–118
Teranishi J. 1986. Economic growth and regulation of financial markets: Japanese experience during postwar high growth period. *Hitotsubashi J. Econ.* 27(2):149–65
Thun E. 2004. Industrial policy, Chinese-style: FDI, regulation, and dreams of national champions in the auto sector. *J. East Asian Stud.* 4(3):453–89
Thun E. 2006. *Changing Lanes in China: Foreign Direct Investment, Local Governments, and Auto Sector Development*. Cambridge, UK: Cambridge Univ. Press
Vittas D, Cho YJ. 1996. Credit policies: lessons from Japan and Korea. *World Bank Res. Obs.* 11(2):277–98
World Bank. 1993. *The East Asian Miracle: Economic Growth and Public Policy: A World Bank Policy Research Report*. Oxford, UK: Oxford Univ. Press
Wright EO. 1996. Review of Peter Evans, *Embedded Autonomy*. *Contemp. Sociol.* 25(2):176–79
Ye M. 2009. Policy learning or diffusion: how China opened to foreign direct investment. *J. East Asian Stud.* 9(3):399–432
Yoo J. 1990. *The industrial policy of the 1970s and the evolution of the manufacturing sector in Korea*. KDI Work. Pap. 9017. Korea Dev. Inst., Sejong-si, Korea