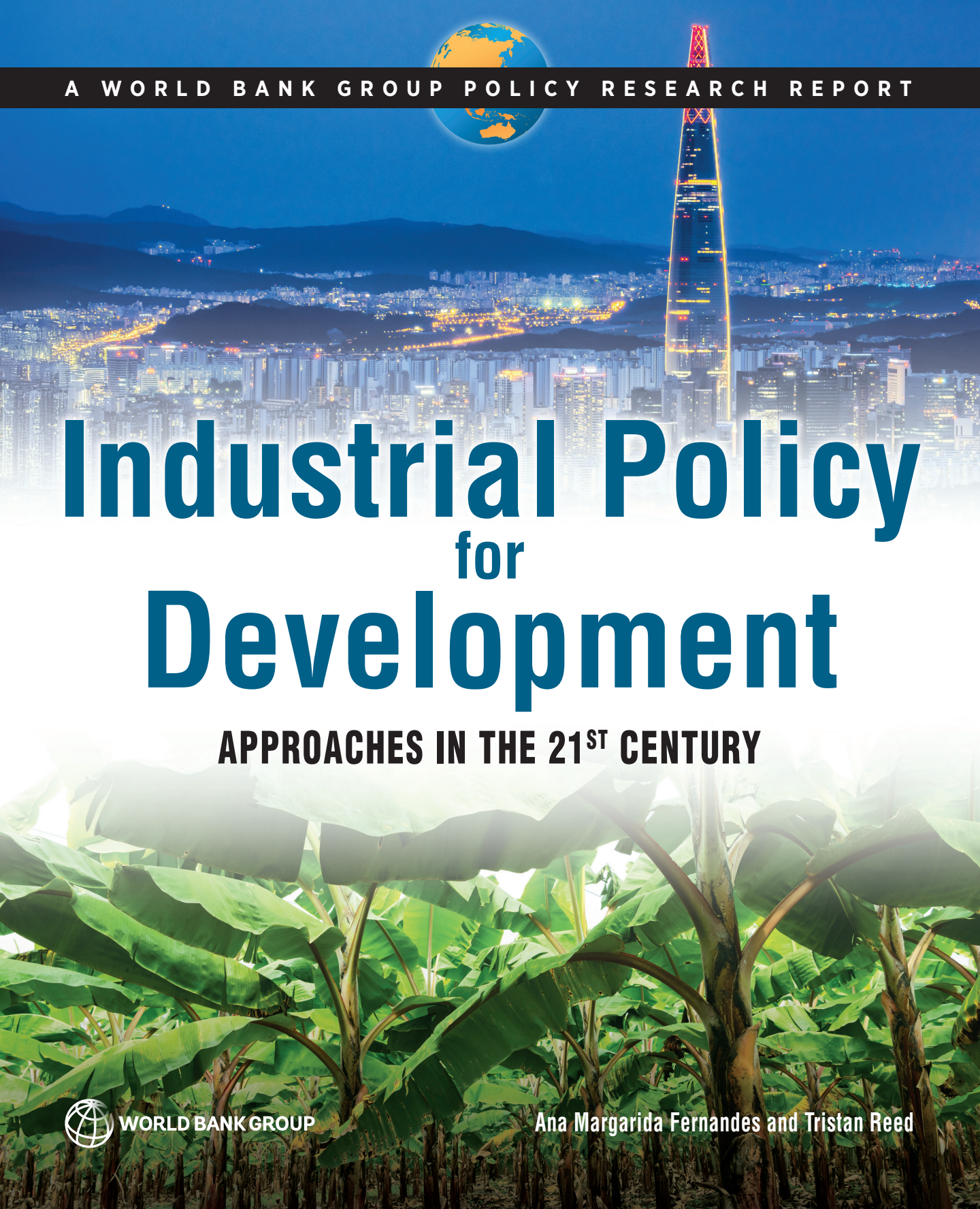
A WORLD BANK GROUP POLICY RESEARCH REPORT
Industrial Policy
for
Development
APPROACHES IN THE 21ST CENTURY
WORLD BANK GROUP
Ana Margarida Fernandes and Tristan Reed

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Contents

Boxes

Figures

Tables

Foreword

It's a question nearly as old as government itself: when, if ever, should the state put its thumb on the scale to favor a particular industry?

Governments have nearly always been hot on the idea. To raise revenue for the empire, China's Han Dynasty rulers set up salt and iron monopolies. To build the "wealth, safety, and strength" of medieval England, the government established Navigation Laws decreeing that all imports and exports from and to the colonies must travel on English-built ships. To protect the "national independence" of the newly formed United States, Alexander Hamilton stacked the deck in favor of US manufacturing.

Policy experts and scholars have been split nearly throughout. Roughly 30 years ago, however, the World Bank took a position that helped stigmatize the idea in the Information Age: outside of a few exceptions in northeast Asia, we said, industrial policy is usually a costly failure. "The prerequisites for success," our 1993 report on the *East Asian Miracle* noted, are "so rigorous that policymakers seeking to follow similar paths in other developing economies have often met with failure." One set of preconditions was especially elusive: "macroeconomic stability and low inflation."

That advice has not aged well—it has the practical value of a floppy disk today. This report updates the recommendations for a global economic landscape that would be unrecognizable to 1990s-era policy makers. The world's average income per capita today is nearly double what it was in 1993, meaning the easiest avenues to prosperity have already been exploited. Educational attainment levels are substantially higher, average inflation is lower, and—with

a few exceptions—the quality of national macroeconomic management is better.

Under these conditions, our analysis finds, industrial policy is far more replicable than previously thought—and it *should* be considered in the national policy toolkit of all countries. On the surface, that recommendation might seem moot: the use of industrial policy across the world is at record levels. A review of the national economic growth strategies of 183 economies conducted for this report found that *all* target at least one industry, with developing economies engaging in the practice more indiscriminately than advanced economies do.

Yet governments in developing economies regularly ask us: are we getting it right? Last year, 80 percent of World Bank country economists reported that client governments sought their advice on how to use industrial policy more effectively. Based on the evidence amassed in this report, our view is that governments in developing economies are botching the job far too often—but not because industrial policy itself is the wrong choice. It's because governments usually resort to blunt instruments, opting for the bludgeon of sweeping tariffs and subsidies over the scalpel of industrial parks and skills development programs. It's because they see industrial policy as a kind of magic bullet: nothing else is needed.

Consider the evidence. The 25 poorest economies—with per capita incomes of less than US$1,200 a year—are the heaviest users of tariffs, averaging a 12 percent tariff rate, more than other developing economies and twice the rate of high-income economies. The 54 upper-middle-income economies—with incomes ranging from about US$5,000 a year to about US$14,000—are the biggest users of business subsidies, which now stand at a record 4.2 percent of their gross domestic product (GDP). The blast radius of these instruments is inevitably economywide, far beyond the targeted industry. They raise costs for nearly all citizens and businesses, they slow job creation, they invite retaliation from abroad—and they are notoriously difficult to unwind. Larger, wealthier countries can ride out the consequences. Smaller and poorer countries cannot.

All countries would be better off with a more pragmatic and precise approach. By itself, industrial policy has seldom been a game-changer: the record shows that, even under ideal conditions, it results in an average gain of just 1 percent

of GDP. Still, in an era of persistently sluggish growth, every option to boost growth ought to be considered. This report offers the first comprehensive 21st-century framework for industrial policy. Call it a feasibility framework: it argues for starting with a light touch and dialing up as state capacity and resources grow.

Three national characteristics define what type of industrial policy a government will be able to pull off: first, the *size* of the domestic market; second, the government's *capacity* to use the chosen instrument of industrial policy; and third, its budgetary room for error. Those traits determine which of 15 possible industrial policy tools will work best—ranging from industrial parks and job skills training all the way to import tariffs, production subsidies, and competitive exchange rate devaluations. These tools are a mix of sharp and blunt instruments, and their effectiveness depends on progressively higher levels of market size, government capacity, and fiscal space.

Resorting to industrial policy, however, does not relieve governments of basic housekeeping duties—the obligation, as our 1993 report put it, is to "get the policy fundamentals right." That includes a healthy and educated workforce, a strong infrastructure for transportation and energy, and a sound macroeconomic framework. It's not always necessary for countries to have these virtues in place before they initiate industrial policy. But long-term success will depend on them, because industrial policy cannot be a permanent solution. To the extent that governments use it to buy time, they should commit to getting the fundamentals right while the industrial policy is in effect—ideally within 10 years.

It is foolhardy to think that a question involving statecraft nearly as old as the state itself has an answer that is at once correct and concise. But let me hazard an attempt.

First, a government contemplating government action to influence a business activity that it deems pivotal for economic development should never convince itself that industrial policy can be a permanent substitute for the institutional arrangements needed to ensure macroeconomic stability and a balanced business climate. Second, it must self-critically assess whether the public services that are necessary inputs for the desired business activities are sufficiently provided. Third, it might contemplate using taxpayer funds to

provide incentives to businesses to boost production or accelerate innovation—provided it has the fiscal and administrative wherewithal to ensure that these monies will not be misappropriated. Finally, governments in small economies with limited administrative expertise and fiscal space should resist the temptation to intervene in foreign exchange markets or provide general tax exemptions to help businesses compete on world markets—because such macroeconomic interventions are invariably self-defeating.

Industrial policy, in short, requires a judicious blend of public institutions, inputs, incentives, and interventions. This report explains why this blend is now within the reach of more than just a handful of East Asian high performers. But it also warns every government—poor, middle income, or rich—that when it comes to industrial policy, its reach can easily exceed its grasp.

Indermit Gill
Chief Economist of the World Bank Group
and Senior Vice President for
Development Economics

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Artificial intelligence (AI) was used only for exploratory research and literature reviews, with Chat GPT, Claude, Ellict, and Perplexity. Original sources were always read carefully before citing. Alice Amsden (1994, 630) criticized World Bank research: "The failure to recognize classic works in the debate and to cite the original source—'to get the copyright'—means that all information to the reader is filtered [through background papers]." In this report, the end notes provide the original sources of all evidence, and many suggestions for additional reading.

Amsden, A. H. 1994. "Why Isn't the Whole World Experimenting with the East Asian Model to Develop? Review of the East Asian Miracle." *World Development* 22 (4): 627–33.

About the Authors

Ana Margarida Fernandes is a lead economist in the World Bank's Development Research Group, focused on trade and development. In her research she has studied the consequences of openness to trade and investment, as well as the impacts of public policies like customs reform, deep trade agreements, and export promotion, and she has significant regional experience in Africa and Eastern Europe. She leads the Exporter Dynamics Database project, which studies the causes of exporter entry, growth, and exit. A native of Portugal, she holds a PhD in economics from Yale University and a BA from the Universidade Nova de Lisboa.

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Overview

For decades, economic growth has been built on a simple formula: governments stuck to sound macroeconomic management, investing in education, health, and infrastructure, and opening markets; private firms did the rest. That approach thrived when global trade was booming and the rules of the game were stable. Not so today: global growth has slowed, automation is thinning out the labor market, and protectionism and subsidies have surged in advanced and middle-income economies. These new conditions could close off the easy avenues for rapid economic growth.

Not surprisingly, governments across the world have begun to resort to a once controversial policy. *Industrial policy*—the range of policy tools that governments use to shape what an economy produces rather than leave it to the discretion of markets alone—is back with a vengeance. Despite recent headlines, advanced economies are *not* the heaviest users of industrial policy. As this report documents, developing economies use it more intensively. New data show that among upper-middle-income economies—those with per capita incomes ranging from US$5,000 to US$14,000—total business subsidies now average 4.2 percent of gross domestic product (GDP), the highest on record. A review of the most recent national development plans of 183 countries reveals that all countries target growth of at least one industry, and that, on average, low-income countries target 13—more than twice the number in high-income countries. Interest in industrial policy has seldom been higher.

A reproducibility package is available for this book in the Reproducible Research Repository at https://reproducibility.worldbank.org/catalog/462.

In a recent survey of World Bank country economists, 80 percent reported that their client governments were seeking advice on industrial policy—overwhelmingly with the goal of spurring faster economic growth and job creation.

This report aims to provide a pragmatic answer. It offers the first comprehensive guide to industrial policies for development in the 21st century. It is distinctive in four respects. First, it covers a broad set of industrial policy tools—15 in all, well beyond the scope of existing literature, which focuses mainly on tariffs and subsidies (refer to box O.1). Second, it offers practical guidance on policy design and implementation, including how to target industries and design effective institutions. Third, it incorporates new evidence from more than 60 countries. Finally, it identifies targeted approaches that can be taken when governments seek to use industrial policy to pursue specific goals: earning foreign exchange, creating jobs, reducing pollution, and strengthening economic resilience.

Box 0.1 Industrial policy means different things to different people

This report offers a comprehensive definition of industrial policy in terms of 15 policy tools. Academic studies of industrial policy focus mainly on import tariffs and subsidies. Beyond that, some governments have emphasized industry-targeted "productive development policies" such as industrial parks or skills-development programs, or "new" industrial policies designed to tackle broader national objectives such as national security or reduced air pollution.

The 15 industrial policy tools that are examined throughout the report encompass all these categories. The tools are grouped into three broad categories: *public inputs* tailored to the needs of a specific industry or activity that are underprovided by markets, *market incentives* aimed at changing prices to make investment in a particular industry or activity more attractive than it otherwise would be, and *macroeconomic interventions* that incentivize industrial policy goals at the economywide level.

The report highlights four public inputs (industrial parks, skills development programs, market access assistance, and quality infrastructure); nine market incentives (import tariffs, public procurement rules, local content requirements, commodity export bans, "quid pro quo" arrangements that require technology transfer, and subsidies for production, innovation, exports, and consumer demand); and two macroeconomic interventions (competitive exchange rate devaluation and tax credits for research and development).

Industrial policy is more replicable than previously thought

It is now more than 30 years since the World Bank first approached the question of whether industrial policy is desirable for developing economies. In assessing the causes of the "East Asian miracle" in 1993, the World Bank's first Policy Research Report concluded: "Our assessment is that promotion of specific industries generally did not work and therefore holds little promise for other developing economies."[1] The report did find that a few "selective interventions" boosted exports and growth in northeast Asia, but these economies benefited from a relatively rare set of circumstances. First, their industrial policy interventions occurred in the context of high educational attainment, high savings rates, and low inequality. Second, the interventions were targeted to tackle problems in the functioning of markets. And third, the relevant governments had the expertise and ability to set and monitor the necessary economic performance criteria. The exact recipe, however, might not work "in other settings," the report noted.

Recent evidence suggests that industrial policy is more replicable than previously thought, depending on the precise tools used. Three broad shifts warrant a reexamination of the initial skepticism. First, the talent available to governments has expanded substantially as education levels have risen across the world. Second, the political environment in many countries has become more supportive of development objectives, delivering, for instance, improved child and maternal health and lower inflation. As a result, many political systems today appear more capable of implementing effective and efficient industrial policies. Third, most economies today trade much more with the rest of the world than they did in the early 1990s. That gives governments less room to tightly protect or micromanage industries but also means it is easier to see what works and what does not: if local firms can compete successfully in global markets, it usually means the industrial policy is working.

Success stories are no longer rare. In Romania, the government offered payroll tax exemptions to qualified computer engineers, incentivizing workers to get degrees in the field. This program helped to turn Romania into a leading global hub for software development. In Brazil, a program redirected research toward locally important staple crops and ecological conditions, laying the groundwork for Brazil's global presence in agriculture. Back in East Asia, researchers revisited the Republic of Korea's experience 33 years later.

They found that the impact of the government's big push for heavy and chemical industry (in the 1970s) caused the economy's GDP to be 3 percent larger *each* year in the long run. This benefit far exceeds the economic cost of the government's "large subsidies," estimated by the World Bank's 1993 report at 2.4 percent of GDP in only *one* year.

Two important caveats are warranted. First, notwithstanding these cases, most research on industrial policy focuses on manufacturing. Yet in a changing world, governments are increasingly exploring industrial policy in other sectors, including agriculture, mining, skilled professional services, and tourism. Second, most evidence on industrial policy assesses effectiveness in terms of opening new markets or revenue growth rather than efficiency—that is, whether the benefits are greater than the costs. On efficiency, the evidence remains strong for investments in a specific set of fundamentals, such as human capital and a sound macroeconomic framework. Nonetheless, the current period of uncertainty warrants experimentation with industrial policy, to see what is effective and efficient.

The evidence gathered in this report reinforces the importance of the preconditions for success first identified in the 1993 report. But effective industrial policy also depends on other characteristics—three, in particular: (1) the size of a country's local market; (2) the *capacity*—referred to here as "bandwidth"—of the government to interact with many businesses and industries at once; and (3) its budgetary room for error, or "fiscal space." The 15 available tools for industrial policy—ranging from industrial parks and worker skill development all the way to import tariffs, production subsidies, and competitive exchange rate devaluations—are a mix of sharp and blunt instruments, and they require varying degrees of market size, government capacity, and fiscal space to implement. Table O.1 provides a selection of country-characteristic combinations and the feasible industrial policy tools in each case from the comprehensive typology included in the report. For many developing economies, these characteristics have improved relative to decades ago: larger middle classes and regional trade agreements provide larger local markets; specialized government agencies like national development banks and investment promotion agencies have additional capacity that complements line ministries; and improved tax collection and access to capital markets has improved fiscal space.

Table 0.1 Typology of feasible industrial policy tools for selected combinations of country characteristics

Country characteristics			Feasible policies
Government bandwidth	Local market size	Fiscal space	
Small	Small	Small	• **Industrial parks** • *Commodity export ban* • *Competitive exchange rate devaluation*
Large	Small	Small	" • **Skills development** • **Market access assistance** • **Quality infrastructure**
Large	Large	Small	" " • *Technology transfer quid pro quo* • *Import tariff* • *Local content requirement*
Large	Large	Large	" " " • **Production subsidy** • **Specific innovation subsidy** • *Export subsidy* • *Public procurement* • *Consumer demand subsidy* • *Research and development tax credit*
			Comparative advantages and market potential also shape feasibility at the industry level.

Source: Original table for this publication.

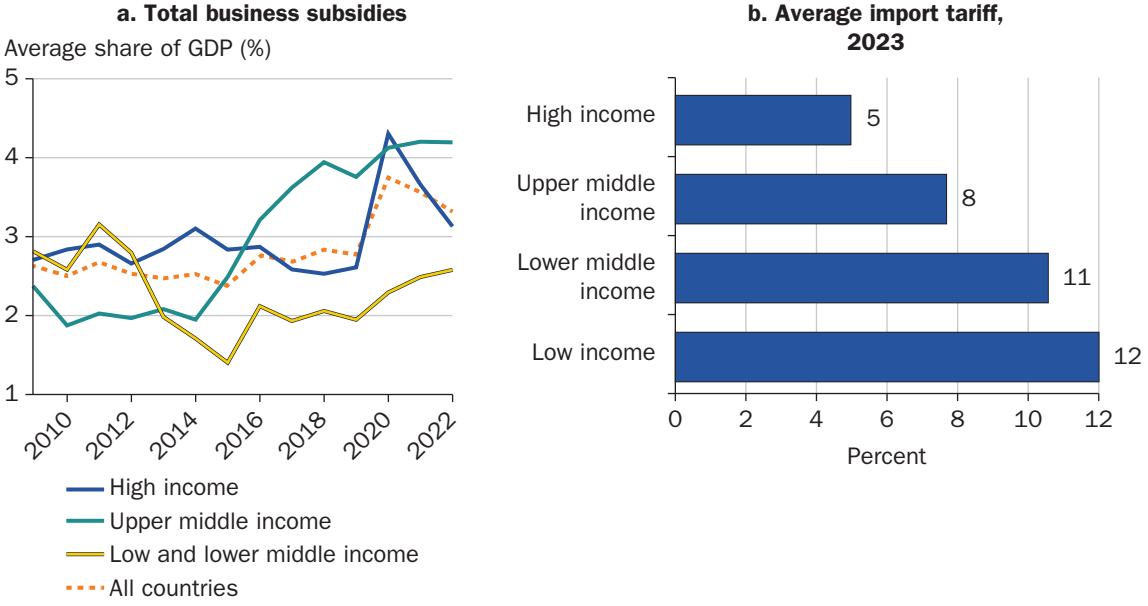
Note: Refer to chapter 1 of the report for a comprehensive typology. Refer to chapter 4 on comparative advantages and market potential. **First-choice policies** in bold address market failures head-on by subsidizing the activities that are underprovided. *Second-choice policies* in italics shape industry outcomes by intervening indirectly in adjacent markets, such as through a commodity export ban, foreign currency market, trade values, consumer markets, or the tax code. The ditto symbol (") indicates that all policy tools listed in the cell above it are feasible for countries with characteristics listed in the row.

In general, when government capacity is small, local market size is small, and fiscal space is also small (as in the case of most low-income economies still), industrial parks constitute the best industrial policy tool. When all three of those advantages are large (as in the case of the world's biggest economies), then import tariffs, innovation subsidies, local content requirements, and many other policy tools can be effective: beneficiary businesses can achieve economies of scale locally, and the government has the capacity to discipline their performance and not sacrifice expenditure on social services. These countries enjoy the widest range of opportunities to experiment with industrial policy for development. In between, countries must choose carefully from a mix of options. The situation today, however, represents some inversion of those principles: this report finds that low-income economies—usually characterized by small market size—tend to be the heaviest users of import tariffs, which require a large market size to be effective. Upper-middle-income countries, for their part, go big on business subsidies.

Subsidies for private businesses are at an all-time high in upper-middle-income countries, and tariffs are often highest in low-income countries.

Recent research has called attention to the growing use of industrial policy by advanced economies, usually tracked through press coverage of announcements of new policies. This report uses additional data that capture the dollar value of these policies. It finds that the use of industrial policy is also rising in developing economies and may be used more intensively there. Total business subsidies, including both direct funding of businesses and tax exemptions, average 4.2 percent of GDP in upper-middle-income countries, the highest level on record (refer to figure O.1, panel a). By contrast, the value of subsidies

Figure 0.1 The value of industrial policies today and differences across income groups



Sources: For subsidies: BOOST Open Budget Portal, World Bank, https://www.worldbank.org/en/programs/boost-portal; Global Tax Expenditures Database, https://gted.taxexpenditures.org/; Government Finance Statistics, International Monetary Fund, https://data.imf.org/en/datasets/IMF.STA:QGFS. For tariffs: Base pour l'Analyse du Commerce International (BACI) (database), Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), https://www.cepii.fr/DATA_DOWNLOAD/baci/doc/baci_webpage.html; World Integrated Trade Solution (WITS) TRAINS (Trade Analysis and Information System) tariff data, World Bank, https://wits.worldbank.org/.

Note: Business subsidies are direct funding plus tax expenditures. The term "direct funding" refers to direct transfers to businesses, such as cash grants, while "tax expenditures" refers to forgone tax revenue from businesses. Tax expenditures are an upper-bound estimate, as they assume activities receiving tax holidays would have occurred in the absence of the tax holiday. If the activity receiving a tax holiday, such as foreign investment, would not have taken place otherwise, forgone tax revenue would be zero. Import tariffs are import-weighted averages of most-favored nation (MFN) tariffs; a similar pattern emerges when using applied tariffs. GDP = gross domestic product.

in high-income countries has declined somewhat from its peak in 2020 during the COVID-19 pandemic, to 3.1 percent.

Tariff levels are another important measure of industrial policy, because higher tariff rates provide greater protection to domestic producers. Low-income countries impose the highest average tariffs on imports, at 12 percent, while high-income countries apply an average tariff of just 5 percent (refer to figure O.1, panel b). This ranking across income groups remains unchanged even after accounting for the tariff increases introduced by the United States in 2025 and China's retaliatory measures. Tariffs also generate government revenue. However, the dispersion of tariff rates across products is much larger in developing economies than in advanced economies, suggesting that tariffs are often applied selectively to tilt economic activity and protect certain industries. If revenue generation were the only goal, governments could instead apply a uniform tariff across all products. These patterns suggest that industrial policy today is hardly the exclusive preserve of advanced economies.

How to make industrial policy work for development

Given the current global appetite for industrial policy, how and when should it be deployed? This report concludes that industrial policy is not a magic bullet for any country, but it can be a useful instrument of development for many. The tool is seldom easy to wield, and it usually comes with trade-offs. Export pushes, for example, can drive growth and earn foreign exchange, but at the risk of provoking protectionist responses. Green industrial policy can help lower emissions at home, but it can also push pollution abroad. Policies aimed at job creation might have to choose between creating large numbers of low-wage jobs or smaller numbers of high-wage jobs.

The key, therefore, is in choosing the most *feasible* instrument of industrial policy, one that matches the opportunities and limitations of market size, government capacity, and fiscal space. This report is the first to offer policy makers a graduated framework for doing so (refer to table O.1). At the low and relatively easy end of the scale are tools such as industrial parks, commodity export bans, and competitive exchange rate devaluations. At the opposite and most difficult end are innovation subsidies and public procurement rules. Developing economies are especially poised to make progress on multiple goals, especially those seeing growth in civil service capacity, local market size, and fiscal space.

Once they have chosen the right tool, governments that achieve success in industrial policy tend to get three things right. First, they maintain close contact with businesses. They talk with firms. They pay attention to what is working and what is not and adjust policy accordingly. Second, they put in place smart incentives, in the form of carrots and sticks. The financial support they offer to businesses, via loans, subsidies, or tariff protection, is conditional: the support is pulled when businesses underperform. Third, they operate with full transparency and accountability: agencies that oversee industrial policies have clear goals and report their results publicly. But in pursuing industrial policy, governments should commit to improve economywide fundamentals, even if that takes longer to see results (refer to box O.2).

Road map

The report is organized around five broad questions that can shape the design and implementation of industrial policies for development. In the complete report, each chapter represents a concrete answer to those questions. The five questions are as follows:

- ***What is industrial policy?*** Chapter 1 lays the conceptual groundwork, framing industrial policy for development as addressing market failures and proposing a taxonomy that links country characteristics to the choice of industrial policy tools, as well as their prioritization (refer to box O.2)—while also recognizing the associated risks.
- ***Who does industrial policy?*** Chapter 2 presents new stylized facts on cross-country patterns in the use of industrial policy tools, showing it is not only, or even mainly, the remit of advanced economies.
- ***How to do industrial policy?*** Chapter 3 distills 12 lessons from a survey of recent evidence on each of the 15 industrial policy tools, emphasizing that context and details matter greatly for outcomes. The chapter offers principles of practice to implement each policy tool and tailor it to the local context.
- ***Which activities to target?*** Chapter 4 proposes a practical framework that can guide governments in the complex decision of which activities to target strategically when pursuing industrial policy for development. The framework considers both the potential development benefits of activities, in terms of positive spillovers and external impacts, and their feasibility,

Box 0.2 Deciding to do industrial policy

(1) Keep emphasis on improving enabling institutions.

Despite the potential of well-designed industrial policies for development, nothing in this report suggests that they can be effective or efficient without enabling institutions. These institutions include accountable and capable implementing agencies that are insulated from politics and interest-group pressures, and strong economywide fundamentals: an educated and healthy workforce, energy and transportation infrastructure, and a sound macroeconomic framework. If governments pursue industrial policy as a temporary fix for fundamentals, they should set milestones for improvements in those fundamentals over the planned length of the industrial policy, 3–10 years.

(2) Select low-cost public inputs not provided by the market.

Even with limited fiscal space and small local markets, countries with sufficient government bandwidth can still pursue an industrial strategy. The first choice should be public inputs that can be delivered at cost and are underprovided due to specific market failures, such as coordination failures (industrial parks), skills underinvestment (skills development), and information asymmetries (market access assistance and quality infrastructure). Some tailoring to the needs of industries may be required but should not be exclusive.

(3) Provide market incentives if fundamentals and public inputs are insufficient.

Countries should turn to market incentives as a last resort, as these are typically the most costly—either fiscally (production and innovation subsidies, consumer demand subsidies, and public procurement), for the broader economy (import tariffs, local content requirements, commodity export bans, export subsidies), or due to retaliation from trading partners. Moreover, these tools require careful monitoring. A notable exception is a technology transfer quid pro quo arrangement, when technology cannot be licensed, which incurs no fiscal cost.

(4) Be wary of macroeconomic interventions.

Competitive exchange rate devaluation is difficult to sustain over the long period of time needed to realize benefits and can trigger retaliation by other countries. More research is needed to understand whether and when general tax credits for research and development in private businesses translate into valuable inventions.

based on market potential and evolving comparative advantages. The discussion encourages governments to think in terms of industrial strategies and proposes experimenting with a portfolio of targeted activities, recognizing that some initiatives will fail.

- ***How to get the institutions right?*** Chapter 5 focuses on the institutions that are crucial for effective industrial policy, which have arguably improved in recent decades. It considers delivery units, which guide diagnostics and policy design for the head of government, and seven implementing agencies with the potential to deliver, including national development banks and export promotion agencies, among others. Three core criteria for effective design and implementation of industrial policy are proposed: embeddedness, appropriate use of incentives, and accountability.
- After addressing these core questions, the report turns to ***applications with narrow industrial policy objectives*** (chapter 6), examining the additional considerations and trade-offs that arise when industrial policy targets specific goals: generating *foreign exchange,* creating *jobs,* reducing pollution through *green industrial policy,* and strengthening economic *resilience*.
- The report concludes with a ***policy brief*** (chapter 7), synthesizing the lessons from across the report for the practice of industrial policy for development.

Note

1. Page et al. (1993, 24).

Reference

Page, J., N. Birdsall, E. Campos, et al. 1993. *The East Asian Miracle: Economic Growth and Public Policy*. World Bank Policy Research Report Series. World Bank; Oxford University Press.

Abbreviations

BNDES	National Bank for Economic and Social Development
CBAM	Carbon Border Adjustment Mechanism
EBRD	European Bank for Reconstruction and Development
ECLAC	Economic Commission for Latin America and the Caribbean
EPA	export promotion agency
ETS	emissions trading system
EU	European Union
EV	electric vehicle
EXIM	Export-Import Bank
FDI	foreign direct investment
G20	Group of Twenty
GDP	gross domestic product
GLC	Government-Linked Company
GQII	Global Quality Infrastructure Index
GTA	Global Trade Alert
GTED	Global Tax Expenditures Database
HS	Harmonized System
IA	innovation agency
IDC	Industrial Development Corporation
IFC	International Finance Corporation
ILO	International Labour Organization
IPA	investment promotion agency
IPR	intellectual property rights

IRA	Inflation Reduction Act
ISO	International Organization for Standardization
IT	information technology
ITCR	Costa Rican Institute of Technology
LCR	local content requirement
LDCs	least developed countries
MDR	Medical Device Regulation
MFN	most-favored nation
MITI	Ministry of International Trade and Industry
MSMEs	micro, small, and medium enterprises
NDB	national development bank
NIPO	New Industrial Policy Observatory
OECD	Organisation for Economic Co-operation and Development
OIZ	Organized Industrial Zone
PPD	public-private dialogue
QI	quality infrastructure
R&D	research and development
RCA	revealed comparative advantage
RISE	Resilient and Inclusive Supply-Chain Enhancement
RPS	Renewable Portfolio Standards
SAR	special administrative region
SDT	special and differential treatment
SENAI	Brazil's National Industrial Training Service
SEZ	special economic zone
SIMAP	Surgical Instrument Manufacturers Association of Pakistan
SOE	state-owned enterprise
TAA	Trade Adjustment Assistance
TRIPS	Trade Related Aspects of Intellectual Property Rights
TVET	technical and vocational education and training
WGI	Worldwide Governance Indicators
WITS	World Integrated Trade Solution
WTO	World Trade Organization

CHAPTER 1

What Is Industrial Policy?

In recent years, much has been written on how governments design and implement industrial policy.[1] Different definitions exist, but they share a common thread: *Industrial policy is a government action expected to increase a strategic business activity.*[2]

This is the broad definition used in this report. "Business activity" can mean performing tasks or producing products—for example, assembling automobiles, creating jobs in the film industry, adopting artificial intelligence in forestry, or conducting research and development (R&D) in export horticulture. "Strategic" means that government has decided one business activity is more important than others. Crucially, the "industrial" in industrial policy does not refer only to manufacturing. Any business activity can be strategic, whether in agriculture, mining, services, or any other.

Industrial policy is sometimes framed as a tool for promoting structural transformation, when broad industries like manufacturing or services grow to represent a larger share of gross domestic product (GDP).[3] A growth strategy emphasizing structural transformation contrasts with one focused only on macroeconomic fundamentals. While a "fundamentals" strategy is agnostic about which industries grow, allowing this to be determined by market forces, a "structural transformation" strategy prioritizes growth in one industry over another.[4] The approach taken by most governments in the 20th century was to ensure sound fundamentals, while sometimes prioritizing the growth of export-oriented manufacturing—which often enabled businesses to achieve scale in international markets and required them to use frontier technology, supporting rapid economic growth.

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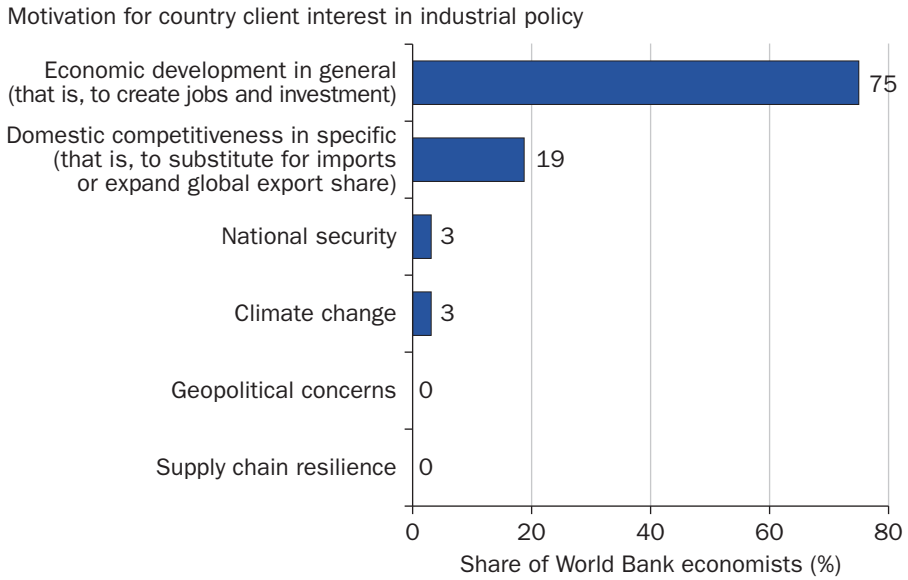
Along these lines, industrial policy is also sometimes framed as "vertical" when it targets a single industry, to contrast with "horizontal" (or "neutral") policy that affects multiple industries or the entire economy.[5] While helpful, this distinction is often ambiguous. For instance, building a road, training engineers, or providing a tax credit for R&D expenditures are typically considered horizontal policies, but in practice they may benefit certain industries more than others and may be chosen for that purpose.

In March 2025, World Bank economists that led interactions with ministries of finance around the globe were asked whether their government clients had sought advice on policies to grow specific industries during the prior year. The results were striking: 80 percent reported that their clients had asked about industrial policy.

Respondents were asked about the motivations behind these requests. As illustrated by figure 1.1, the results were clear. Developing-country governments are still overwhelmingly motivated by the goal of creating jobs and attracting investment, rather than newer concerns like national security or climate change. This suggests that for most developing economies, industrial policy is not a new phenomenon—it continues to be driven by the classic motivation of promoting economic development. Given this singular motivation, developing economies face fewer trade-offs between industrial policy goals compared to advanced economies, which more often balance development with additional goals like security and climate change mitigation.[6] An important caveat discussed in chapter 6 is that targeting jobs as such rather than jobs and investment, productivity, or development in general, does imply an additional trade-off.

Industrial policies have long been advocated on the grounds that they can correct market failures, when private incentives fail to produce growth.[7] Market failures occur when investment decisions need to be coordinated, when information is scarce, and when businesses learn from each other by sharing inputs and training labor. These issues are considered especially common in developing economies, which typically have fewer industries than advanced economies. A central goal of industrial policy in developing economies is to diversify into new industries, often by adapting or importing technologies from abroad. Since correcting market failures can raise per capita income, these types of interventions are often referred to as "industrial policy for development." Their textbook appeal is that they theoretically

Figure 1.1 **World Bank country client interest in industrial policy**



Source: March 2025 survey, World Bank.

Note: The sample covers responses by 32 economists in the World Bank's prosperity vertical who are the lead counterparts of finance ministries on economic policy issues. They were asked the motivation behind their most substantive engagement on industrial policy. Categories other than jobs and investment are as in Evenett et al. (2024).

involve no trade-offs: by increasing overall welfare, industrial policy can leave society as a whole better off.

Three categories of industrial policy tools, some of which are second choice

Which industrial policy tools have the greatest potential to grow business activities? Three broad categories are available: (1) *public inputs* tailored to the needs of a specific industry or activity, (2) *market incentives* that encourage a specific industry or activity, and (3) *macroeconomic interventions* that broadly incentivize industrial policy goals (refer to table 1.1 and below).[8] This section first provides brief examples, followed by a typology that indicates which tools are most effective in different country contexts.

With many industrial policy tools available to governments, a key challenge is deciding which to apply and in which contexts. To navigate this challenge, economic principles can help identify the most promising policies for a given

Table 1.1 Fifteen industrial policy tools

Market failure	No.	Industrial policy tool	Rank	Example of policy tool addressing market failure
Public inputs tailored to needs of activity				
Coordination failure	1	Industrial parks	**1st choice**	• Better infrastructure and/or preferential regulation in a location allows first movers to coordinate and pool labor, inputs, and ideas.
Underinvestment in training	2	Skills development	**1st choice**	• Subsidies for apprenticeships, specialty degree programs, and skilled worker income tax breaks compensate for underinvestment in worker training.
Asymmetric information	3	Market access assistance	**1st choice**	• Export promotion agencies deliver information about how to succeed in new markets and teach foreigners what a country exports.
	4	Quality infrastructure	**1st choice**	• Standards agencies certify product quality so it is visible to consumers.
Market incentives				
Positive spillovers, including from learning-by-doing with advanced products and processes, and discovery of costs and demand	5	Production subsidies	**1st choice**	• Grants and tax credits, or debt and equity investments from state-owned banks, support learning-by-doing.
	6	Specific innovation subsidies	**1st choice**	• Grants incentivize the invention of new products or technology, and vouchers incentivize the adoption of new technology where private benefits are insufficient.
	7	Commodity export bans	2nd choice	• Export restrictions lower the domestic price of commodities, *when production subsidies for users of the commodity are infeasible.*
	8	Public procurement	2nd choice	• Requirements that a fixed share of government purchases come from local suppliers, *when market access assistance or production subsidies are infeasible.*
	9	Import tariffs or quotas	2nd choice	• Tariffs protect infant industries with strong international market growth, *when production subsidies are infeasible.*
	10	Export subsidies	2nd choice	• Export duty drawbacks incentivize businesses to seek new markets, *when market access assistance or production subsidies are infeasible.*

(Continued)

Table 1.1 Fifteen industrial policy tools *(continued)*

Market failure	No.	Industrial policy tool	Rank	Example of policy tool addressing market failure
	11	Technology transfer quid pro quo	2nd choice	• Foreign investors are required to form joint ventures to transfer technology that is not available to license locally.
	12	Local content requirements	2nd choice	• Requires businesses to use domestic inputs, *when production subsidies for input producers are infeasible.*
	13	Consumer demand subsidies	2nd choice	• Consumer subsidies increase demand for (environmentally friendly) products, *when production subsidies (or pollution taxes) are infeasible.*
Macroeconomic interventions				
	14	Competitive exchange rate devaluation	2nd choice	• Accumulation of foreign reserves makes exporters more competitive, *when market access assistance or production subsidies are infeasible.*
	15	R&D tax credit	2nd choice	• Tax credits for R&D, especially for businesses to partner with basic research at universities, *when innovation subsidies cannot be targeted to specific technology.*

Source: Original table for this publication.

Note: Italics indicate why a policy tool is second choice. Second-choice policy tools shape industry outcomes indirectly when first-choice policy tools are not feasible.
R&D = research and development.

country, regardless of what industry or activity they target. This is particularly relevant for developing economies, which often face many market failures as well as highly constrained resources, few entrepreneurs, a need for foreign exchange, and limited power relative to multinational corporations and trading partner countries. For the purpose of this report, the most promising industrial policy options are referred to as "first choice," while less promising options are referred to as "second choice."[9]

To illustrate this framing, imagine an old car drifting on the road because of two problems: the left shock absorbers are worn out and the right tires are completely deflated. A first-choice solution would be to fix both problems. But if the car's owner can afford to fix only one problem, which should they choose? Replacing the shock absorbers without inflating the tires will only make the car drift farther to the right—and vice versa. An alternative solution might be to partially inflate the tires; even without replacing the shock absorbers, this might improve the car's overall alignment. Similarly, when governments face fiscal or institutional constraints, they may adopt second-choice solutions. While not ideal, these may be the best achievable options.

This principle is useful when selecting industrial policy tools, which can address market failures directly or indirectly. Direct policies address market failures head-on by subsidizing the activities that are underprovided. For example, if there is too little entrepreneurship, governments can encourage more of it by subsidizing businesses, workers, and entrepreneurs. These should be chosen first, if they are feasible, because they directly target the problem. When governments have adequate resources (for example, if the subsidy can be funded through broad-based corporate or personal income taxes), benefits from first-choice policies can outweigh the costs—the equivalent of fixing both the shock absorbers and the tires in the example above.

Instead of providing direct transfers to businesses and individuals, indirect policies typically regulate entire markets. These policy tools should be chosen second, since they work through broader and less precise interventions that carry additional costs. For example, import tariffs can support domestic producers in an infant industry while harming consumers through increased prices, and they can raise costs for businesses that rely on imported inputs like metals or specialized equipment. These costs are particularly high for inputs and essentials without easy substitutes, such as food, medicine, and critical

minerals. In the car analogy, partially inflating the tires is a second choice because it does not fully fix the alignment problem and has costs (for example, partially inflated tires wear out faster).

Across the literature, experts advise that industrial policy should address a clear market failure. Harrison (2024), along with Cherif and Hasanov (2019), emphasize that a central requirement of any industrial policy should be its ability to correct a market failure. Rodrik (2004) reinforces this view, noting the pervasive role of market failures in hindering productive diversification and entrepreneurship in new activities. Rodrik further emphasizes demonstration effects, or informational spillovers that emerge in discovering the cost structure of an economy, and the need for coordinating investments that benefit from economies of scale.[10]

These themes form the backbone of this report's analysis of industrial policy tools, each of which is examined through the lens of whether it effectively addresses market failures—and whether it does so as the first-choice solution. The following sections provide an overview of the three categories of industrial policy tools: public inputs, which address distinct and specific market failures, market incentives, and macroeconomic interventions, for which all tools address the same broader market failures related to positive spillovers.

Tailored public inputs

All industries rely on public inputs like infrastructure and regulation. These are often described as horizontal policies that are broadly accessible across all industries. But in many cases, public inputs must be tailored to a specific industry's needs. They result from a process whereby government and industry collaborate and whose focus is to deal directly with the problems that keep productivity low in existing or growing industries.

There are four key types of public inputs.

First, *industrial parks* concentrate improved infrastructure in a specific location. Many investors hesitate to assume the costs and risks of being the first mover in a new industry. This often creates coordination failures, where businesses delay investments until others act. Industrial parks streamline production and logistics, foster economies of scale, and help businesses coordinate investment. In developing economies, industrial parks often include preferential regulations

that differ from national rules—for example, Morocco's Casablanca Midparc Free Zone for aeronautics and Ethiopia's Kilinto Industrial Park for pharmaceuticals. Residential developments for workers and other municipal zoning that concentrates a service industry in a location, for instance health care facilities near a research center or a retail and entertainment complex for tourists, is another variety of industrial park.

Second, *skills development programs* build the specialized workforce required by an industry. Businesses may be reluctant to provide training due to concerns that trained workers will leave for competitors. Even when businesses do invest in training, it is not profitable for workers to acquire these skills with uncertain employment opportunities. Skills development programs are designed to address this underinvestment through training. For instance, the Costa Rican Institute of Technology (ITCR) and Intel jointly designed a semiconductor manufacturing degree program to train students for jobs in advanced electronics.

Third, businesses lack the information and knowledge needed to succeed in local and global markets. To overcome these information asymmetries, governments provide *market access assistance* to help businesses connect to international buyers.[11] These efforts can take a variety of forms, including support to participation in industry trade fairs—such as those operated by PROMPEX, Peru's export promotion agency—as well as the provision of platform onboarding, digital marketing, or data security certification services for digital services exporters.

Fourth, governments provide *quality infrastructure*, or the institutions and policies that establish and certify product quality, safety, and environmental standards. This is another solution to information asymmetry problems. Quality infrastructure refers not only to physical infrastructure but to the institutional framework, governance arrangements, and technical facilities needed to ensure quality standards. An example is Plan Calidad Argentina, which helped strengthen quality infrastructure as part of the government's effort to boost export competitiveness.

Market incentives

Market incentives are policies that change the relative price of an output or input in one industry compared to others, making that industry more attractive. Market incentives are motivated by the more generic market failure of positive

spillovers. An illustrative example is the time and experience businesses and workers often need in a new industry before they can compete internationally. First movers to some extent reveal local costs and potential demand to other potential entrants. Production subsidies can offer temporary support to promote this "learning-by-doing," allowing businesses to match international prices until they can lower costs on their own. Moreover, learning can create what economists call Marshallian externalities (after economist Alfred Marshall): shared labor pools, networks of specialized businesses to supply intermediate inputs, and the spread of knowledge and ideas that can accelerate innovation. Businesses typically do not account for these spillover benefits when making investment decisions, so they underinvest, providing a strong rationale for subsidies. Of course, as Jagdish Bhagwati quipped, "the whole problem with externalities is that, as we have known from the industrial policy debates, they are the first refuge of the scoundrels."[12] Externalities are easily described in theory, but are very difficult to measure. The challenge of targeting industries based on proxies for positive spillovers is discussed in chapter 4.

Production subsidies, or government payments that reduce businesses' costs, are the most common example of a market incentive. Historically, production subsidies have frequently supported capital investments (for example, the Republic of Korea's guarantees on foreign loans to heavy industry in the 1970s) or wages (for example, Romania's personal income tax break for software developers in the 2000s). Both have been shown to raise productivity and grow industries. Rather than input bills, they may be paid as a percentage of incremental sales of domestically manufactured goods (for example, India's production-linked incentive scheme in place since 2020 for 14 industries including pharmaceuticals and drones). More recently, subsidies frequently support specific technologies (for example, fertilizer in Mozambique) or exports (for example, apparel and textiles in Pakistan). Subsidies can also be paid to consumers to stimulate demand in a targeted industry (for example, subsidies for electric vehicles in many countries). Similarly, public procurement requires public agencies to buy from local producers, as an attempt to boost domestic industries.

Import tariffs are another key market incentive. By taxing imported goods, tariffs protect domestic producers from cheaper international competition, effectively serving as subsidies that allow them to charge higher prices. Unlike direct subsidies, tariffs generate revenue for the government, but they also impose higher costs on domestic consumers. Historical examples include the

United States during the 1890s, indicating that success is possible but only in industries supported by large domestic markets and abundant natural resources.

Other market incentives regulate specific industries and activities, typically with the aim of changing prices and encouraging industrial development. Commodity export bans, for instance, seek to reduce domestic prices for key commodities, benefiting the industries that process them (for example, Indonesia's raw nickel and bauxite ore export bans in 2014). Technology transfer quid pro quo policies require foreign investors to form joint ventures with local businesses, ensuring technology transfer (for example, China and India's automobile industries, until recently). Local content regulations mandate that foreign investors use a certain share of domestically produced inputs (for example, the European Union requirement for video-on-demand services like Netflix to include locally produced films and shows).

Macroeconomic interventions

Macroeconomic interventions, also motivated by the generic market failure of positive spillovers, are policies that change the relative price of very broad activities rather than targeting a specific industry. One example is competitive exchange rate devaluation, where governments deliberately lower the value of the currency, often by accumulating foreign currency reserves. This makes domestic industries that produce goods and services for export more competitive by lowering the cost of their exports on global markets. Exchange rate devaluation played a central role in East Asia's rapid growth in the 20th century, and more recently in Viet Nam. Another example is R&D support for businesses, through both tax credits and grants, which effectively subsidize innovation and are widely used in advanced economies.

A typology of feasible industrial policy tools, by country characteristics

When industrial policy lives up to its promise, it is usually in contexts where country-specific characteristics come into play. The evidence points to three essential characteristics:

- *Government bandwidth:* Designing and effectively delivering targeted tools like production or innovation subsidies and skills development programs requires the government to have institutional capability, trained

personnel, and interagency coordination, designated as "bandwidth" as well as extensive interaction with businesses and investors.[13] The key elements of government bandwidth include the availability and expertise of a workforce dedicated to engaging with businesses, as well as an effective institutional setup for public-private dialogue. Tools like market access assistance and quality infrastructure, which require export promotion and standards agencies to interact with their clients, also require bureaucratic capacity. By contrast, tools like import tariffs, commodity export bans, and export subsidies require less firm-level engagement and thus lower government bandwidth since they are applied across an industry. Macroeconomic tools like competitive exchange rate devaluation and R&D tax credits also operate at the economywide level—though they still require effective customs processes, tax agencies, and central banks. Importantly, government bandwidth can vary within countries: some specialized agencies may function well even when the wider civil service does not.

- *Local market size:* A large market allows businesses to achieve economies of scale domestically while also attracting foreign investors. Larger market size—defined by the size of the domestic middle class but also the size of destination markets covered by preferential trade agreements—is associated with sustained poverty reduction at the macroeconomic level. This reflects the presence of increasing returns to scale at the business level, notably in capital-intensive industries.[14] Tools like import tariffs and demand subsidies that encourage consumers to buy specific goods are effective only when businesses can rely on a sufficiently large domestic market.[15] Similarly, policies that target domestic businesses, like local content requirements, public procurement, or technology transfer quid pro quo policies, require a large market for beneficiaries to obtain scale.
- *Fiscal space:* Governments that can raise tax revenue and/or borrow affordably can afford tools such as production or innovation subsidies. Countries with limited fiscal space may turn to second-choice tools like import tariffs, which have the added benefit of raising revenue.

Of course, other factors may also shape the success of industrial policy in particular industries. Abundant resources or installed infrastructure operated by capable businesses can create a basis for comparative advantage, while slow demand growth or global competition may limit the scope for scale.

These considerations are examined in chapter 4, which focuses on designing industrial strategies for targeted activities.

As these characteristics evolve, countries change the mix of industrial policy tools they use. For example, India, Korea, Malaysia, and Singapore initially relied on import tariffs and later transitioned to production subsidies as they grew. While this shift is sometimes explained by a change in ideology, it may have a more banal explanation: increased tax revenue and government bandwidth to deliver subsidies contingent on businesses' individual performance. It could also reflect a recognition that domestic market size was too small for import tariffs to be effective.

To assess the feasibility and effectiveness of various industrial policy tools across countries, this report proposes a novel taxonomy in table 1.2 that classifies these three country characteristics as binaries—large/small government bandwidth, large/small local market size, and large/small fiscal space (relative to each characteristic's median across countries) and indicates feasible policy tools.[16] Among the industrial policy options, first-choice policies are in bold. Three country examples, in descending order by population, for each combination of country characteristics are included.

While table 1.2 has potential for use as a novel diagnostic tool, four critical points must be noted:

- Table 1.2 is conceptual rather than determinative. Chapter 3 assesses the available evidence on how effective these policies are in practice.
- Country examples are illustrative only, and country placement in a category may be refined with additional data.
- Within each of the broad country categories, there is a continuum of heterogeneous country contexts that may influence the feasibility of policy tools.
- The taxonomy is discussed with country characteristics treated as given, but in practice these characteristics can evolve, and governments have agency to shape their positioning in ways that expand the set of industrial policy tools they are able to implement.

Before discussing four combinations of country characteristics that represent especially common situations, a key broad insight from table 1.2 is the sharp contrast between developing and advanced economies, in terms of the range of

Table 1.2 Country typology with feasible industrial policies, by type

Country characteristics				Feasible industrial policies					
Government bandwidth	Local market size	Fiscal space	Examples	Public inputs		Market incentives		Macroeconomic interventions	
Small	Small	Small	• Mozambique • Madagascar • Cameroon	• **Industrial parks**		• *Commodity export ban*		• *Competitive exchange rate devaluation*	
Small	Small	Large	• Nepal • Kyrgyz Republic • Nicaragua				• *Export subsidy*		• *R&D tax credit*
Small	Large	Small	• Brazil • Nigeria • Bangladesh			• *Commodity export ban* • *Technology transfer quid pro quo* • *Import tariff* • *Local content requirement*			
Small	Large	Large	• Uzbekistan • Belarus • Bulgaria				• *Export subsidy*		• *R&D tax credit*
Large	Small	Small	• Senegal • Rwanda • Namibia		• **Skills development** • **Market access assistance** • **Quality infrastructure**	• *Commodity export ban*			
Large	Small	Large	• Georgia • Botswana • Latvia				• **Production subsidy** • **Specific innovation subsidy** • *Export subsidy* • *Consumer demand subsidy*		• *R&D tax credit*

(Continued)

Table 1.2 Country typology with feasible industrial policies, by type *(continued)*

Country characteristics				Feasible industrial policies					
Government bandwidth	Local market size	Fiscal space	Examples	Public inputs		Market incentives		Macroeconomic interventions	
Large	Large	Small	• Indonesia • Japan • Philippines	• **Industrial parks**	• **Skills development** • **Market access assistance** • **Quality infrastructure**	• *Commodity export ban* • *Technology transfer quid pro quo* • *Import tariff* • *Local content requirement*		• *Competitive exchange rate devaluation*	
Large	Large	Large	• India[a] • China[b] • United States[a]				• **Production subsidy** • **Specific innovation subsidy** • *Export subsidy* • *Consumer demand subsidy* • *Public procurement*		• *R&D tax credit*

Source: Original table for this publication, using data from World Development Indicators, World Bank, https://databank.worldbank.org/source/world-development-indicators.

Note: **First-choice policies** in bold address market failures head-on by subsidizing the activities that are underprovided. *Second-choice policies* in italics shape industry outcomes by intervening indirectly in adjacent markets, through a commodity export ban, foreign currency market, trade values, consumer markets, or the tax code. Country examples are the three largest populations in each group classified by three binary indicators: (1) government bandwidth is classified relative to the median value for Government Effectiveness in the Worldwide Governance Indicators (above median = large, below median = small); (2) market size is classified relative to median GDP in US dollars at market prices (above = large, below = small); (3) fiscal space is classified relative to the median ratios of both tax to GDP and debt to GDP with some exceptions (below-median tax to GDP and above-median debt to GDP = small fiscal space, else large fiscal space). GDP = gross domestic product; R&D = research and development.

a. India and the United States, despite having above-median debt-to-GDP ratios, are classified as having large fiscal space because of their access to capital markets.

b. China, despite having a below-median tax-to-GDP ratio, is classified as having large fiscal space because of its unique local government financing model.

feasible industry policy tools available to them. Some advanced economies lack fiscal space due to increasing debt burdens, which narrows their options. But for the most part, advanced economies have greater access to the full range of tools (particularly first-choice tools) than developing economies, which often face fiscal constraints, high borrowing costs, or lack of access to international debt markets. As a result, the very countries that need industrial policy the most—to diversify their domestic industries and drive economic development—are often those with the least access to it.

Small countries without fiscal space or government bandwidth

Many developing economies have small domestic markets, limited fiscal space due to low capacity for tax collection and/or high debt burdens, and limited government bandwidth. Countries with this combination of characteristics (for example, Mozambique, Madagascar, and Cameroon) often have the greatest need for industrial policy to develop new industries and stimulate growth, but they also have the fewest feasible tools.

The only first-choice tool feasible for such countries is industrial parks to help address market failures related to investor coordination. These can sometimes be established without fiscal space—for example, by auctioning public land and coordinating with private sector entities for the park's operation and/or ownership. Parks also provide opportunities to streamline regulatory processes. Those with preferential regulation, such as special economic zones (SEZs), can help businesses overcome challenges like high tariffs on imported machinery and inputs—which are also often imposed to generate revenue in countries with limited fiscal space. But if those SEZs involve tax exemptions, fiscal space may be relevant.

Among market incentive tools, the only feasible option for this category of countries is a commodity export ban to make key commodity inputs cheaper for domestic businesses. While import tariffs are frequently high in such countries, they are unlikely to be successful as industrial policy tools, given the small size of the domestic market. At the macroeconomic level, the only feasible intervention for these countries is a competitive exchange rate devaluation to make their exports more competitive. However, this carries many risks, including inflation.[17]

Small countries without fiscal space but with government bandwidth

Some small developing economies also lack fiscal space but have relatively large government bandwidth, evidenced by effective public service delivery. Countries with this combination of characteristics (for example, Senegal, Rwanda, and Namibia) can feasibly pursue the same limited set of tools as above, with three additional first-choice public inputs that require strong administrative capacity: skills development programs, market access assistance, and quality infrastructure. These tools can sometimes be delivered on a cost-recovery basis, where businesses pay fees for government services, making them viable for fiscally constrained countries. But for effective implementation, they require government bandwidth or at least "pockets of excellence" across the civil service—such as in education ministries, export promotion agencies, or standards agencies.

Large countries without fiscal space but with government bandwidth

Some countries have limited fiscal space but have government bandwidth and are also home to large markets. Countries with this combination of characteristics (for example, Indonesia, Japan, and the Philippines) can feasibly pursue three additional market incentives: technology transfer quid pro quo policies, import tariffs to protect domestic businesses, and local content requirements. Of these, technology transfer quid pro quo is an additional first-choice policy tool available to such countries. Foreign investors may be willing to transfer their technology to domestic businesses in exchange for access to their large markets. Countries in this category may also pursue import tariffs and local content requirements, but these are second-choice policy tools as they impose higher costs on domestic consumers and businesses.

Countries with fiscal space and government bandwidth

Some countries enjoy both fiscal space and government bandwidth, including large economies (for example, India, China, and the United States) and small economies (for example, Georgia, Botswana, and Latvia). These countries can pursue a much broader range of industrial policy tools, especially subsidies. They can implement first-choice policies like production subsidies, to directly support domestic businesses, as well as specific innovation subsidies, to incentivize R&D and the adoption of new technologies. Rules requiring government procurement from local suppliers are also feasible, even if these rules entail higher costs.

Concerns about industrial policy for development

Despite its potential, many remain skeptical of industrial policy—even when its purpose is to correct market failures—and argue that governments should avoid it. It is fair to say that World Bank staff share this skepticism. There are several reasons.

First, the benefits of industrial policy are difficult to quantify. It is hard to measure the economic benefits of fixing market failures relative to the costs. For example, when entrepreneurs start new ventures, they help reveal whether a new industry is viable, and this knowledge is a public good that benefits everyone.[18] Yet because individual businesses cannot capture such broad benefits, there is a lack of incentive to create new ventures. This challenge motivates government policies to promote entrepreneurship, such as subsidies for start-ups or temporary import tariffs to protect new businesses from foreign competition.

Recent efforts to quantify these effects have found that the impact of industrial policy can be positive but not transformative. One study estimates that gains from addressing a classic rationale for industrial policy—positive spillovers across industries, perhaps due to the pooling of labor, inputs, and ideas—are substantial but not enormous, ranging from 0.59 percent to 2.06 percent of GDP.[19] These gains are modest when compared with the sustained annual GDP growth rates of over 7 percent achieved by historical trade-led growth "miracle" economies in East Asia and Eastern Europe, as well as some resource-rich economies.

Clearly, other factors play an important role in driving overall growth, including investment in human capital through health and education; shared physical infrastructure in utilities, transportation, and energy; and a macroeconomic framework that supports low inflation and access to credit.[20] Industrial policy therefore requires a willingness to experiment and accept the possibility of mistakes.

Recently, experimentation has become even more complicated. Historically, governments targeted industrial policy toward export-oriented manufacturing, guided by the 19th- and 20th-century experience when such activities were closely associated with rapid growth. Recent policy shifts, however, including rising protectionism and economic nationalism, may limit developing

economies' access to large export markets in higher-income economies. At the same time, automation has eroded manufacturing's ability to generate the broad-based employment that once underpinned shared prosperity. The expansion of the middle class in many developing economies also justifies renewed focus on manufacturing for local—rather than global—markets, as well as on productivity gains in labor-intensive services like health care and retail. In the 21st century, there is more uncertainty over which activities to target for industrial policy.

Second, industrial policy carries political risks. Powerful interest groups often lobby for policies that benefit their constituents at disproportionate cost to the government. This can divert resources from more broadly valuable investments, such as education and health. Economists often describe this dynamic as government failure, offering it as an alternative explanation for why developing economies have struggled to build competitive industries.[21] In such contexts, industrial policy can be inefficient or even harmful. For instance, subsidizing one industry may raise the costs of labor, capital, or raw materials for others. If the supported industry is less productive, the overall economy could end up with fewer jobs and lower investment.[22]

Third, industrial policy can affect global markets. When a country is large enough, policies to promote its domestic industries can have spillover effects on other countries. For example, cheap loans from state-owned banks can reduce capital costs for domestic exporters, enabling them to cut prices and expand their global market share. While this benefits foreign consumers who enjoy lower prices, it harms foreign competitors and their workers. World Trade Organization (WTO) rules against certain industrial policy tools, including prohibitions on export subsidies, were designed to prevent these kinds of harmful spillovers and avoid a "race to the bottom," in which countries compete through subsidies rather than natural advantages (refer to box 1.1). The global shipbuilding industry is a recent example of how subsidies can significantly reshape market shares across countries.[23]

Box 1.1 Using trade rules to respond to industrial policy in other countries

Industrial policy in one country can sometimes benefit producers abroad. For example, between 2013 and 2020, only about 49 percent of the gains in consumer surplus and business profits generated by subsidies to the United States electric vehicle industry were captured by North America. Battery suppliers in Japan and the Republic of Korea captured 37 percent of these gains, as the subsidies allowed them to scale up production and reduce costs. Europe also benefited substantially.[a] Similarly, German subsidies for solar panel adoption between 2010 and 2015 spurred innovation, with most of the resulting benefits accruing outside Germany.[b] From the perspective of the government paying the subsidy, this implies that the costs may outweigh the benefits.[c] As a result, economists have long argued that countries may be better off enjoying the benefits of other countries' industrial policies, rather than retaliating against them.[d]

More recent evidence and experience, however, suggests that the effects both across and within countries are more complicated. Even when industrial policies in one country benefit consumers abroad from lower prices, some workers and investors in other countries may be harmed if their businesses lose market share to subsidized foreign competitors. China's rapid rise as an exporter illustrates this complexity. In the United States, consumers benefited from trade with China through cheaper imports,[e] while regions with industries more exposed to import competition experienced larger employment declines.[f] By contrast, in Ethiopia, increased imports from China coincided with industrial job creation, as lower-priced imported inputs reduced costs for domestic businesses.[g] Exposure to other countries' industrial policies can therefore have very different effects across groups.

In response to these tensions, the World Trade Organization (WTO) has established rules disciplining the use of industrial policies that distort trade and providing remedies for member governments to challenge noncompliant measures.[h] Perhaps surprisingly, these rules prohibit only a narrow set of subsidies—those explicitly tied to export performance or local content requirements. Most other subsidies are technically permitted but "actionable": countries may challenge them if they can demonstrate harm. Retaliation typically takes the form of antidumping measures (tariffs on products sold below cost by a foreign business) or countervailing duties (tariffs on all products from a country to offset foreign subsidies). In principle, such measures are temporary and can be withdrawn once the relevant subsidies are removed.

Two major critiques of this system have emerged. The first is that remedies are reactive and require difficult approval processes. WTO rules permit retaliation only after harm has occurred and been demonstrated through a data-intensive litigation process. As a result, relatively few subsidy cases have been brought

(Continued)

Box 1.1 Using trade rules to respond to industrial policy in other countries *(continued)*

through the WTO dispute settlement mechanism, mostly by advanced economies with the legal and technical capacity to litigate. More important, there is no mechanism for responding to anticipated harms through preemptive tariffs on countries suspected of subsidizing emerging industries. This gap has led some countries to raise tariffs outside the WTO mechanism.

The second critique is that some rules may constrain growth in developing economies. Export subsidies and local content requirements, in particular, can be important for industrial development. Moreover, since most developing economies have small markets, their industrial policies would have little chance of harming foreign countries.[i] For this reason, many developing economies in the WTO have argued for exceptions for industrial policies focused on regional development, research and development (R&D), and environmental objectives.[j] Advanced economies, however, have generally been reluctant to expand such exceptions.[k]

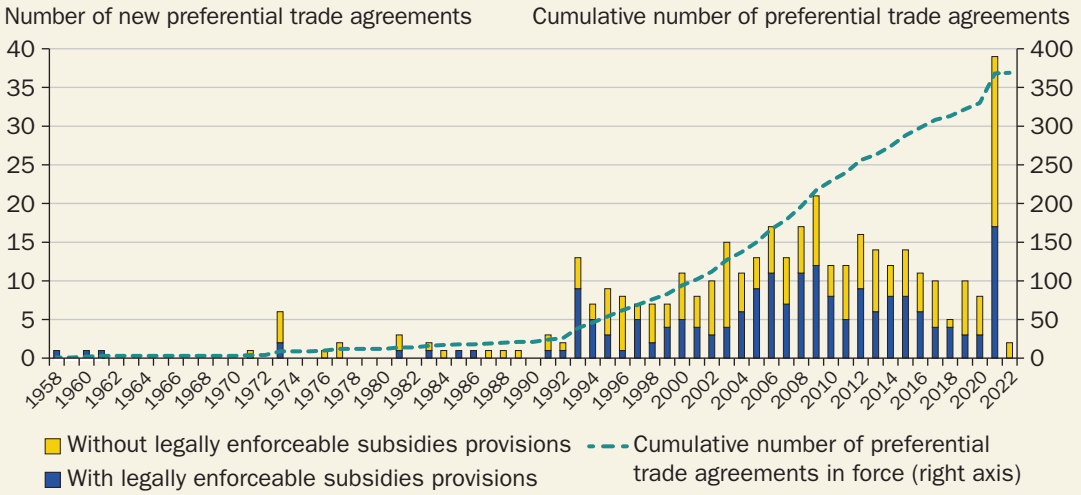
Notably, WTO rules already allow special and differential treatment (SDT) for developing economies, including: (1) longer timelines to implement agreements and commitments, (2) stronger safeguards for their trade interests, and (3) technical assistance to help them comply with WTO requirements, handle disputes, and implement standards. In addition, least developed countries (LDCs) have LDC-specific SDT provisions.[l] For example, LDCs are exempted from the prohibition of using export subsidies as long as they remain LDCs. In the WTO, access to SDT provisions has long been a subject of debate, as developing economies account for two-thirds of the WTO membership. In recent years, some developing economies announced that they would not seek SDT flexibilities in future WTO negotiations.[m] Notably, in September 2025, China announced that it will not seek SDT flexibilities in future WTO negotiations, while keeping its developing economy status.

Other mechanisms for disciplining industrial policy operate outside the WTO framework, including state aid control in the European Union (EU) and provisions in preferential trade agreements related to subsidies and other policy areas. State aid control involves a framework of rules requiring the monitoring, evaluation, and—in many cases—prior approval of government support measures to ensure that it does not distort competition or undermine market efficiency.[n] Amid substantial growth in preferential trade agreements since the 1990s, the share of agreements containing legally enforceable provisions to regulate subsidies has also increased (refer to figure B1.1.1). Such provisions are more common in agreements among advanced economies than in those involving developing economies: between 2011 and 2022, 65 percent of new agreements among advanced economies and 40 percent among developing economies included subsidies provisions.[o] Evidence suggests that

(Continued)

Box 1.1 Using trade rules to respond to industrial policy in other countries *(continued)*

Figure B1.1.1 Provisions on subsidies in preferential trade agreements



Sources: Deep Trade Agreements (database), World Bank, https://datatopics.worldbank.org/dta/table.html; Mattoo et al. 2020.

Note: Legally enforceable subsidies provisions are defined as those with legally enforceable language and a dispute settlement mechanism available.

agreements with subsidies provisions help shield countries from the trade-distorting effects of industrial policies adopted by partner countries.[p] The scope for industrial policy is further constrained by other trade agreement provisions, including rules on antidumping, local content, rules of origin, intellectual property, and technical barriers to trade, as well as transparency requirements for government procurement and investment incentives.[q]

a. Barwick et al. (2025b).

b. Gerarden (2023).

c. A recent economic model simulating global trade suggests that most of the gains from export subsidies accrue not to the subsidizing country, but rather to consumers in other countries (Lashkaripour and Lugovskyy 2023).

d. Refer, for example, to Johnson (1965); Krugman et al. (1984).

e. Jaravel and Sager (2019) estimate that a 1 percentage point increase in import penetration from China causes a 1.91 percent decline in US consumer prices.

f. Acemoglu et al. (2016) estimate that rising Chinese import competition resulted in 2–2.4 million US job losses between 1999 and 2011. This figure likely represents less than 1 percent of total US job separations during the period, based on a rough average of 13 million separations per quarter (Lazear and McCue 2017). Nonetheless, the geographic concentration of job losses across the United States placed significant stress on those communities.

g. Mavungu (2025) estimates that a one-unit increase in a measure of Chinese import penetration leads to a 15.2 percent increase in manufacturing employment in Ethiopia.

h. Beyond dispute settlement, the WTO's main value is the agreement among members not to impose different tariff rates on different countries within the same product categories. This prevents dominant trading partners from pushing down prices (Bagwell and Staiger 2011).

i. Bown (2024) makes this argument.

(Continued)

Box 1.1 Using trade rules to respond to industrial policy in other countries *(continued)*

j. WTO (2023).

k. WTO (2024).

l. The UN Committee for Development Policy sets the thresholds for inclusion of countries into the LDC category, based on three socioeconomic criteria: human assets index, gross national income per capita, and economic vulnerability index. Since its establishment in 1971, eight countries graduated from the LDC category: Botswana (1994), Cabo Verde (2007), Maldives (2011), Samoa (2014), Equatorial Guinea (2017), Vanuatu (2020), Bhutan (2023), and São Tomé and Príncipe (2024).

m. For example, in 2019, Costa Rica, Korea, and Singapore announced that they would not be availing of SDT in current and future WTO negotiations.

n. State aid is defined under Article 107 of the Treaty on the Functioning of the European Union (TFEU) as a measure that meets four conditions: (1) it is granted through state resources (for example, grants, tax exemptions, or preferential purchasing); (2) it confers a selective economic advantage to certain undertakings or industries; (3) it distorts or threatens to distort competition; and (4) it affects trade between EU member states (Pop et al. 2021; World Bank 2025). The framework for state aid control is guided by principles such as necessity, proportionality, and appropriateness to ensure that the aid is targeted, minimal, and the most effective option available. A balancing test is also applied to weigh the benefits of the aid against potential negative impacts on competition and trade.

o. Between 2011 and 2022, 153 new trade agreements were signed, of which 31 were among advanced economies (20 with subsidies provisions) and 20 were among developing economies (8 with subsidies provisions).

p. Barattieri et al. (2025).

q. Fernandes et al. (2021, 2023).

Deciding when to pursue industrial policy for development

Given these concerns, should a country pursue industrial policy at all? While it departs somewhat from economic orthodoxy, there are several reasons to do so.

Three broad shifts in recent decades warrant a reexamination of the skepticism surrounding industrial policy. First, the talent available to governments has expanded substantially amid rising education levels globally. Second, the political environment in many countries has become more supportive of development objectives. While attribution is difficult, broad improvements in macroeconomic stability, growth, and health outcomes likely reflect a closer alignment of politics with development goals, rather than improvements in talent alone. As a result, many political systems today appear more capable of implementing industrial policies effectively and efficiently. Third, most economies are now open rather than closed. This openness narrows the scope of industrial policy—placing greater emphasis on public inputs—but also reduces the need for any single agency to control every policy lever.

In this new environment, governments can use the following decision sequence to prioritize industrial policy interventions.

(1) Keep emphasis on improving enabling institutions.

Despite the potential of well-designed industrial policies for development, nothing in this report suggests that they can be effective or efficient without enabling institutions. These institutions include accountable and capable implementing agencies that are insulated from politics and interest-group pressures, and strong economywide fundamentals: an educated and healthy workforce, energy and transportation infrastructure, and a sound macroeconomic framework. If governments pursue industrial policy as a temporary fix for fundamentals, they should set milestones for improvements in those fundamentals over the planned length of the industrial policy, 3–10 years.

(2) Select low-cost public inputs not provided by the market.

Even with limited fiscal space and small local markets, countries with sufficient government bandwidth can still pursue an industrial strategy. The first choice should be public inputs that can be delivered at cost and are underprovided due to specific market failures, such as coordination failures (industrial parks), skills underinvestment (skills development), and information asymmetries (market access assistance and quality infrastructure). Some tailoring to the needs of industries may be required but should not be exclusive.

(3) Provide market incentives if fundamentals and public inputs are insufficient.

Countries should turn to market incentives as a last resort, as these are typically the most costly—either fiscally (production and innovation subsidies, consumer demand subsidies, and public procurement), for the broader economy (import tariffs, local content requirements, commodity export bans, export subsidies), or due to retaliation from trading partners. Moreover, these tools require careful monitoring. A notable exception is a technology transfer quid pro quo arrangement, when technology cannot be licensed, which incurs no fiscal cost.

(4) Be wary of macroeconomic interventions.

Competitive exchange rate devaluation is difficult to sustain over the long period of time needed to realize benefits and can trigger retaliation by other countries. More research is needed to understand whether and when general tax credits for research and development in private businesses translate into valuable inventions.

Notes

1. Refer, for example, to Cherif and Hasanov (2019), Criscuolo and Lalanne (2024), DiPippo et al. (2022), EBRD (2024), Evenett et al. (2024), Fasteau and Fletcher (2024), Harrison (2024), Juhász et al. (2023), Mazzucato (2018), Robinson (2009), and Rodrik (2004).
2. For example, the 2024 *World Development Report*'s glossary defines industrial policy as "a policy that directs state support toward specific technologies, sectors, industries, or firms" (World Bank 2024, xxvi). The IMF website defines it as "policies… designed to develop or support specific domestic industries, firms, or narrowly defined economic activities to achieve certain economic or non-economic objectives." Tirole (2017, 365) defines it as "the channeling of public funds or tax breaks to benefit certain technologies, sectors or even specific firms or to support small businesses."
3. Refer, for example, to Juhász et al. (2024).
4. Goldberg and Reed (2023); Rodrik et al. (2017).
5. Crespi et al. (2014); Harrison and Rodríguez-Clare (2010).
6. IMF (2025, 77) emphasizes that industrial policies "typically involve trade-offs between competing objectives."
7. For textbook examples of market failures, refer to Juhász et al. (2024), Rodrik (2009), and Stiglitz (1989).
8. A closely related terminology of public inputs and market interventions (designated here as incentives) is used in Crespi et al. (2014).
9. Lipsey and Lancaster (1956) provide a general statement of the theory of the "second-best": the idea that when multiple market failures exist, fixing just one may not work and can even backfire. Bhagwati (1971) surveys contemporary literature, arguing certain trade and industrial policies can be first- or second-best given different market failures. Corden (1997, 21) proposes a hierarchy of policy tools according to whether they are first-best ("making the appropriate correction as close as possible to the point of divergence [from private and social cost]"), second-best, and so on: "At each step down the hierarchy an additional by-product distortion is imposed, and the welfare level attainable with the appropriate optimal policy declines." To avoid confusion, this report calls these "first-choice" and "second-choice."
10. Hausmann and Rodrik (2003) define the discovery of an economy's cost structure as the process whereby businesses discover which activities can be produced at low enough cost. Such discovery can take place only through experimentation by entrepreneurs.
11. Trade facilitation defined as the simplification, modernization, and harmonization of export and import processes is an active and important area for policy action but is not considered in this report as part of market access assistance.
12. Bhagwati (2000, 9).
13. Hausmann (2008) introduces the term "government bandwidth."
14. Goldberg and Reed (2023). On capital-intensive industries, refer to Leone et al. (2025).

15. For these tools, market size through preferential trade agreements does not matter.
16. For ease of measurement, market size is captured in table 1.2 by domestic size only (GDP). However, for most industrial policy tools (except tariffs), the concept of market size also includes the size of destination markets with preferential access. Similarly, fiscal space is measured parsimoniously using debt-to-GDP and tax-to-GDP ratios—though for countries where natural resource revenues are a key source of fiscal income, fiscal space may be large despite low tax-to-GDP ratios. Improvements to the taxonomy in table 1.2 are left for future work.
17. The set of feasible industrial policy tools in fragile and conflict-affected countries with small market size, no government bandwidth, and small fiscal space may be further constrained by violent conflict, insecurity, and displacement. Future refinements to the country taxonomy should incorporate such features.
18. Hausmann and Rodrik (2003) model this market failure.
19. Bartelme et al. (2025); Lashkaripour and Lugovskyy (2023) find similar results.
20. Commission on Growth and Development (2008).
21. Refer, for example, to Krueger (1990, 1993).
22. For example, Furman (2025) finds that while the US Bipartisan Infrastructure Law increased spending on highway construction by 36 percent from mid-2019 to mid-2024, the costs of inputs—such as asphalt, concrete, and labor—rose even more. After accounting for these increases, real infrastructure spending fell by 17 percent over the same period. This highlights the challenge of major investment booms when the supply of inputs cannot increase as fast as spending.
23. Barwick et al. (2025a) show significant reallocation of market share from Japan and Korea to China from 1998 to 2024.

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CHAPTER 2

Who Does Industrial Policy?

Stylized facts and differences from existing literature

The most widely used database to compare industrial policy across countries is the Global Trade Alert (GTA), established in 2009 by Simon Evenett to record state interventions that could affect global trade (refer to box 2.1).[1] The GTA finds the most interventions in large economies: the correlation between the number interventions and gross domestic product (GDP) is 0.8.[2] Two conclusions drawn from this database based on past work are that (1) advanced economies heavily dominate the use of industrial policy, and (2) modern industrial policy tends to rely more on subsidies and export promotion than on import tariffs.[3]

Drawing on additional data sources, this chapter interrogates these conclusions while also establishing new ones. The chapter introduces a series of stylized facts, including: countries target fewer industries as they get richer; developing economies use tariffs, commodity export restrictions, and local content requirements more than advanced economies; and advanced economies rely more on business subsidies, although such subsidies are also at an all-time high in upper-middle-income countries. A final cross-cutting stylized fact is that cross-country comparisons of industrial policy use are often very difficult, due to data limitations and methodological challenges.

Overall, even with caveats, these findings are quite contrary to the recent literature based on the GTA. Developing economies use industrial policy just as much, if not more, than advanced economies. For the poorest, there has been no transition from tariffs towards "modern" subsidies. Viewed in historical context, this finding is perhaps unsurprising. As Ha-Joon Chang has observed, advanced economies once used industrial policy extensively in pursuit of their own growth.[4] Developing economies today are using similar means, where available, to catch up to the leaders.

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Countries target fewer industries as they get richer

As a first step in describing who does industrial policy, the authors reviewed the most recent national growth strategies or development plans for 183 countries.[5] The review asked a simple question: How many industries does each country explicitly prioritize for future growth? Since countries typically list priority industries in their national development plans, these plans serve as one potential indicator for measuring governments' use of industrial policy.

Box 2.1 Measuring industrial policies according to "expected impact" rather than "government intent"

A key distinction of this report is its focus on policies that, based on economic principles, are *expected* to increase strategic business activities. Much of the current literature instead classifies industrial policy based on government *intent*. While useful in some respects, the intent-based approach relies on subjective interpretation and often excludes a wide range of relevant policies.

To illustrate, it is helpful to understand how intent-based analyses of industrial policy are conducted, all drawing from the Global Trade Alert (GTA) database. Between 2017 and 2022, GTA recorded nearly 30,000 policy announcements, including around 19,000 subsidies and over 4,000 tariffs (such as antidumping or countervailing duties). Researchers then assemble their own databases of industrial policy, applying judgment to determine government intent behind policies in the GTA data.

As figure B2.1.1 shows, the results of this approach can differ substantially. Juhász et al. (2023), for example, classify only 9,000 of the GTA database's 2017–22 policy announcements as industrial policy. They use natural language processing, an automated text analysis tool, to identify policies where governments explicitly declare their intent "to change the composition of economic activity." As a result, they exclude policies like a 2011 Swiss loan described as "added export subsidies" and a 2020 Indian production subsidy scheme to "incentivize large scale electronics manufacturing." In response, the European Bank for Reconstruction and Development[a] uses ChatGPT to "recover" some policies excluded by Juhász et al., nearly doubling the count to 16,000. By contrast, the New Industrial Policy Observatory (NIPO) database adopts a different intent-based filter, focusing only on policies that either target strategic industries like semiconductors, critical minerals, medical products, and low-carbon technology or have specific policy motives (supply chain security, strategic competitiveness, digital transformation, geopolitical concerns, national security and/or geopolitical concerns, supply chain resilience/security, domestic competitiveness, or climate change mitigation), yielding about 18,000 policies.[b]

These differences underscore two points about government intent-based approaches to industrial policy analysis. First, each database involves significant judgment in determining what counts

(Continued)

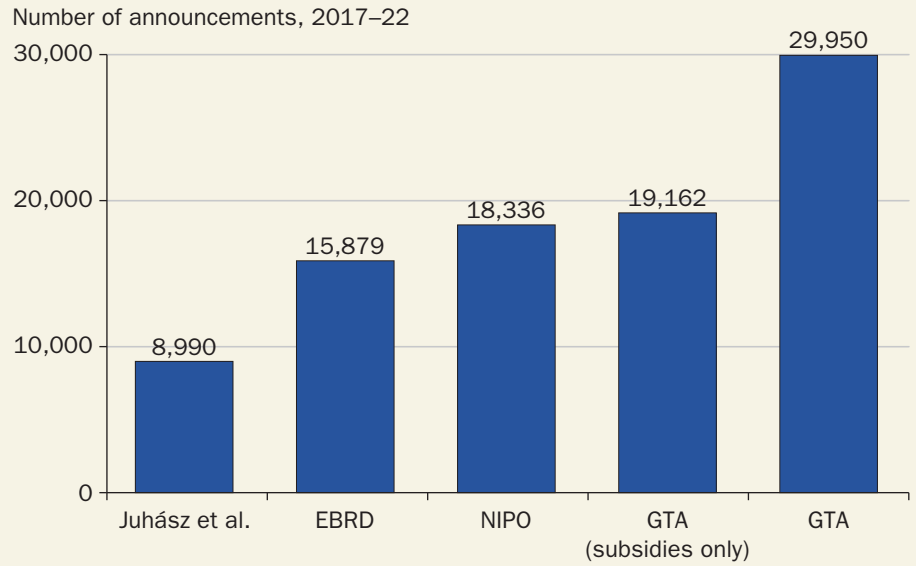
Box 2.1 Measuring industrial policies according to "expected impact" rather than "government intent" *(continued)*

as industrial policy. Second, when machine learning is applied, the classification process is not fully transparent. Moreover, even when designed with a different intent, the economic effects of policies like subsidies and tariffs are often identical.

For these reasons, this report does not attempt to infer government intent. Instead, it focuses on broad policy tools that can be expected to grow specific activities or industries. Moreover, by drawing on additional data, this report considers a much broader set of policies than the GTA database—and produces different stylized facts than Juhász et al., EBRD, and NIPO.

Figure B2.1.1 Alternative databases of industrial policy practice compared to the Global Trade Alert

Industrial policy interventions in Global Trade Alert

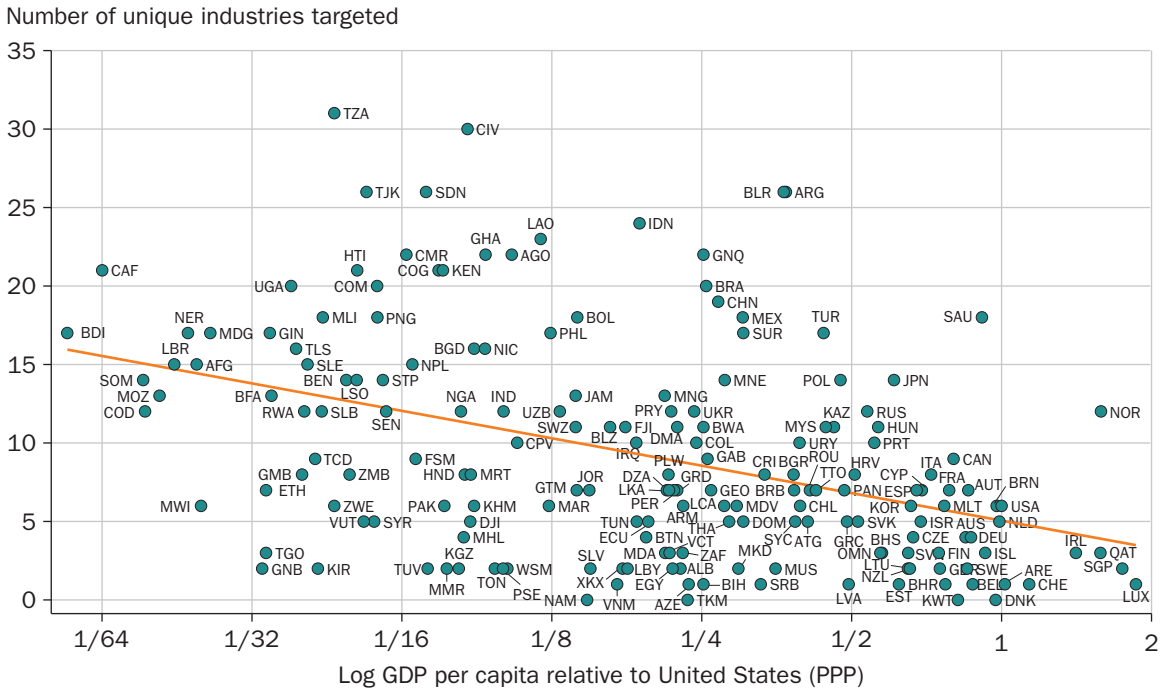


Sources: EBRD 2024; Evenett et al. 2024; Global Trade Alert (GTA) (database), St. Gallen Endowment for Prosperity through Trade, https://globaltradealert.org/data-center; Juhász et al. 2023.

Note: Data include both GTA liberalizing measures and measures that discriminate against foreign businesses (and protect domestic businesses) across 69 countries also covered in NIPO (New Industrial Policy Observatory). Juhász et al., EBRD (European Bank for Reconstruction and Development), and NIPO independently define industrial policies within the GTA data. Industrial policy measures in the NIPO database are restricted to interventions covering specific industries (for example, medical products, critical minerals, or advanced technology products) or policy motives (national security and/or geopolitical concerns, supply chain resilience/security, domestic competitiveness, or climate change mitigation). In the GTA, subsidies include export, quantity, and industrial subsidies.

a. EBRD (2024).
b. Evenett et al. (2024).

Figure 2.1 Number of industries specified in national development plans, by income



Sources: National development plans (183 total); United Nations Statistics Division, for Harmonized System (HS) codes; World Development Indicators (database), World Bank, https://databank.worldbank.org/source/world-development-indicators.

Note: A "unique industry" is defined as a product name mentioned in a national development plan that can be matched to a single two-digit HS code (1992) for agriculture, mining, and manufacturing or a service category in the services trade data from the Harvard Growth Lab's Atlas of Economic Complexity. For each economy, the GDP per capita from two years prior to the publication of the national plan is used, to match with trade data used later in the analysis. For the economy labels used in the figure, refer to ISO, https://www.iso.org/obp/ui/#search (select "country codes"). GDP = gross domestic product; PPP = purchasing power parity.

The review finds that governments at all income levels name specific industries in their national development plans, but the number of industries identified declines as GDP per capita increases (refer to figure 2.1). For example, Papua New Guinea targets 18 industries for future growth, while Czechia, a country with similar population size but much higher GDP per capita, targets only five. On average, low-income countries target 13 industries, lower-middle-income countries target 12, upper-middle-income countries target 9, and high-income countries target 5. This measure suggests that industrial policy is more heavily practiced in developing economies than in advanced economies.[6] The number of industries targeted by middle-income economies displays greater variation, partly reflecting country size, as larger economies have more industries to target.

Why might this be the case? Notably, advanced economies' national development plans are less specific, often focusing broadly on "manufacturing," "services," or types of technologies (for example, artificial intelligence or quantum computing) instead of specific industries. Since advanced economies already have capabilities across many industries, they tend to prioritize technological innovation in general. In contrast, since developing economies have fewer existing capabilities, their priority is expanding into new industries.

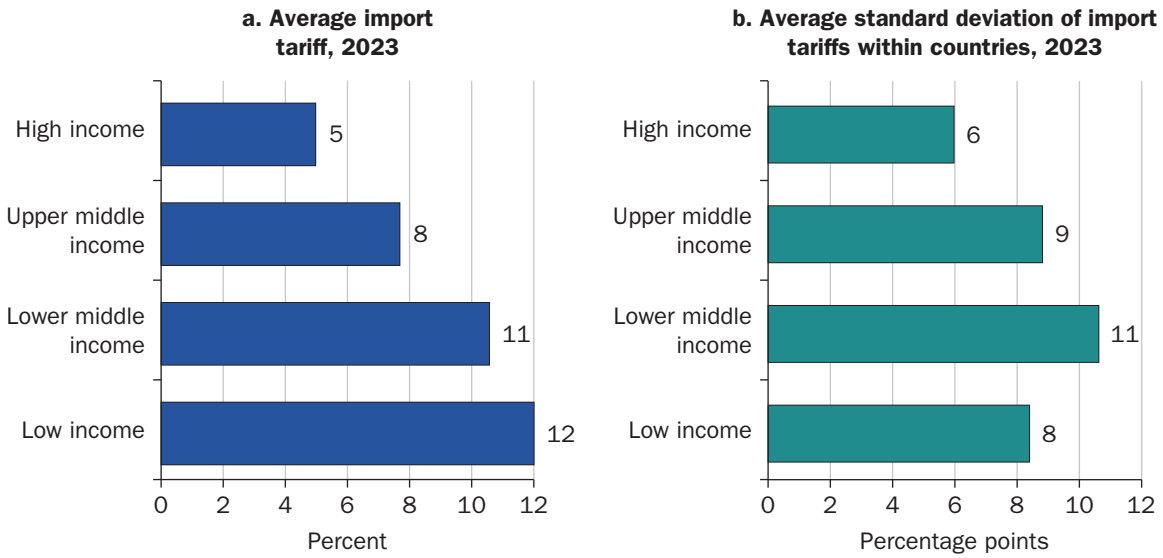
Developing economies use tariffs more than advanced economies

One limitation of the GTA database is that it only records whether a new policy is introduced and it does not capture the policy's strength—it does not distinguish, for example, between low and high tariff rates. Tariff levels are an important measure of industrial policy, since higher tariff rates provide greater protection to domestic producers.

Data on import-weighted average tariffs in 2023 show a clear relationship between tariff level and country income level (refer to figure 2.2, panel a).[7] Low-income countries impose average tariffs of 12 percent on imports, lower-middle-income countries average 11 percent, upper-middle-income countries average 8 percent, and high-income countries average just 5 percent. Even when accounting for the tariff increases introduced by the United States in 2025 and China's retaliatory measures, the ranking across income groups remains unchanged.[8] A similar pattern appears in the New Industrial Policy Observatory (NIPO) database, which targets GTA data for critical industries or with specific policy motives. NIPO finds that lower-income countries introduce import tariffs more heavily as an industrial policy tool, though their levels are not captured.[9]

As noted, tariffs also generate government revenue for many developing economies. Unlike corporate and personal income taxes, tariffs are relatively easy to collect as goods cross borders. From 2021 to 2023, tariffs provided an average of 17 percent of total government revenue for developing economies.[10] However, figure 2.2, panel b, suggests that these countries do not use tariffs solely for revenue purposes. The dispersion of tariff rates across products is much larger for developing economies than for advanced economies, which suggests that tariffs are often applied selectively to tilt economic activity and protect certain industries. If revenue generation was the only goal, governments could apply a uniform tariff across all products.

Figure 2.2 Average tariff levels and dispersion within countries, by income group



Sources: Base pour l'Analyse du Commerce International (BACI) (database), Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), https://www.cepii.fr/DATA_DOWNLOAD/baci/doc/baci_webpage.html; World Integrated Trade Solution (WITS) TRAINS (Trade Analysis and Information System) tariff data, World Bank, https://wits.worldbank.org/.

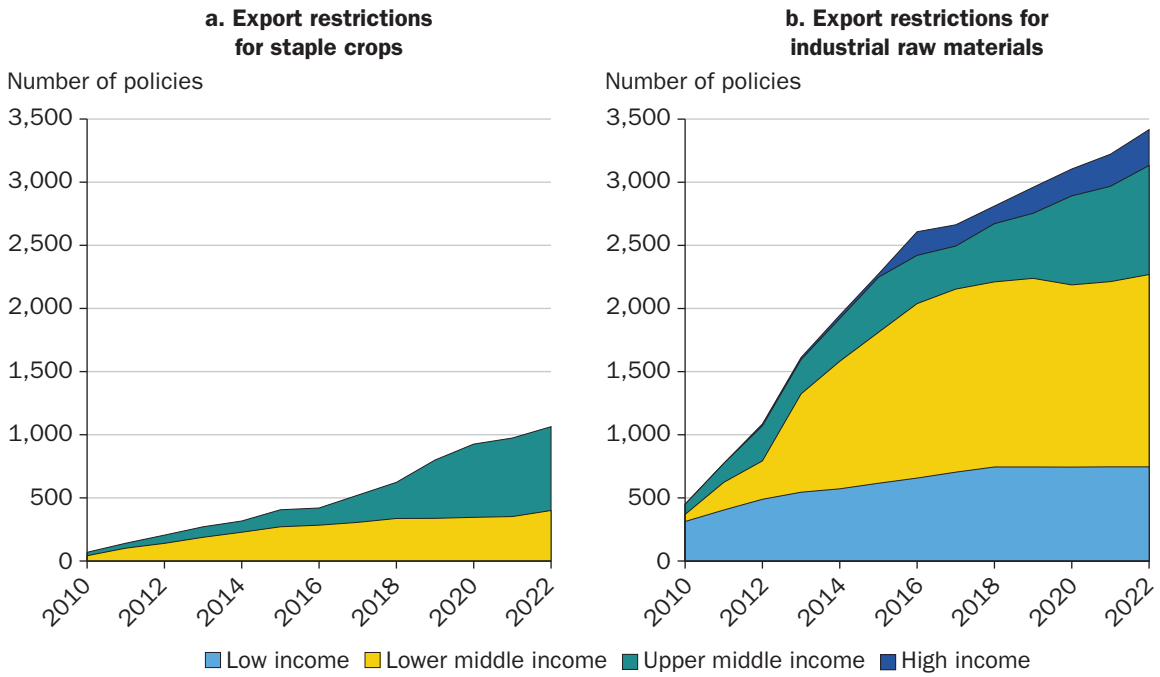
Note: Most-favored nation (MFN) tariff rates are used. Panel b presents the average standard deviation of MFN tariffs across Harmonized System (HS) six-digit products within countries by income group. Within-country the average tariff is import value–weighted, but averages across income groups weight countries equally. The rankings between income groups are identical using applied tariff rates, though average rates are slightly lower. The sample covers 187 economies (66 high income, 49 upper middle income, 50 lower middle income, 22 low income).

Developing economies use commodity export restrictions and local content requirements more than advanced economies

Export restrictions, particularly commodity export bans, are increasingly used across countries to promote domestic industries. This is especially relevant for minerals that are critical inputs for digital technologies.

Examples include Indonesia's nickel ore export bans in 2014 and 2020, Zimbabwe's chromium export ban in 2021, and Namibia's export bans on lithium and rare earth minerals in 2023. Export bans have overtaken other forms of export restrictions, such as export taxes and licensing requirements. In 2023 alone, GTA data recorded 516 export bans imposed by 64 countries. Many countries across the income spectrum also restrict exports of agricultural commodities and industrial raw materials (refer to figure 2.3), for example: Argentina and Gabon (upper middle income); India, Viet Nam, and Zambia (lower middle income); and Burundi, Ethiopia, and Sierra Leone (low income).[11]

Figure 2.3 Rising export restrictions, by income group



Sources: Export Restrictions on Staple Crops (database), Organisation for Economic Co-operation and Development, https://www.oecd.org/en/topics/sub-issues/agro-food-trade/export-restrictions-on-staple-crops.html; OECD 2024.

Note: The sample covers 10 countries (4 upper middle income, 6 lower middle income) in panel a and 55 countries (8 high income, 17 upper middle income, 19 lower middle income, 11 low income) in panel b.

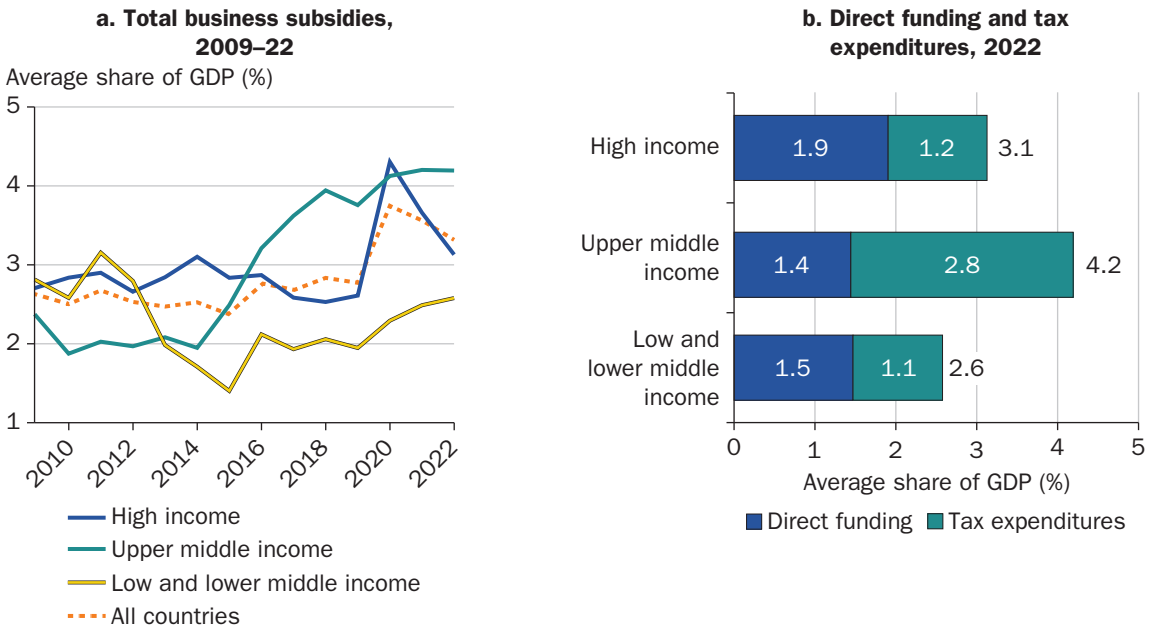
Regarding local content requirements, the GTA reports their heavy use by upper-middle-income countries, which introduced more than 2,800 new such measures between 2010 and 2023, whereas those measures were rarely imposed by high-income or low-income countries.

Advanced economies rely more on business subsidies than developing economies

Evidence from the GTA database shows that subsidy-type interventions increased significantly between 2009 and 2021, with most adopted by Group of 20 (G20) economies.[12] A limitation of the GTA is that it likely undercounts these interventions for lower-income economies, where reporting on new policies is less regular.[13]

Improving upon a mere indication of prevalence, the economic value of subsidies to businesses can be tracked in two ways: by the International Monetary Fund Government Finance Statistics data (supplemented by World Bank BOOST data in some instances), which measures government direct funding of businesses, and by the Global Tax Expenditures Database (GTED), which quantifies tax expenditures.[14] Tax expenditures are an upper-bound estimate, which assumes activities receiving tax holidays would have occurred in the absence of the tax holiday. If the activity receiving a tax holiday, say foreign investment, would not have happened otherwise, forgone

Figure 2.4 Direct funding to businesses and tax expenditures, by income group



Sources: BOOST Open Budget Portal, World Bank, https://www.worldbank.org/en/programs/boost-portal; Global Tax Expenditures Database, Council on Economic Policies and the German Institute of Development and Sustainability, https://gted.taxexpenditures.org; Government Finance Statistics (GFS), International Monetary Fund, https://data.imf.org/en/datasets/IMF.STA:QGFS; Redonda et al. 2025.

Note: Total subsidies are direct funding plus tax expenditures. The term "direct funding" refers to direct transfers to businesses, like regular transfers intended to compensate for recurrent losses, subsidies payable to resident producers for output used locally, subsidies resulting from the central bank accepting interest rates lower than the prevailing market rates, and subsidies on payroll, while "tax expenditures" refers to forgone tax revenue from businesses. The basis for direct funding figures is GFS data, supplemented where necessary by BOOST and fiscal survey data if the most recent three overlapping observations for each country differed at most by 0.1 percent of GDP. For countries with no GFS data, BOOST or fiscal survey data were used, which provide a similar picture in a smaller subsample. The sample covers 89 countries for panel a (35 high income [H], 22 upper middle income [UM], 21 lower middle income [LM], 11 low income [L]), and 64 countries for panel b (30 H, 19 UM, 12 LM, 3 L). Lower-middle-income and low-income countries have been grouped together given the small size of the latter group. The largest (in terms of GDP) countries in the sample are the United States [H], Brazil [UM], India [LM], and Tanzania [L]. China is not covered by either of the databases. Not all countries have data for all years. Missing values for 2022 are replaced with values for 2021 when available. GDP = gross domestic product.

tax revenue would be zero. Data from 89 economies (excluding China) reveals that subsidies have grown rapidly as a share of GDP since 2010, particularly in upper-middle-income and high-income countries (refer to figure 2.4, panel a). By 2022, the sum of direct funding and tax expenditures in these countries averaged 4.2 percent and 3.1 percent of GDP, respectively (refer to figure 2.4, panel b). In upper-middle-income countries, this value is at an all-time high and tax expenditures make up a larger share of total state support for businesses. However, these values may be undercounted in developing economies due to data limitations. Further, these values do not account for other types of subsidies such as subsidized credit, below-cost utilities, debt restructuring, waivers on fees and charges, underpriced access to government land, loan guarantees, implicit and explicit insurance, and discriminatory procurement. Finally, it is unknown whether the values capture subsidies targeted at strategic business activities or the economy as a whole.

Estimating the overall fiscal cost of subsidies and of industrial policy more broadly is difficult, as definitions of industrial policy vary across studies. Sometimes estimates vary widely even for the same country. Available estimates from several organizations are available, but they are not comparable to the total subsidies to businesses discussed above. A recent study by the Economic Commission for Latin America and the Caribbean (ECLAC), for example, analyzed the fiscal costs of industrial policies—what it refers to as "productive development policy instruments"—in Argentina, Brazil, Chile, Colombia, and Mexico.[15] Due to methodological and data limitations, however, the quantification included only instruments that directly support the creation of new businesses or operational improvements at existing businesses. It excluded support related to the business environment and capacity building, as well as investments in specialized infrastructure—key tools typically associated with industrial policy.[16] As a result of this limited scope, ECLAC found that the five countries allocated a relatively small share of public resources to such policies from 2021 to 2022: between 0.2 percent and 1.2 percent of GDP. By comparison, Organisation for Economic Co-operation and Development (OECD) countries average an expenditure of 3.2 percent of GDP on industrial policy.[17] According to one study, China spent an estimated 1.5 percent of GDP on industrial policy annually over the period 2017–19, while the Republic of Korea spent 0.7 percent and the United States 0.4 percent.[18] More recent research by International Monetary Fund researchers estimates China's annual spending possibly reaching about 4 percent of GDP as of 2023.[19]

Comparing the cross-country use of public inputs and macroeconomic interventions—as well as public procurement—is particularly challenging

As noted in chapter 1, this report focuses on three types of industrial policy tools that are expected to grow industrial activities: public inputs, market incentives, and macroeconomic interventions. Of these, public inputs and macroeconomic interventions—and, among market incentives, public procurement—are the most difficult to measure. Nonetheless, partial indicators exist that shed light on how countries deploy these tools across income levels.

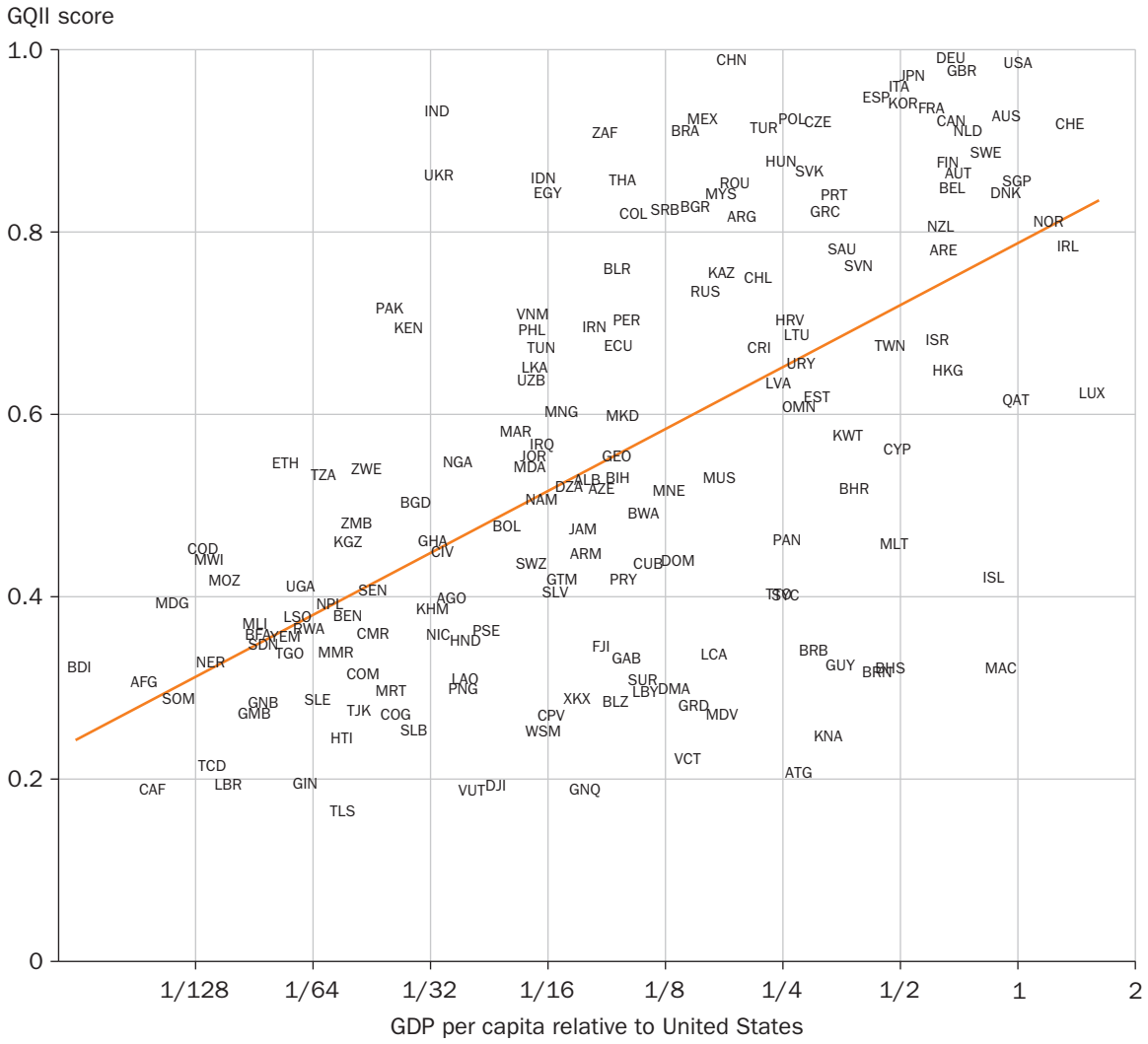
The use of public inputs is particularly difficult to compare across countries because they often do not involve an easily measurable fiscal cost. This report highlights four types of public inputs: industrial parks, skills development programs, market access assistance, and quality infrastructure. Efforts to measure the use of industrial parks include a recent global inventory that identifies about 5,400 special economic zones (SEZs) across 147 countries, nearly 90 percent of which are in developing economies. China alone has more than 2,500 SEZs, Türkiye has nearly 500, and India and Viet Nam both have nearly 400.[20] This inventory does not include municipal zoning for specific industries, which exists in almost every city.

Skills development programs are not systematically tracked, but examples reveal global trends. These include programs on advanced technologies (for example, semiconductor training in Costa Rica), services (for example, nurse training in the Philippines or information technology (IT) training in India), and reskilling workers to transition out of carbon-intensive activities (for example, programs for coal workers in the Slovak Republic's Horna Nitra region and Romania's Jiu Valley).

The prevalence of market access assistance programs is reflected in the growth of export promotion agencies, which typically manage this public input. Their number has grown in recent decades, reaching 140 countries in 2024.[21]

Most countries' quality infrastructure systems rely on a diverse set of public and private institutions. The Global Quality Infrastructure Index (GQII) compares quality infrastructure across countries, covering key components like standardization, accreditation, metrology, and international recognition.[22] Countries with higher income per capita tend to have stronger quality infrastructure systems (refer to figure 2.5).[23]

Figure 2.5 Quality infrastructure score, by income



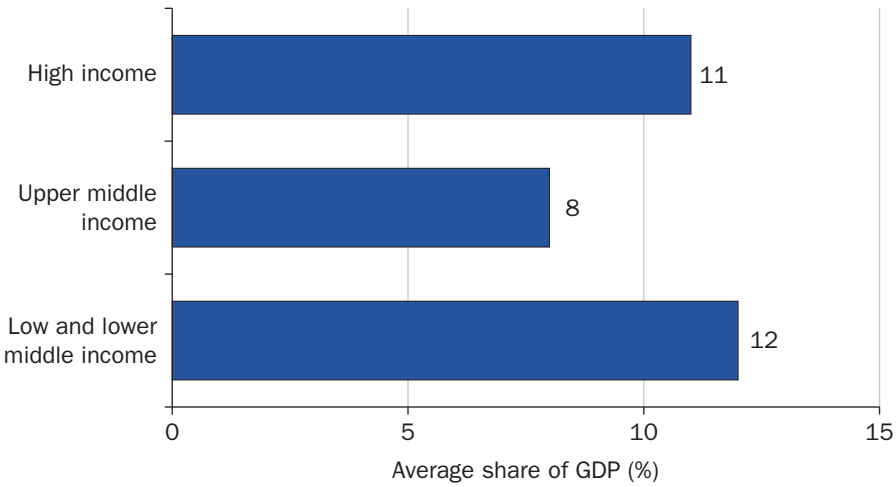
Sources: Harmes-Liedtke et al. 2024; World Development Indicators DataBank, World Bank, https://databank.worldbank.org/source/world-development-indicators.

Note: The sample covers 185 economies for which Global Quality Infrastructure Index (GQII) scores are available. For the economy labels used in the figure, refer to ISO, https://www.iso.org/obp/ui/#search (select "country codes"). GDP = gross domestic product.

Among market incentive tools, public procurement is similarly difficult to measure. Governments procure large amounts of goods and services to deliver public services and implement policies. Data from the Global Public Procurement Database, covering 97 countries,[24] indicate no systematic relationship between the size of government procurement and income per capita. Government procurement accounts for 12 percent of GDP in low- and lower-middle-income countries, 11 percent in high-income countries, and 8 percent in upper-middle-income countries (refer to figure 2.6). There is no cross-country data set that systematically documents the use of government procurement as tools to promote domestic industries—for example, through "buy local" provisions. However, the GTA reports an increase in the number of new procurement-related measures that discriminate against foreign interests from 2009 to 2023. This increase has been more pronounced in high-income countries, where such measures reached 335 in 2023, compared to 34 in low- and middle-income countries.

Macroeconomic interventions are also difficult to measure systematically. In particular, competitive exchange rate devaluation—when governments

Figure 2.6 Government procurement, by income group



Source: Global Public Procurement Database, World Bank, https://www.globalpublicprocurementdata.org/gppd/.

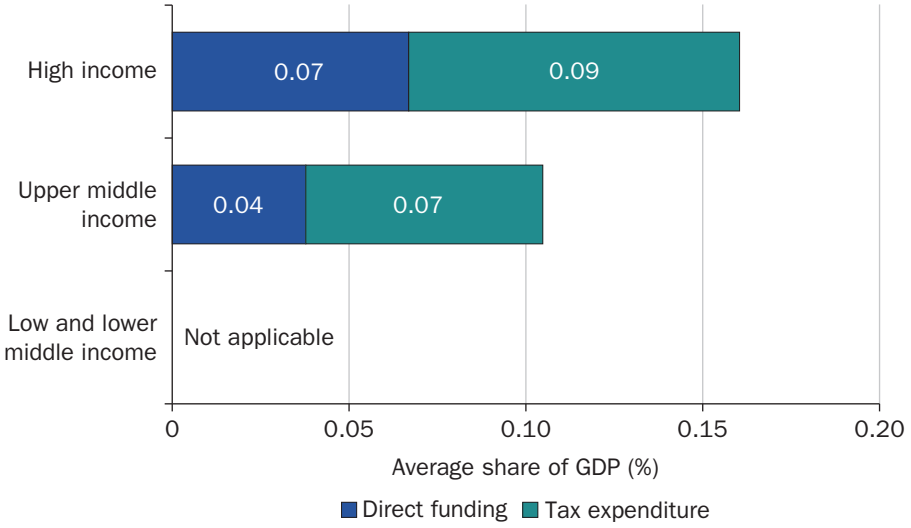
Note: The sample covers the most recent year (between 2018 and 2022) for 97 countries (30 high income, 32 upper middle income, 26 lower middle income, and 9 low income).

deliberately lower the value of the currency by accumulating foreign currency reserves—cannot be measured directly. While central banks' accumulation of foreign reserves is typically public, it may reflect other dynamics, such as foreign investment inflows or an export boom. This makes it difficult to determine when a country deliberately undervalues its exchange rate.

Information on government support for R&D, by contrast, is more readily available, at least for more advanced economies. Recent OECD data covering 46 countries show that high-income countries spend, on average, about 0.16 percent of GDP on R&D support for businesses (refer to figure 2.7).[25] Of this, 0.09 percent comes through tax credits and the remainder through direct funding. While important, this amount is small compared to total business subsidies in high-income countries, which average 3.1 percent of GDP (refer to figure 2.4). In upper-middle-income countries, R&D support is somewhat lower, at 0.11 percent of GDP.

Figure 2.7 **Support for research and development, by income group**

Research and development subsidies



Source: R&D Tax Incentives Database, Organisation for Economic Co-operation and Development, https://oe.cd/rdtax.

Note: The sample covers 39 high-income countries and 7 upper-middle-income countries (Argentina, Brazil, China, Colombia, Costa Rica, South Africa, and Türkiye). Lower-middle-income and low-income countries have been grouped together, with no country covered by the data in either group.

Explaining countries' policy choices

Building on the assessment of how countries at different income levels use industrial policy, the remainder of this chapter considers how other country characteristics shape policy choice. Overall, developing economies often choose industrial policy tools that are second-choice (feasible but costlier to the wider economy) due to limited fiscal space and limited government bandwidth. By contrast, larger economies (as measured by GDP) tend to use first-choice tools (which directly address market failures with limited costs). These conclusions confirm the conjectures in the country typology in chapter 1.

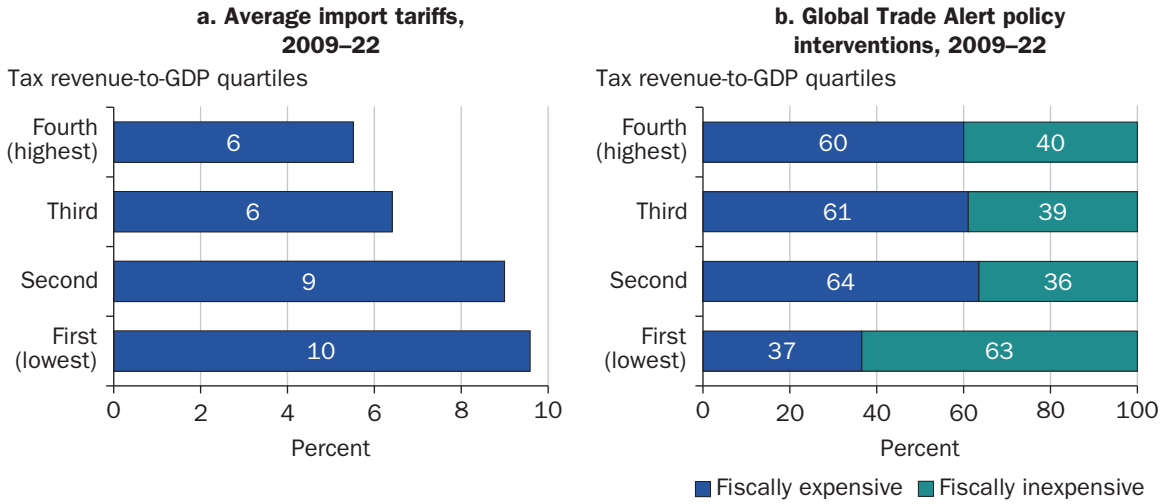
Governments without fiscal space choose second-choice industrial policies

Fiscal space—a government's ability to raise revenue, borrow, and finance public investments—is difficult to measure precisely, but a common proxy is tax revenue as a share of GDP. A clear pattern emerges from the evidence: governments with lower tax revenue-to-GDP impose higher import tariffs on average (refer to figure 2.8, panel a). Similarly, GTA data show that countries in the lowest quartile of tax revenue-to-GDP are much more likely to rely on tariffs than on "fiscally expensive" industrial policies like grants to businesses (refer to figure 2.8, panel b).[26] This suggests that countries with less fiscal space cannot afford first-choice industrial policy options like production or specific innovation subsidies, instead opting for second-choice options like tariffs.

More effective governments choose firm-specific policies

The GTA database records when policies provide targeted support to individual businesses through tools like trade finance, direct grants, or loans. These measures are considered "firm-specific" policies because they involve government engagement with businesses, requiring higher levels of institutional capacity and resources to implement. Policies that simply regulate markets, by contrast, such as tariffs and antidumping measures, protect businesses broadly so they are "not firm-specific" and they require less administrative capacity. Countries with lower levels of government effectiveness, as measured by the Worldwide Governance Indicators based on expert assessments, are less likely to implement firm-specific policies (refer to figure 2.9).

Figure 2.8 Industrial policy choice and tax revenue



Sources: Global Trade Alert (GTA) (database), St. Gallen Endowment for Prosperity through Trade, https://globaltradealert.org/data-center; World Development Indicators DataBank, World Bank, https://databank.worldbank.org/source/world-development-indicators; World Integrated Trade Solution (WITS) TRAINS (Trade Analysis and Information System) tariff data, World Bank, https://wits.worldbank.org/; World Revenue Longitudinal Database, International Monetary Fund, https://www.imf.org/en/Topics/fiscal-policies/world-revenue-longitudinal-database.

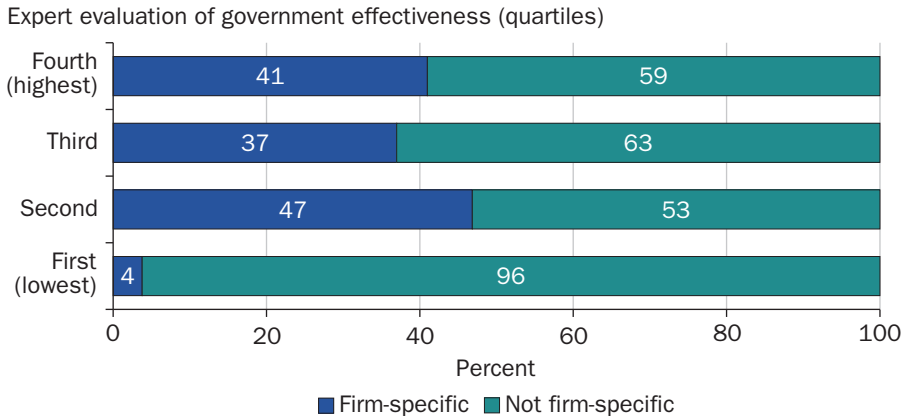
Note: Most-favored nation (MFN) tariff rates are used in panel a. The rankings between tax revenue to GDP quartiles are identical using applied tariffs, though average rates are slightly lower. In panel b, the most common "fiscally expensive" policies are state loans, financial grants, and trade finance. The most common "fiscally inexpensive" policies are tariffs, antidumping measures, and price stabilization measures. Only GTA measures that discriminate against foreign businesses or protect domestic businesses are considered. The sample covers 181 countries in panel a and 179 countries in panel b. Not all countries have data in all years. GDP = gross domestic product.

Larger countries choose first-choice industrial policies that are trade-neutral

Larger economies are frequently targeted by retaliatory tariffs, since their industrial policies often have cross-border spillover effects (refer to figure 2.10, panel a). Retaliatory policies include countervailing or antidumping tariffs imposed to offset subsidies that disadvantage foreign producers. To avoid this, larger economies are more likely to adopt more trade-neutral industrial policies—tools that subsidize businesses regardless of their export performance and do not protect from foreign competition (refer to figure 2.10, panel b).

Figure 2.9 Industrial policy choice and government effectiveness

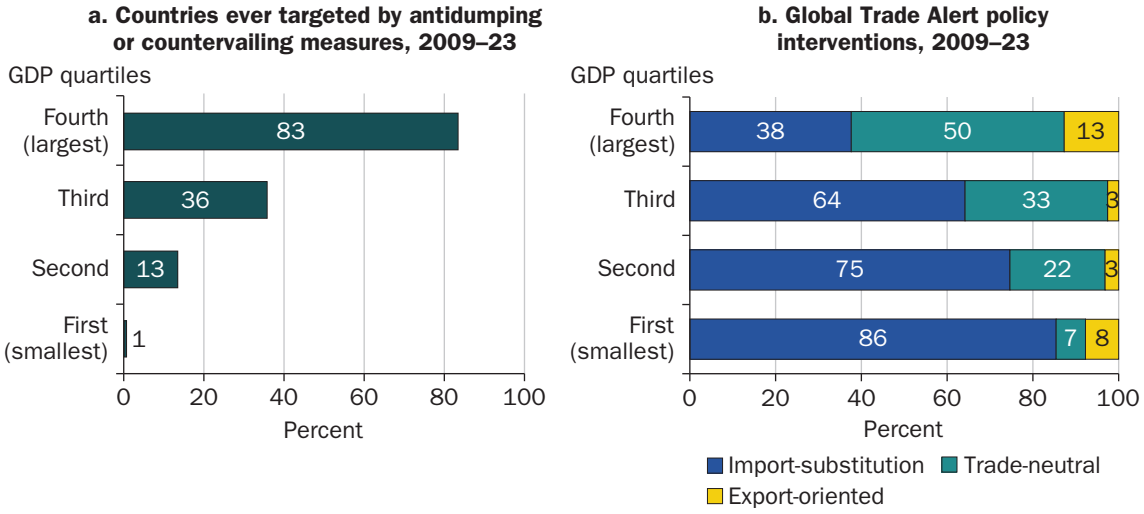
Global Trade Alert policy interventions



Sources: Global Trade Alert (GTA) (database), St. Gallen Endowment for Prosperity through Trade, https://globaltradealert.org/data-center; Worldwide Governance Indicators (database), World Bank, http://www.govindicators.org/.

Note: Firm-specific policies require more government bandwidth (that is, greater institutional capacity or resources). These include trade finance, financial grants, and state loans. Not firm-specific policies include tariffs, antidumping measures, and state loans. Only GTA measures that discriminate against foreign businesses or protect domestic businesses are considered. The sample covers 189 countries.

Figure 2.10 Industrial policy choice and economic size



Sources: Global Trade Alert (GTA) (database), St. Gallen Endowment for Prosperity through Trade, https://globaltradealert.org/data-center; World Development Indicators DataBank, World Bank, https://databank.worldbank.org/source/world-development-indicators.

Note: In panel b, the most common import-substitution policies include tariffs, antidumping measures, and price stabilization. The most common trade-neutral policies are state loans, financial grants, and loan guarantees. The most common export-oriented policies are trade finance, financial assistance in foreign markets, and export incentives. Only GTA measures that discriminate against foreign businesses or protect domestic businesses are considered. The sample covers 184 countries. GDP = gross domestic product.

Notes

1. The GTA tracks policy changes based on online sources (official government documents and businesses' financial reports).
2. This value is the correlation between the logarithm of the number of new discriminatory policy interventions by country-year and the logarithm of GDP by country-year for the period 2009–23.
3. Juhász et al. (2023).
4. Chang (2002).
5. The use of countries' development plans to measure industrial policy is an approach that has recently been followed for work on China. Keyword searches of "pillar industry" or "encouraged industries" in provincial-level or national-level five-year plans have been conducted by Barwick et al. (2025) and Cen et al. (2024).
6. A caveat to this finding is that there is a distinction between governments stating in their plans that they prioritize certain industries and actually implementing industry-targeted policies. A comprehensive data collection on industry-targeted policies is beyond the scope of this report.
7. 2023 is the most recent year for which import-weighted tariff data are available in TRAINS (Trade Analysis and Information System) with global coverage.
8. As of August 27, 2025, China's tariffs were 32.6 percent on US goods (representing 5.5 percent of China's imports in June) and an average of 6.5 percent on all other countries. US tariffs were 57.6 percent on goods from China (7.1 percent of US imports in June) and an average of 20.8 percent on all other countries. This would result in higher average tariff levels for the United States (21 percent versus 2.4 percent in 2023) and China (6.6 percent versus 3.2 percent), which would increase tariffs levied by high-income and upper-middle-income country groups by 0.3 percent and 0.1 percent, respectively.
9. Evenett et al. (2024).
10. This percentage is based on information in the World Development Indicators, World Bank, https://databank.worldbank.org/source/world-development-indicators.
11. Kowalski and Legendre (2023) show that between 2009 and 2020, 53 countries instituted export restrictions on critical minerals.
12. Refer to Rotunno and Ruta (2024), who focus on indicators for the imposition of new domestic subsidies in the GTA that encompass "production subsidies, subsidies transferring resources from governments to firms (excluding production subsidies), subsidies resulting in losses in government revenues, and policies in which governments assume risks related to actions by beneficiary firms."
13. For example, Gatti et al. (2025) collected additional data on industrial policy interventions in the Arab Republic of Egypt and Morocco (as well as in Saudi Arabia and the United Arab Emirates) and show that the number of interventions is larger than the corresponding numbers in Juhász et al. (2023) for the same countries. The reason is that industrial policy in these economies is carried out through state-owned enterprises which do not regularly announce their market interventions.

14. Government Finance Statistics (International Monetary Fund, https://data.imf.org/en/datasets/IMF.STA:QGFS) and Redonda et al. (2025), respectively. Refer to the data appendix for further details on the databases and how values of direct funding of businesses and tax expenditures are harmonized to be combined and comparable across countries.
15. ECLAC (2024) argues that such productive development policies differ substantially from what has hitherto been referred to as "industrial policies." In contrast, as discussed in chapter 1, the present report includes productive development policies in its encompassing definition of industrial policy.
16. ECLAC's (2024) exercise follows the work of the Organisation for Economic Co-operation and Development (OECD) in focusing specifically on direct support instruments to improve how businesses operate: subsidies (nonreimbursable financing), tax incentives (exemptions, discounts, tax credits, and other measures), financial instruments (loans and guarantees), capital contributions (for example, venture capital), and direct support services (technical advice, provision of information, and training). But ECLAC (2024) alerts to serious methodological and data challenges. In Mexico, for example, tax instruments could not be included in the analysis, and in Colombia, financial instruments could not be included.
17. Refer to Criscuolo et al. (2023), who cover nine OECD countries (Canada, Denmark, France, Ireland, Israel, Italy, the Netherlands, Sweden, and the United Kingdom) that spend on average 1.4 percent of GDP on industrial policy through grants and tax expenditures and 1.8 percent of GDP through financial instruments (loans, loan guarantees, and equity investments, including 1.1 percent of GDP on export finance schemes). The OECD quantification exercise excludes the agricultural industry, which implies the 3.2 percent figure could be larger if that industry were included.
18. De Pippo et al. (2022).
19. Garcia-Macia, Kothari, and Tao (2025) calculate the equivalent fiscal cost of four industrial policy instruments for China in 2023: cash subsidies, tax benefits, subsidized credit, and subsidized land for favored sectors. The latter three instruments may, however, be available to all firms rather than merely those in targeted industries.
20. UNCTAD (2019) provides the global compilation of SEZs—the 5,400 number excludes nearly 8,400 single enterprise zones. Refer also to EBRD (2024) and McCaig et al. (forthcoming).
21. The data appendix describes the collection of information on export promotion agencies.
22. Refer to Harmes-Liedtke et al. (2024) for more detail.
23. Figure 2.5 is similar to figure 3.3, panel b, in the 2025 *World Development Report* on standards but uses a different measure of GDP per capita.

24. Global Public Procurement Database, World Bank, https://www.globalpublicprocurementdata.org/gppd/.
25. R&D Tax Incentives Database, Organisation for Economic Co-operation and Development, https://oe.cd/rdtax.
26. It is useful to acknowledge that a reverse causality relationship is possible whereby tariffs serve as a substitute revenue source in countries with limited tax collection capacity.

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CHAPTER 3

How to Do Industrial Policy?

This chapter begins with the premise of a government that has already decided to expand a particular business activity. For such a government, the central question is not whether to promote the activity, but how.[1] Which policy tool should be chosen, and how does that choice depend on local context and constraints? Further, if a government chooses a second-choice tool because first-choice options are not feasible, how can it still achieve the best possible results? The chapter highlights how each tool tends to perform across contexts, distilling 12 lessons from a review of recent evidence.

Given the wide range of industrial policies covered, the chapter does not attempt a comprehensive literature review for each tool. Instead, it examines many case studies to illustrate key ideas—while providing additional references in the endnotes, emphasizing rigorous studies offering causal evidence. The review is distinctive compared to several well-known efforts, namely Harrison and Rodríguez-Clare (2010) and Juhász et al. (2024), given its focus on a much broader set of tools than production subsidies and import tariffs, as well as its emphasis on practical advice.

As described in chapter 1, contextual differences make it difficult to formulate broad recommendations about industrial policy. Nonetheless, recent evidence does yield important insights. Drawing on these findings, the remainder of this chapter distills 12 lessons for how governments might choose among 15 industrial policy tools that are expected to grow industrial activities (refer to table 3.1), and principles of practice to make each tool more effective once it has been selected.

The lessons are organized into the same three categories of industrial policy tools introduced in chapter 1: (1) public inputs tailored to the needs of

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a specific industry or activity, (2) market incentives, and (3) macroeconomic interventions. As in chapter 1 (refer to table 1.1), the lessons highlight the distinction between first-choice approaches, which directly address market failures, and second-choice approaches, which work indirectly and often entail additional costs. While the primary focus is on industrial policy for development, all the lessons are equally relevant for industrial policy motivated by additional concerns discussed in chapter 6. In these cases, governments often pursue second-choice approaches despite their higher costs.

The chapter also emphasizes that the effectiveness of any industrial policy tool depends heavily on country context. Building on the typology introduced in chapter 1 (refer to table 1.2), the lessons focus on three country characteristics that shape whether a given tool is feasible and effective: fiscal space, local market size, and government bandwidth. Whereas chapter 1 classified country types and matched them to feasible tools, this chapter provides a typology of tools and the country characteristics needed for them to succeed. Chapter 4 discusses how other national comparative advantage further shapes policy outcomes.

Accordingly, the chapter shifts the report's focus to implementation. Table 3.1 reframes fiscal space, market size, and government bandwidth as minimum country requirements. In the table, these cells are blank where the tool can succeed even without that characteristic (that is, feasible even in countries with small fiscal space, small markets, and/or large government bandwidth) and have the word "large" where the characteristic is essential (that is, feasible only in countries with large government bandwidth, large local market size, and/or large fiscal space). For example, industrial parks are a direct, first-choice tool feasible in all countries. By contrast, consumer demand subsidies are an indirect, second-choice approach feasible only in countries with large government bandwidth, large local market size, and large fiscal space. All other tools fall somewhere in between.

The lessons are organized into the three categories of industrial policy tools. All 15 tools shown in table 3.1 are covered, though research and development (R&D) tax credits are included as part of the discussion on innovation subsidies, and export subsidies are included as part of the discussion on production subsidies. The 11th lesson steps back from individual tools and addresses a cross-cutting issue: how governments should eventually unwind industrial

Table 3.1 Minimum country requirements for each industrial policy tool

No.	Industrial policy tool	Rank	Minimum country requirements		
			Government bandwidth	Local market size	Fiscal space
Public inputs tailored to needs of activity					
1	Industrial parks	**1st choice**			
2	Skills development	**1st choice**	Large		
3	Market access assistance	**1st choice**	Large		
4	Quality infrastructure	**1st choice**	Large		
Market incentives					
5	Production subsidies	**1st choice**	Large		Large
6	Specific innovation subsidies	**1st choice**	Large		Large
7	Commodity export bans	2nd choice			
8	Public procurement	2nd choice	Large	Large	Large
9	Import tariffs or quotas	2nd choice		Large	
10	Export subsidies	2nd choice			Large
11	Technology transfer quid pro quo	2nd choice	Large	Large	
12	Local content requirements	2nd choice	Large	Large	
13	Consumer demand subsidies	2nd choice	Large	Large	Large
Macroeconomic interventions					
14	Competitive exchange rate devaluation	2nd choice			
15	Research and development tax credit	2nd choice			Large

Source: Original table for this publication.

Note: First-choice policies address market failures directly by subsidizing the activities that are underprovided. Second-choice policies shape industry outcomes by intervening indirectly in adjacent markets. Blank cells indicate that no minimum requirements of a given country characteristic are needed for a policy to be feasible.

policies once their objectives have (or have not) been met. The final lesson emphasizes that to be pro-competitive, industrial policy should be open to trade.

For each tool, the discussion also sets out "principles of practice." These should not be interpreted as recommendations to adopt a particular policy over the alternatives. Instead, they provide guidance for maximizing the benefits of a tool once it is chosen, or for governments considering whether to use it in the future. These principles draw on case study evidence as well as references to existing practitioner toolkits, where available.

Tailored public inputs

Industrial parks solve coordination failures and are feasible in all countries and conducive to private sector collaboration.

Governments can help address coordination failures through industrial parks, which concentrate shared infrastructure in a specific location.[2] In principle, this can be achieved at little cost: governments need only coordinate where businesses locate and encourage simultaneous investment, allowing them to share workers, suppliers, and knowledge.[3]

Industrial parks

Industrial parks represent a direct, first-choice policy solution to coordination failures. They can be implemented with minimal fiscal outlay and require only modest levels of government bandwidth—making industrial parks a useful starting point for developing economies undertaking industrial policy. An industrial park typically includes serviced land, factory shells, and utilities that are cheaper, more reliable, and easier to access than businesses could obtain individually. To establish one, governments can auction state-owned land or coordinate the lease of private land to an entrepreneur who agrees to develop and operate the park. Protected tourist areas are another version of an industrial park, designed to coordinate investment in the tourism industry and protect natural assets.

While many governments directly invest in industrial parks at significant fiscal cost, this is not strictly necessary. A World Bank review of Ethiopia's industrial zone program, for example, documented up-front development and financing costs of more than US$1 billion for nine publicly owned parks—an investment that might take up to two decades of rapid growth to yield positive returns.[4] Alternative models transfer operation and management to the private sector (through outsourcing or public-private partnerships), limiting the government's involvement to lower-cost aspects like strategic planning, policy formulation, and provision of infrastructure. In Türkiye's Organized Industrial Zone (OIZ) model, the public sector leads the development phase (for example, site selection, development, and initial management), but the private sector assumes more management responsibility once 50 percent of industrial parcels become operational.[5] In Costa Rica, industrial parks are fully owned and operated by private developers.[6]

Despite their global popularity, there is surprisingly little evidence on the effectiveness of industrial parks in the literature. Full cost-benefit analyses are rare outside Asia, and the findings from that region are mixed: some studies report modest net benefits, while others find robust returns.[7] A study of 4,000 industrial parks in India found that they raised the probability of industrialization, partly by coordinating private investment.[8] Governments can evaluate their own industrial parks simply by examining whether the park becomes self-sustaining—operating profitably over time by renting space and selling services.

Special economic zones (SEZs) combine the physical features of an industrial park with special regulatory or customs regimes. Often these include tax exemptions for investors to offset specific government failures or political risks. While industrial parks are prevalent in all countries, SEZs are especially common in developing economies. Unlike basic industrial parks, however, operating SEZs requires substantial government bandwidth and entails fiscal costs when paired with tax incentives. They can serve as second-choice tools—addressing government failures indirectly, such as by piloting reforms that can be rolled out economywide after resolving broader political economy challenges.[9] By operating outside local or national regulatory regimes, SEZs may also help reassure investors about the credibility of long-term government commitments.[10] SEZs can take multiple forms, including export processing zones, free trade zones, science parks, and high-tech zones.

Most research on the impacts of industrial parks focuses on SEZs. Ideally, such studies would separate the contribution of infrastructure from that of preferential regulation, but this is rarely feasible in practice. China provides the strongest causal evidence, as its large geography allows comparisons across regions with and without industrial zones; studies show positive effects on investment, employment, output, productivity, and wages. Crucially, evidence from China shows that industrial parks increased both foreign and domestic investment, suggesting local entrepreneurs were not "crowded out" by the focus on attracting foreign investment. Case studies from Costa Rica, the Dominican Republic, Mauritius, and Rwanda do not provide causal evidence, but they illustrate how SEZs supported diversification from agriculture in smaller economies. Likewise, countries like Bangladesh, Madagascar, Morocco, Poland, and Viet Nam used SEZs to integrate into global value chains in apparel, automotive, and electronics.[11]

There are also many examples of industrial parks that failed to meet their goals. Indonesia's Integrated Economic Development Zone (KAPET) program, for instance, offered capital tax incentives but failed to stimulate business entry or increase output.[12] In Viet Nam, some evidence suggests that too many zones may have been established, and that a smaller number would likely have been more effective.[13] Some of Ethiopia's many industrial parks struggled to attract investment and experienced falling employment after the country lost its African Growth and Opportunity Act (AGOA) status in 2022, underscoring the risks faced by SEZs that rely solely on trade preferences for their competitiveness.[14] Some zones create political economy challenges in the form of interjurisdictional disputes and popular discontent, as was the case with the Próspera charter city in Honduras.[15]

Recent research also examines industrial parks' positive spillovers, or benefits for surrounding regions. Studies in India, Poland, Türkiye, and Viet Nam find evidence of increased economic activity in the areas surrounding industrial zones, suggesting they do not crowd out investment in nearby regions.[16] In African countries, evidence suggests that households living near industrial zones become wealthier and shift away from agriculture.[17] However, all studies also find clear evidence that spillover effects diminish rapidly with distance from the industrial zone, and local supply chain linkages are often never established. For example, businesses in Ethiopia's industrial zones report sourcing locally only for noncore activities, such as packaging, while importing core inputs.[18] Since an industrial park addresses a local coordination failure, the presence of positive spillovers is not strictly necessary to justify investment in an industrial park. Rather, parks are justified if, once established, they can operate profitably, charging users for services at cost-recovery prices, without ongoing subsidies from the government.

Principles of practice for industrial parks include the following:

- **Select locations close to pools of specialized or low-cost labor, with reliable access to markets via ports or major transport hubs.** Governments face a significant trade-off when industrial parks are intended to reduce regional disparities by investing in lagging regions, since investors generally prefer leading cities.[19] The risks of poor location are clearly illustrated in the historical example from Ghana of a "cattle-based industrial complex" that dispersed industry across the country, including to

politically favored areas, raising transport costs.[20] In contrast, investments in productive locations can have significant returns: the government of Ethiopia promoted its nascent cut-flower industry by building cold-storage facilities near existing horticulture projects and at the national airport while increasing the cargo shipping capacity at Ethiopian Airlines by 52 percent.[21]

- **Provide critical investments outside the zone.** Without complementary infrastructure, including transportation links and power and water utilities, industrial parks cannot function effectively. For example, Nigeria's Calabar Free Trade Zone failed because its planned deepwater port was never constructed.[22] More broadly, SEZ performance across Africa has been uneven, hindered by inadequate connecting infrastructure and unreliable utilities, among other persistent challenges.[23]
- **Use rigorous, transparent, and predictable procurement processes.** Fair and transparent procurement attracts investors, operators, and users while ensuring the park's alignment with government objectives.[24]

Skills development, market access assistance, and *quality infrastructure* solve information asymmetries but require government bandwidth.

Three other public inputs—skills development programs, market access assistance, and quality infrastructure (QI)—are direct, first-choice solutions for a different set of market failures. In contexts where these inputs are missing, their provision can generate benefits even when governments charge cost-recovery prices, thereby keeping the fiscal burden to a minimum. However, these policy tools require greater government bandwidth, including sustained engagement with the private sector to ensure their design aligns with business needs.

Skills development

Businesses are often reluctant to invest without an existing pool of skilled workers, especially if local education institutions do not yet provide the relevant training.[25] Even after investing, businesses may be reluctant to provide training due to concerns that trained workers will leave for competitors.[26] Industry-targeted skills development programs are a direct, first-choice solution to this underinvestment in training. Governments can help by coordinating stakeholders and shaping degree programs to meet the requirements of emerging industries.

Skills development can help foster new industries, as shown by Costa Rica's well-known success in semiconductors (refer to box 3.1). It can also prepare workers for global markets through migration. Though less widely recognized, this approach can be an effective form of service-oriented industrial policy—particularly when governments regulate training quality while allowing the private sector to develop training opportunities in areas of strong global demand. Notable examples of this approach include nurse training in the Philippines and information technology (IT) training in India.[27]

Box 3.1 Costa Rica's industry-specific training in high tech as part of a broad industrial policy package

In 1996, Costa Rica's government sought to attract Intel Corporation to invest in a semiconductor manufacturing and testing facility in the country.[a] Intel expressed concerns about the shortage of technically trained graduates with the skills it required. In response, the government collaborated with Intel to establish tailored training programs: a one-year associate degree program in semiconductor manufacturing, codesigned with the Costa Rican Institute of Technology (ITCR), and English-language training for Intel's first cohort of technicians.[b] By addressing coordination failures, these efforts ensured that the training programs were demand-driven and aligned with industry needs. Moreover, as Intel's managers and engineers later moved to local businesses, the benefits spread through the broader economy.

The case also highlights the importance of continuously adapting training programs to evolving industry demands. In 2014, Intel announced that it would relocate its assembly operations to Asia while retaining more advanced engineering and design functions in Costa Rica.[c] This shift led Intel to make additional investments in training and to deepen collaboration with universities to ensure the supply of higher-skilled workers.[d] Today, Intel employs roughly 2,000 workers in Costa Rica, many in engineering and research and development (R&D) roles.[e]

Importantly, industry-specific training was only one component of Costa Rica's broader industrial policy package that helped attract Intel. The government also offered investment and tax incentives under a free trade zone, along with infrastructure investments that combined with political stability and rule of law. This makes it difficult to isolate the importance of skills development from other components—a common challenge when evaluating industrial policy, since governments typically implement a bundle of policies simultaneously.

a. Monge-González and González-Alvarado (2007).

b. Spar (1998).

c. Monge-González (2017).

d. Costa Rica's free trade zones law requires companies to make additional investments every eight years to renew their incentives.

e. CINDE (2022). For 2025 developments, refer to https://www.intellinews.com/intel-pulls-back-from-costa-rica-in-fresh-blow-to-manufacturing-hub-393235/.

Even when industrial policy is not the explicit motivation, the skills and education levels of a country's workforce have important implications for how governments approach industrial policy more broadly. Multinational businesses are more likely to locate research R&D activities in countries with a strong base of skilled labor.[28] Studies of the staggered expansion of higher education in Brazil and China confirm this link: as the number of college-educated workers grew, particularly in science and engineering fields, innovation increased, productivity rose, and trade expanded.[29]

Principles of practice for skills development include the following:

- **Match training with private sector demand, but maintain flexibility.** Training programs should be aligned with the requirements of specific industries, while retaining the ability to adapt as conditions change. In many developing economies, the quality of training provided through universities and technical and vocational education and training (TVET) programs often falls short of international standards and adjusts slowly to new demands—contributing to the mixed evidence on the effectiveness of public vocational training systems.[30] Yet the case of Shenzhen Polytechnic University in China is a successful example of skills development codesigned with industry.[31] Another challenge is skills mismatch, where workers are trained in highly specialized skills that have little value domestically if the targeted industry fails to materialize. To avoid this risk, Costa Rica initially collaborated with high schools and colleges to design a general curriculum in electronics but waited until Intel established operations before specifying and developing more specialized training programs.[32]
- **Develop both technical and managerial skills.** Even where technical skills in science and engineering are strong, a shortage of managerial talent can serve as a binding constraint to industrial upgrading.[33] Efforts should focus not only on expanding the supply of management training but also on ensuring quality, enabling domestic training institutions to meet global standards. Management training may also be imported, using scholarships for students to attend graduate programs abroad.
- **Consider global skills partnership programs.** Such programs leverage emigration destination country financing to complement origin country financing to invest in education and training systems in the origin

country to meet common skill needs.[34] For small countries with limited fiscal space but sufficient government bandwidth, these programs can foster growth, especially of services sectors.

Market access assistance

Many businesses lack the information and knowledge needed to compete effectively in global markets on their own, particularly in developing economies. Export processes and foreign buyers' requirements, including quality and certification standards, are often complex, costly, and difficult for businesses to identify and navigate on their own.[35] For example, manufacturers of surgical instruments in Pakistan reported that compliance with the European Union's Medical Device Regulation (MDR) can cost up to €200,000 in the first year and €30,000 annually thereafter.[36] Market access assistance, including export promotion and supplier development programs, is a direct, first-choice solution for overcoming these information gaps, reducing costs, and providing credible signals of supplier quality to prospective foreign buyers.

Governments from a variety of contexts have had success with market access assistance. In Peru (PROMPEX) and Uruguay (URUGUAY XXI), government programs helped exporters lower the fixed costs of introducing new products and entering new foreign markets.[37] A program in Tunisia sought to do the same, though ended up instead helping businesses grow in existing markets, rather than by finding new ones.[38] In Denmark, the Trade Council's matching services enabled small businesses to begin exporting and contributed to increased sales, value added, and employment.[39] A cost-benefit analysis of the Danish efforts found that participating businesses' value added increased by roughly three times the cost of the programs. Another form of market access assistance is an export credit guarantee, a financial protection mechanism issued by government or quasi-governmental export credit agencies, which ensures exporters receive payment for goods or services shipped overseas if the foreign buyer defaults on payment. These have been shown to positively affect businesses' exports in advanced economies.[40]

The effectiveness and efficiency of supplier development programs has been studied in fewer contexts. Supplier development programs seek to help small and medium-size local businesses to supply multinationals operating in a country. The Provee program in Costa Rica included activities like assessing the capabilities of potential suppliers, creating a supplier database, and organizing

matchmaking through business fairs and one-on-one meetings between suppliers and buyers. This program was shown to foster links between domestic businesses and high-tech multinationals.[41]

Principles of practice for market access assistance include the following:

- **Bundle services.** Providing several forms of market access assistance together often yields stronger results than stand-alone efforts. In Colombia, for example, combining counseling, trade missions, and trade fairs led to greater export performance.[42] In Costa Rica, combining two initiatives—the supplier development program Provee and a program to help small businesses innovate (PROPYME)—generated higher wage gains for businesses using both programs simultaneously.[43]
- **Pair with other industrial policy efforts.** While market access assistance is generally beneficial and sometimes cost-effective, its impacts can be modest compared with other forms of industrial policy. As a result, many countries combine export promotion with production, innovation, or export subsidies, often providing both to the same businesses. In Tunisia, for example, a matching grant program (FAMEX) supported businesses with services for both market access and product or technological upgrading. Evidence suggests that the program's investments in product development led to stronger and longer-lasting impacts on export performance than market access assistance alone.[44]

Quality infrastructure

Certification is a public good, assuring buyers that products (and the processes involved in their production) meet recognized environmental, safety, and quality standards, which can stimulate demand in both domestic and international markets. However, the private sector typically lacks the incentives and legal authority to organize certification bodies. QI comprises public and private institutions and policies related to standardization, conformity assessment (testing, inspection, certification), accreditation, and metrology. Several QI services require large investments with only a limited commercial business case. This is particularly the case for metrology, which relies on specialized equipment to ensure the international traceability of measurements—an important input for testing laboratories. Metrology and accreditation are therefore typically provided by governments.[45] Other parts of the QI system, especially conformity assessments, often face a classic

chicken-or-egg problem in lower-income settings. Demand for testing and certification is too limited for private providers to enter the market, yet demand itself cannot grow without reliable and accessible QI services in place. QI is a direct, first-choice tool for addressing underinvestment in testing and certification and for tackling information asymmetry problems.[46]

Evaluating QI's impact as an industrial policy tool is challenging, since its effects work through a broad system of standards, measurement, and certification rather than through specific programs or interventions.[47] But case studies from agribusiness highlight its strategic importance. In Bolivia, for example, collaboration between the government and businesses to tighten sanitary standards and establish a laboratory for testing Brazil nuts enabled the country to regain access to European markets and become a leading exporter within a decade.[48] Similarly, public investment to strengthen QI allowed Benin to satisfy new food safety standards and resume pineapple exports to Europe.[49]

Principles of practice for QI include the following:

- **Define a clear strategic vision and provide resources for implementation.** A comprehensive national quality policy should establish strategic objectives and road maps for developing effective QI systems.[50] Because QI involves multiple institutions and stakeholders, this is a complex task that requires coordination, capable institutions, strong political leadership, and recognition of QI's role in industrial development. Crucially, the policy should prioritize certain industries, at least initially, given the diverse needs across industries or value chains. For instance QI needed to export seafood typically relates to disease control, while services that are needed to export apparel primarily relate to social and environmental compliance. Argentina's experience illustrates these challenges: quality initiatives during the 1990s and 2000s failed due to poor oversight, institutional misalignment, and weak policy integration. To address these issues, the 2016 Plan Calidad Argentina (PCA) improved policy coherence, strengthened institutional collaboration, and provided targeted support to key industries.[51] The PCA established an Annual Quality Plan, mechanisms for interministerial coordination, a digital quality map, and laboratory accreditation programs.

- **Establish independent agencies for standardization, metrology, and accreditation.** Most countries create designated national bodies for each of these functions.[52] National standards bodies, which can be public or private, are responsible for developing national standards, representing the country in international bodies like the International Organization for Standardization (ISO), and adopting international standards domestically. Metrology institutions establish, disseminate, and safeguard measurement standards; spread metrological knowledge; and provide primary calibration services to independent laboratories and regulatory bodies. Accreditation bodies assess and certify the technical competence of laboratories, inspection bodies, certification organizations, and other entities involved with standardization and metrology—an important function for securing and maintaining international recognition of a country's QI system.
- **Establish QI as a public-private partnership system.** While there is a clear need for government intervention in some areas and at earlier stages of development, a well-functioning QI system relies on active involvement from private sector organizations. In particular, conformity assessment can often be commercially viable and should be left to the private sector as much as possible.[53] When industrial policy interventions are needed because of insufficient market demand, it is good practice to focus on demand-side support rather than direct government provision of conformity assessment services, which can be costly.

Market incentives

Production subsidies, **depending on information available and context, may be best tied to either output, wages, or investment.**

Production subsidies

Production subsidies are a direct, first-choice approach to promote investment, hiring, and reduce businesses' costs in targeted industries. They can be used to achieve a wide range of policy goals and priorities, but they also help address the general market failure of underinvestment in activities with positive spillovers.

Perhaps unsurprisingly, there is evidence that production subsidies can help industries grow. They most commonly subsidize capital investment, as in the Republic of Korea's foreign loan guarantees to expand what was called in the

1970s heavy and chemical industry, which led to expanded sales and later productivity (refer to box 3.2). In other contexts, subsidies have been provided for wages—for example, tax deductions on worker payments in Romania and Tunisia's high-tech industries.[54] However, labor productivity does not necessarily increase with wage subsidies.[55] They have also been used to subsidize business entry and the production of targeted outputs. In China's drive to grow its shipbuilding industry until 2013, subsidies for entry included expedited and simplified licensing procedures as well as discounted land prices in coastal areas, alongside investment and output subsidies.[56]

Box 3.2 What is the latest evidence about the Republic of Korea's subsidies for industry?

Korea's big push to develop its so-called heavy and chemical industry from 1973 to 1979 is one of the most widely cited examples of industrial policy.[a] Rather than targeting production of narrowly-defined products, the drive targeted investment in capital-intensive industries broadly, with the intention of diversifying Korea beyond light manufacturing exports, like electronics, fish products, and textiles.

The case is unique in that subsidies were provided at minimal fiscal cost simply by relaxing restrictions on what was then a closed economy. Such subsidies were given as part of a general strategy to promote exports.[b] During the period 1973–79 exporters in the heavy and chemical industry were given special preferences. At the time, access to foreign credit was highly restricted, and imports of capital equipment faced high tariffs. The government granted exemptions from these policies for businesses in the heavy and chemical industry while also providing guarantees on foreign loans, allowing businesses to borrow more and import key inputs at low cost.[c] Since most economies today already permit businesses to borrow abroad and impose relatively low tariffs on capital equipment, comparable subsidies would now need to take the form of investment tax credits or grants, which entail fiscal costs.

Several recent studies provide new insight into the effectiveness and efficiency of Korea's subsidies. For example, an industry-level analysis using a difference-in-differences approach (comparing the performance of targeted industries with that of similar but nontargeted industries) finds that targeted industries had stronger sales, exports, employment, and labor productivity after the subsidies ended.[d] However, analysis at the plant level offers important nuance: Korea's subsidies diverted capital and workers to the lower-productivity plants that frequently sought loans, particularly new entrants. This led to lower labor productivity than would have been achieved had subsidies gone to higher-productivity businesses.[e]

(Continued)

Box 3.2 What is the latest evidence about the Republic of Korea's subsidies for industry? *(continued)*

What was this industrial policy's overall contribution to Korea's growth? Another recent study, using extensive data up to 33 years after the subsidies ended, finds that this negative impact of subsidies going to less productive businesses was eventually outweighed by the gains from learning-by-doing. It estimates that Korean gross domestic product (GDP) today is about 3 percent higher than it would have been without the subsidies.[f] Accumulated over decades, this gain is substantial. Net benefits remain significant even after accounting for the costs of the credit guarantees, which were about 0.4 percent of GDP annually or 2.4 percent of GDP over 1973–79.[g] Notably, two-thirds of the benefits emerged only after the first decade, suggesting that short-run evaluations of industrial policy may understate long-term benefits. Although Korea's growth accelerated in the 1980s, after the subsidies ended,[h] this acceleration may partly reflect accumulated learning in new industries created by earlier support.

Important caveats remain, however. First, despite its significance, the estimated benefits of Korea's subsidy program are still small relative to the country's overall growth. Fundamentals like a high savings rate and investment in education played a much greater role, and may themselves have been necessary for industrial policy to work.[i] Second, if the government had opened the economy completely, rather than implementing industrial policy through exemptions to select businesses, growth might have been even faster and the targeted industries might have emerged on their own.[j] Indeed, growth did accelerate as the economy opened in the 1980s.

Finally, evidence suggests that some untargeted industries experienced even faster productivity growth than subsidy recipients. Between 1963 and 1979, Korea's light and medium industries experienced total productivity growth twice as fast as that of heavy and chemical industries.[k] A major factor was the shift from craft-based to modern production techniques in smaller-scale activities like metal and leather product assembly. Overall, industrial policy alone would not have been sufficient to drive Korea's growth, and uncertainty remains about whether it was necessary.

a. Jones and Sakong (1980, 85–118) describe the tools government used to support this industry and others, including "export industries, tourist business and other foreign exchange earning industries whose rationalization and development will improve the balance of payments" (p. 107). Refer also to Amsden (1989).

b. Rhee et al. (1984) frame Korea's "competitive edge" as a bundle of policies designed to promote exports.

c. At the time, domestic banks did not have sufficient capital to cover lending needs.

d. Lane (2025).

e. Kim et al. (2021).

f. Choi and Levchenko (2025). Table B4 of that paper shows positive effects on total factor productivity only in the long run, after 1981.

g. Box 6.3 of Page et al. (1993) estimates these based on an interest rate differential compared to bank loans.

h. Acemoglu et al. (2019).

i. Page et al. (1993).

j. Miron and Aldighieri (2021) argue that repealing the Foreign Capital Inducement Act (FCIA) of 1966 would have led to even faster growth, and that this counterfactual is not captured in Choi and Levchenko (2025).

k. Dollar and Sokoloff (1990) find 7.3 percent growth in total factor productivity for medium-size industries and 7.4 percent in light industries, compared to 3.3 percent in heavy industries.

Industry growth alone does not mean production subsidies create net economic benefits. In Korea's heavy and chemical industry, recent estimates suggest that subsidies led to substantial improvements in economic welfare (refer to box 3.2). In contrast, the benefits of China's shipbuilding industry were much smaller—implying that the subsidies would be justified only if they generated non-economic benefits that are harder to quantify, such as increased national security.

In other cases, production subsidies have failed to stimulate industry growth altogether. In Ecuador, the 2018 Organic Law for Productive Development offered tax exemptions for new investments in priority industries but did not generate investment or jobs.[57] In Uganda, a tax holiday for priority industries initially attracted investment but produced no lasting increases in sales or employment.[58] In principle, such disappointing outcomes are more likely when subsidies do not directly target a clear market failure, or, as discussed in chapter 4, when subsidies target industries without comparative advantage or market potential.

Principles of practice for production subsidies (direct funding) include the following:

- **Subsidize costs only when it is known which inputs constrain growth.** If governments understand which inputs are the key constraints, subsidies should be tied to the costs of those inputs. For example, cost-based capital investment subsidies (paid in proportion to the cost of new equipment or technology) can promote learning and increase output, and have been shown to raise investment in Organisation for Economic Co-operation and Development (OECD) countries.[59] But if the underlying market failure is that workers and businesses underinvest in skills development, the issue may be addressed more directly through a cost-based wage subsidy (paid proportionally to the wage bill), which lowers the cost of employing and training workers. The trade-off between subsidizing labor versus capital is discussed in greater detail in chapter 6.
- **Otherwise, subsidize output when the key constraints are less certain.** Output subsidies (paid in proportion to revenues) let businesses choose the most efficient way to expand production. By contrast, input subsidies require governments to know which aspects are most critical for boosting

productivity (for example, workers, intermediate inputs, or capital). In the United States, a study comparing two renewable energy subsidies found that an output-based tax credit for generation was more cost-effective at increasing generator productivity than an up-front input subsidy for equipment.[60]

- **Make subsidies available to all businesses within an industry to preserve competition.** Subsidies that are more dispersed across businesses within an industry have been shown to have larger positive impacts on productivity.[61] Subsidies that are less dispersed and given to only a few businesses in an industry can reduce incentives to innovate, since they guarantee those businesses a competitive advantage over others. This approach is relevant for large economies like China's where there are many businesses in most industries. When subsidies are not dispersed, or where the economy is small and can support only a few businesses in an industry, competition may still be encouraged by lowering tariffs and/or requiring businesses to export. For instance, Japan's weakening of the Antimonopoly Law of 1947 was a key component of Japan's industrial policy, as it allowed government-organized cartels to coordinate bulk purchases of raw materials, standardize quality, and restrict quantities to avoid investment in excess capacity. This was accompanied by a requirement for the cartels to compete in international markets, hence incentives to innovate and grow were preserved (refer to the "Pro-competition industrial policy is open to trade" section of this chapter).[62]
- **Do not restrict subsidy eligibility to small or young businesses.** One potential approach to promote competition is to give subsidies only to small or young businesses, under the assumption that they may challenge incumbents. Indeed, micro-level evidence across emerging economies suggests that young businesses, though not always small, create more jobs.[63] Yet, small or young businesses may not yield the highest return on investment. In Türkiye, access to credit was found to have the largest impact on medium-size businesses—those large enough to credibly challenge industry leaders—rather than on the smallest businesses.[64] Moreover, new industries are often started by entrepreneurs in large conglomerates, which have the resources and expertise to execute investments. Subsidies for young businesses are

least useful in mature industries or those with large economies of scale. Entry subsidies, for example, reduce costs for new businesses to enter an industry, without tying support to specific inputs or outputs. They should be used cautiously. Across all of China's shipbuilding subsidies, for example, some evidence suggests that entry subsidies were the least cost-effective for boosting sales, as they encouraged entry by many small, less productive businesses.[65] Indeed, in 2009 the government imposed a moratorium on new entry in shipbuilding and shifted focus toward subsidizing output and investment for existing businesses.

- **Complement production subsidies with innovation subsidies.** While subsidies for capital investment may incentivize businesses to adopt new equipment, those subsidies do not necessarily incentivize them to adapt that equipment to the local context, or invest in developing new product specifications to meet demand. Production subsidies can therefore be complemented by innovation subsidies, which are described next. A comparison of trends across cities found that city-level production subsidies for solar panels in China significantly boosted output, innovation, and business productivity, but especially when combined with R&D grants.[66]
- **Keep it simple.** Complex procedures can deter participation or skew government support toward businesses with more administrative effectiveness. For example, in Nepal's cash rebate scheme for exporters, documentation requirements proved too burdensome for smaller businesses, rendering the scheme ineffective overall.[67]

Principles for using tax exemptions or credits (rather than direct funding) as production subsidies include the following:

- **Corporate income tax holidays are less effective at stimulating production compared to cost- or revenue-based subsidies, but effectiveness can be improved with performance contingencies.** Corporate income tax holidays increase profits but do not lower the price of investment or employment relative to the price of output. For this reason, they stimulate less investment and employment than cost- or revenue-based subsidies, which do change these relative prices. While income tax holidays can still encourage entry into new markets by helping entrants recover sunk costs that eat into profits, they are less likely to

change investment or hiring decisions by already profitable incumbents. Despite this drawback, corporate income tax holidays are used widely to subsidize production. One reason is that they are easier to implement, because they are calculated based on corporate income already reported to tax authorities, and do not require additional reporting on revenue or costs. To ensure they still shape businesses' decisions, many countries make them contingent on targets like growth of investment, employment, or domestic production, but this requires sufficient government bandwidth. Undertaking cost-benefit analysis of such tax holidays is crucial to identify the direct costs (tax revenue foregone) incurred against the economic benefits being pursued.[68] But good practices in tax administration indicate that a well-managed tax system with internationally competitive corporate income tax rates is more valuable than reliance on tax holidays.[69] Still, many developing economies have significant progress to make in their tax systems before reaching that point.

- **Enable businesses to borrow against tax credits and holidays.** Tax credits are often claimed after the investment, hiring, or other activity occurs. This may be politically attractive because it avoids the appearance of direct transfers to the private sector.[70] But it poses risks in contexts where businesses cannot borrow against future tax benefits, as is common in developing economies with shallow financial markets. In these contexts, governments should establish mechanisms for businesses to borrow against tax credits. Where that is not possible, cash grants may be more impactful.
- **Consider constraints from international tax agreements.** The Base Erosion and Profit Shifting initiative of the Group of 20 (G20) and OECD economies establishes rules to ensure large multinational corporations pay a minimum 15 percent corporate income tax rate, and that profits are taxed where their customers are located, rather than where production is located. Domestic laws adopted in line with these rules may constrain economies seeking to attract and retain export-oriented foreign direct investment (FDI) using tax incentives. An alternative perspective is that such rules are actually an opportunity for developing economies to discourage foreign investors from demanding tax incentives that lower their effective tax rates below 15 percent.

Export subsidies

Governments frequently subsidize exports, given their potential to promote learning and create spillover benefits, and foreign exchange benefits. Export subsidies are different from market access assistance. Rather than subsidizing specific activities like foreign marketing or establishing foreign affiliates, export subsidies simply pay businesses to export, for instance by reducing tax liabilities only for exporters. It may require less government bandwidth to subsidize exports compared to production, since export subsidies can be implemented by the customs authority alone, for instance as an import duty drawback.

Despite advantages for low-bandwidth governments, evidence suggests that such export subsidies have only modest or short-lived impacts, and they often risk crowding out private sector efforts—particularly in contexts with limited export capacity. In Pakistan, for instance, an export rebate scheme targeting apparel and textiles led businesses to focus on subsidized products, ultimately reducing exports of non-eligible products due to business capacity constraints.[71] Export subsidies also discourage businesses from serving the domestic market, limiting valuable opportunities for learning and spillovers, especially in countries with large or growing middle classes. Moreover, for non-least developed countries (non-LDCs) export subsidies clash with World Trade Organization (WTO) rules potentially leading to retaliation by other countries (refer to box 1.1).

For these reasons, trade-neutral production subsidies, where governments can support both domestic and export production, should be preferred whenever there is enough bandwidth. If there is concern that exports are low because businesses lack information about new markets, or cannot afford the fixed costs of entering those markets, these issues can be addressed directly with market access assistance rather than export subsidies.

Innovation subsidies are effective when technology adoption or invention is low and have low risk of crowding out.

While production subsidies target overall investment, employment, and production in an industry, innovation subsidies are direct, first-choice approaches that focus on businesses that adopt existing technologies or invent entirely new ones. Subsidies for technology adoption address barriers like lack

of information, risk aversion, or limited access to finance. Subsidies for inventing new technologies—including through R&D and so-called "moonshot" efforts—are motivated by weak incentives for innovation, since new technologies can often be copied, or because inventions are often unaffordable for most customers, like some medical treatments. These subsidies can be complemented by other policies to support innovation, like scholarships for students in science, technology, engineering, and mathematics; grants for basic research at universities; and intellectual property rights protection (refer to the chapter 4 section "Complementary investments and reforms to build comparative advantage").

The main advantage of innovation subsidies over production subsidies is that they encourage businesses to differentiate themselves by creating or adopting new products, which can help mitigate the risk of crowding out unsubsidized competitors. In Kenya, for example, an experiment offered business training—a "new technology" in that context—to female entrepreneurs, resulting in higher sales and profits, among other gains. Importantly, the study found no evidence of crowding-out effects: competitors that did not receive training saw no decline in sales, and markets expanded on average.[72] The broader lesson is that innovation directed at new products and new customers can expand economic activity rather than simply shifting it.

Specific innovation subsidies

Achieving the right balance between innovation subsidies for adoption and invention depends on a country's stage of economic development. Developing economies often benefit more from adopting existing technologies, while advanced economies often prioritize the development of new technologies. Innovation subsidies are either specific or nonspecific, depending on whether or not they target a specific technology specified in advance.

Specific subsidies for adoption are typically given through vouchers, or government-backed coupons for businesses to purchase new technologies at discount, often from vetted vendors. The goal is for subsidized businesses to introduce new products and act as customers for one another. Examples include fertilizer vouchers in agriculture,[73] government support for artificial intelligence products,[74] or vouchers for services like market research, advertising, and training.[75] Studies generally find short-run increases in sales

among voucher recipients, though evidence is more limited on whether businesses continue using the targeted technologies after vouchers expire.

Specific subsidies for invention are sometimes called "moonshots," after space exploration efforts. These can be structured as "push" subsidies, such as research grants that directly fund innovation inputs, or "pull" subsidies that reward outputs, such as advance market commitments.[76] One example is Peru's effort to adapt and develop domestic fish eggs for aquaculture to reduce reliance on foreign technologies.[77] Another example is the Brazilian Agricultural Research Corporation (Embrapa), a public agency that directed research toward priority staple crops and local ecological conditions, especially in remote and research-scarce regions. One estimate suggests this agency's investments had benefits worth 17 times costs.[78]

Principles of practice for specific innovation subsidies include the following:

- **Incentivize participation and performance.** Low uptake is a common challenge for specific innovation subsidies, especially those focused on technology adoption. Some businesses are unaware of available programs, while others are discouraged by the paperwork required to apply. Another challenge is ensuring that support translates into actual productivity gains. Incentive mechanisms can help address both issues. For instance, Israel established the Advanced Manufacturing Institute in 2020, which connects businesses with consultants to diagnose opportunities and design road maps for productivity improvements. Typically, this involves installing new technology (for example, helping a cardboard manufacturer reduce energy costs by introducing a new drying process).[79] The institute charges a fixed fee for its services but also receives bonuses if businesses subsequently achieve measurable performance gains, encouraging the institute to help as many businesses as possible while also maximizing the impact of its support.
- **Keep application procedures simple and fast.** Complex or time-consuming processes can deter participation, particularly by small and young businesses that innovation subsidies are often intended to support. Large or R&D-intensive businesses often have the most resources to apply for benefits—but subsidies are typically less effective for these businesses, since they are more likely to invest in innovation without government support.[80]

- **Build in rigorous evaluation.** Given the limited evidence on innovation subsidies and the challenge of assessing their effectiveness, a rigorous evaluation should be built in from the start. Patent and patent citations are particularly useful measures of performance. Typically, governments simply compare the performance of supported businesses with the rest of the market—which can produce overly optimistic assessments, since businesses that opt in or are selected may already be stronger.[81] In Italy, for instance, a study found that larger and more profitable businesses were those that selected into an innovation subsidy.[82] More reliable evidence can be generated by randomizing which businesses receive subsidies, such as through lotteries. But these efforts require patience, and governments often prefer quick disbursement or strict eligibility criteria, making randomization difficult.[83]

Research and development tax credits

More often, governments give nonspecific innovation subsidies, namely R&D tax credits and grants, for which similar principles apply. R&D tax credits are used to incentivize R&D broadly, without targeting specific businesses or technologies. From this perspective they are a macroeconomic intervention, targeting a specific activity, but across all sectors of the economy. Across studies, they are generally found to be effective: on average, every US$1 of forgone tax revenue generates between US$0.60 and US$2.50 in additional R&D spending.[84] However, R&D tax credits are considered second best because they do not target businesses with the greatest potential for innovation.[85] There remains uncertainty about when and whether R&D spending translates into valuable invention, for instance patents that are widely cited. Money may be better spent funding basic research at universities, which can have greater positive spillovers for the economy.

Some governments also run competition programs to promote R&D. For example, the Brazilian Innovation Agency (Finep) offers cash grants to businesses with promising research proposals. An evaluation suggests that this subsidy led to sustained business growth and higher patenting.[86] Interestingly, this program led more to technology adaptation rather than invention. While the patents generated were not cited widely, suggesting they were not globally valuable, they did heavily cite foreign patents and coincided with machinery imports, suggesting they helped businesses adapt technology from abroad.[87] This example highlights how developing economies invest to adapt technology to their local context.

Public procurement can incentivize quality improvement and innovation by local suppliers.

Many governments establish rules requiring public procurement of goods with certain attributes, such as local content ("buy local"), small business sourcing ("buy small"), or energy efficiency ("buy green"). These rules function like consumer demand subsidies, and are financed indirectly: if local, small, or green products are more expensive than readily available alternatives, the government bears the additional cost. If governments can already buy what consumers prefer at competitive prices and quality, such subsidies have little to no fiscal impact. Such rules require some bandwidth to implement, because governments must reach out to new suppliers. When rules require purchases of local content, the local market created with additional government demand must be large enough to sustain producers. Small countries, for example, may struggle to source locally produced vehicles.

Public procurement

Evidence shows that government contracts often improve long-run business performance, which suggests that public procurement can help businesses overcome market failures. For instance, studies from Brazil, Kenya, and Uganda show that businesses that win government contracts see higher sales and employment, and that these effects persist beyond the contract period.[88] Government demand can also incentivize businesses to innovate, especially in the presence of capacity constraints.[89]

Rules requiring that governments procure locally produced goods and services are an indirect way to stimulate industries but may not be a cost-effective means to achieve industrial policy goals. For instance, a recent study of "Buy American" provisions in the United States—designed to create jobs—finds that they created about 100,000 jobs at a cost of US$111,500 to US$137,700 per job. A recent tightening of the policy, which restricted the use of foreign inputs even further, is projected to create fewer jobs at an even higher per-job cost of US$154,000 to US$237,800—more than double the average US wage. This suggests that job creation could be achieved more cheaply and directly through a policy like wage subsidies.[90]

Principles of practice for public procurement include the following:

- **Collect and analyze bid data to assess costs.** Procurement rules often imply fiscal costs. Qualified bidders, such as businesses designated "small"

or "local," may charge higher prices than "large" or "foreign" businesses. In Spain, for example, "buy small" policies were shown to significantly increase the cost of providing public services, offsetting many of their positive effects on business performance.[91] Tracking the prices of goods offered by both qualified and unqualified bidders can help governments identify and measure the scale of this issue in their local context.

- **Consider conditionalities through outcomes-oriented procurement.** Procurement contracts can themselves serve as conditionalities (for example, businesses receive a procurement contract for delivering a solution to an innovation problem). Renewal of procurement contracts can also be made conditional on subsequent actions by the supplier like the use of local supply chains, reinvestment of profits, or improved working conditions. This is called outcomes-oriented procurement, which typically offers a fixed price, combined with incentives for quality improvement and innovation. Of course, additional requirements can slow innovation and reduce participation, potentially concentrating benefits toward large businesses with the resources to manage compliance. The design challenge is to specify procurement conditions that define output clearly while leaving businesses free to experiment with how to deliver.[92]
- **Include standard safeguards to ensure fair, contestable, and transparent procurement.** Governance safeguards that can be considered are open contracting processes, disclosure of bids, and audits.

Import tariffs can accelerate industry growth when there are resources and a large local market.

The use of import tariffs as an industrial policy tool is typically motivated by the "infant industry" argument—the idea that young industries need temporary protection from foreign competition until they reach sufficient levels of scale and productivity to compete on their own. If the infant industry creates knowledge spillovers, such policy is warranted. But, compared to a tool like production subsidies, tariffs are a second-choice option for fostering an infant industry, because they impose broader costs. Restricting imports through import quotas is an alternative to tariffs to foster an infant industry. In theoretical models there are conditions under which the welfare losses from imposing import quotas are lower than those from imposing tariffs (even though quotas do not generate tax revenues but rather raise administrative costs to the government).[93] In practice, import quotas are rarely used today given they are prohibited under WTO rules.

Import tariffs

Note, this discussion purposefully ignores the "optimal tariff" argument, which posits that a country with sufficient market power can increase its welfare by imposing a tariff that shifts the terms of trade in its favor—that is, lowering the world prices of its imports to benefit domestic consumers and generate revenue. Only large countries can profit from such tariff imposition and only if other countries do not retaliate with their own tariffs.[94]

Tariffs increase costs for both producers and consumers. For producers, tariffs make imported inputs more expensive.[95] These harmful impacts are evident in India: despite broad trade liberalization after 1991, persistently high tariffs on synthetic fibers hurt the performance of the country's apparel exports relative to Bangladesh and Viet Nam.[96] For consumers, they increase prices.[97] Even in two commonly cited historical examples—US tinplate and Japanese semiconductors—where tariffs actually resulted in globally competitive industries, the welfare costs for consumers were large.[98] These costs were large because infant industries can take decades to become internationally competitive: in the US tinplate case, US prices did not match UK prices (ex-tariff) until 20 years after the tariff was imposed. Despite these costs, some countries use tariffs instead of subsidies because they lack fiscal space.

Given these additional costs, genuine success stories of infant industry protection through tariffs are rare, while failures are common. Success typically requires a unique alignment of conditions. The United States steel rail industry in the late 19th century, for instance, benefited from abundant natural resources, a large domestic market that encouraged innovation, and politically powerful buyers who maintained competitive pressure.[99] The French mechanized cotton spinning industry, which benefited from import protection for its spun-cotton outputs during the early 19th century, grew rapidly in the second part of the century in part because import tariffs on the raw material cotton were also relaxed.[100] Such conditions are unusual. By contrast, unsuccessful efforts to industrialize through import substitution—replacing imports with domestic production—is the norm.[101] In South Africa during the 2010s, tariff protection shifted relative prices, allowing less productive businesses with excess capital to benefit disproportionately, reducing overall productivity.[102] Colombia's 2022 tariffs on textiles—introduced to shield domestic businesses from Chinese competition and combat underinvoicing—failed to raise employment or labor productivity,

and tariff revenues actually fell as importers evaded tariffs through fraudulent invoicing and rerouting goods through neighboring countries.[103] Similarly, Argentina's tariff hikes on electronics in the early 2000s led to inefficient assembly businesses and low-quality, high-cost televisions and cell phones.[104]

Principles of practice for import tariffs include the following:

- **Avoid tariffs on capital equipment or raw materials.** Import tariffs are especially problematic when applied to capital equipment or raw materials, since they raise costs for downstream industries that may also be developing. Korea's industrialization success, for instance, is partly attributed to an asymmetric tariff strategy that initially kept lower tariffs on imported capital goods than on imported final goods.[105] This meant that businesses like Hyundai Motors could more affordably import equipment and machinery to expand production and invest in R&D, while still enjoying protection from imported final goods. Likewise, the drawbacks of tariffs on raw materials to promote industrialization have long been recognized—as early as 1791, Alexander Hamilton's *Report on Manufactures* recognized their usefulness for infant (though not for mature) industries.[106] Tariff liberalization may improve industrial policy effectiveness. For instance, to promote the solar panel and wind turbine industries, China liberalized tariffs on electronic circuits used in these industries.[107]
- **Anticipate retaliation by other countries.** When large economies impose tariffs, trading partners often respond in kind, creating the risk of trade wars that hurt overall welfare. For example, recent modeling suggests that the US "reciprocal tariffs" introduced on April 2, 2025, would lead to net welfare losses for the US economy if its trading partners retaliated.[108] Businesses in developing economies, which often operate on thin margins within global value chains, are particularly vulnerable to higher costs or reduced market access from tariff escalations.

Technology transfer quid pro quo is effective when licenses are not available, but only in large markets.

Developing economies often use older and less efficient production technologies compared to firms in advanced economies. This could be called an information asymmetry. A long-standing argument is that industrial policies

should encourage firms to adopt new technologies that would allow them to produce better products.[109]

Many existing technologies cannot simply be purchased and deployed, especially in developing economies. Often, they require extensive training before they can be used effectively. Most production processes involve not only machinery but also work practices and knowledge of specialized input suppliers. To adopt these processes, domestic businesses often need a joint venture or other partnership with an experienced foreign business.

Technology transfer quid pro quo

A direct, first-choice industrial policy approach to this challenge is a *quid pro quo* ("this for that" in Latin) for technology transfer—under which governments require foreign businesses to form joint ventures with domestic businesses as a condition for access to the domestic market. Though controversial (refer to box 3.3), these arrangements have proven effective in large domestic markets.

Box 3.3 International harms of technology transfer quid pro quo in the auto industry?

Technology transfer quid pro quo partnerships are voluntary, and foreign businesses entering unfamiliar markets often pursue joint ventures even without explicit policy requirements.[a] However, some foreign businesses describe such arrangements as "forced" technology transfer and argue that they harm their home countries. In recent years, these perspectives have contributed to trade tensions among large economies.[b] Relatedly, local businesses involved in joint ventures in the automobile industry have been subject to lawsuits when their domestic models closely resemble those of foreign partners.[c]

Macroeconomic simulations have outlined the potential channels through which technology transfer quid pro quo arrangements could harm foreign economies. The first channel is that they could reduce foreign direct investment (FDI) by multinational businesses, compared to a counterfactual in which they retain full control over their intellectual property. This would harm welfare in the home country because lower FDI reduces profits for the multinational businesses headquartered there.[d] The second channel is that domestic partners in joint ventures could become successful exporters and eventually compete with multinational businesses in third markets. This could harm multinationals' employees from the home country, especially in cases where the home country already enjoys a significant technological advantage.[e]

(Continued)

Box 3.3 International harms of technology transfer quid pro quo in the auto industry? *(continued)*

In the automobile industry, evidence of harm via the second channel is limited—though recent shifts in the global electric vehicle (EV) industry highlight important caveats. In the combustion engine vehicle segment, local automakers do not dominate the local market nor the export market. In India, Maruti Suzuki remains the leading automobile manufacturer, supported by its expansive service and parts network. In China, joint ventures with Volkswagen, Toyota, and Renault still hold top market shares and have not been overtaken by Chinese automakers.

In the EV segment, Chinese automakers have achieved a leading position only recently. While China's original technology transfer quid pro quo policies helped establish the domestic automotive industry, its advances in EVs appear unrelated to any direct requirement for technology transfer. China's leading EV producer, BYD (Build Your Dreams), for example, has its origins producing rechargeable batteries for consumer electronics, and introduced its first pure EV in 2009—one year before its first automotive joint venture with Daimler, and 10 years before Tesla entered the Chinese market. Moreover, when Tesla did enter China in 2019, it was not subject to quid pro quo requirements and became the first foreign automaker allowed to operate without a joint venture.

a. Bamford et al. (2004).

b. In 2018, the United States raised a complaint about China at the World Trade Organization (WTO) focusing on claims of forced technology transfer, though it later asked the WTO to stop working on the complaint after China changed certain regulations (Sykes 2021). Yu (2022) argues that international law does not, in general, prohibit countries from imposing restrictions on foreign investment.

c. A prominent design dispute involved Chery's 2003 release of the QQ minicar, which closely resembled General Motors' (GM's) Chevrolet Spark but launched earlier and at a lower price, outselling the Spark by a factor of six. This was an especially complex case, given that GM's joint venture partner, Shanghai Automotive Industry Corporation (SAIC), also owned a 20 percent stake in Chery.

d. Holmes et al. (2015).

e. Choi et al. (2025).

The most well-known examples of this approach come from China and India's automobile industries. In the early 1980s, regulations in both countries capped foreign ownership of domestic businesses at 50 percent. As a result, multinational automakers seeking to enter these markets established joint ventures with state-owned enterprises, forming the Beijing Jeep Corporation in China and Maruti Suzuki in India. Over time, additional joint ventures with automakers like Ford, Hyundai, and Toyota brought substantial transfers of design, engineering, and manufacturing expertise, while also helping develop domestic networks of parts suppliers, distribution channels, auto dealerships, and service providers.

Evidence from China shows that domestic partners eventually developed capabilities beyond the joint ventures themselves. For example, Toyota-First Auto Work (FAW)—a joint venture between Japan's Toyota and China's FAW—produces Chinese versions of fuel-efficient Toyota cars. But over time, FAW also developed its own fuel-efficient models.[110] Domestic partners also succeeded at developing more affordable vehicles, a segment the joint ventures often overlooked. By 2007, Chinese automakers BYD, Chery, and Geely had captured roughly 30 percent of the domestic market by producing low-end models tailored to local demand.[111]

Principles of practice for technology transfer quid pro quo include the following:

- **Consider only with a large enough market to attract investors.** The main risk of technology transfer quid pro quo requirements is that they discourage foreign businesses from entering at all, denying consumers access to foreign products and limiting opportunities for domestic businesses to learn from foreign competitors. For countries with smaller national markets, regional trade agreements like MERCOSUR in South America or the African Continental Free Trade Agreement, which create larger duty-free markets, could be leveraged for similar purposes. However, most success stories of technology transfer quid pro quo policies come from large single-country markets.
- **Smaller economies especially can consider alternative approaches to promote technology transfer from foreign investors.** Promising alternatives include: (1) *conditional tax incentives* tied to verifiable transfers of knowledge or investments in R&D; (2) *public-private innovation hubs* that bring businesses and government agencies together to codevelop technologies and share intellectual property; and (3) *joint research funding*, often cofinanced by international donors or multinational businesses, that aligns with domestic technology priorities.

Commodity export bans and *local content requirements* shape downstream and upstream markets.

Commodity export bans and local content requirements (LCRs) are industrial policy tools designed to promote local sourcing of inputs, with the goal of

fostering infant industries either downstream or upstream in the value chain. Export bans restrict the sale of a commodity abroad, increasing local supply and lowering prices for downstream processing. This report does not evaluate export restrictions with other motivations like security (for example, on staple crops for food security or on semiconductors to retain technological superiority) or stabilization of international prices during a glut (for example, as in the oil and cobalt markets). LCRs require businesses to use a minimum share of domestic value or domestically produced components in their final products, providing additional demand for upstream input suppliers. Both policies are indirect, second-choice approaches to market failures that could instead be addressed more directly through subsidies, but governments often adopt them when fiscal space is limited.

Yet, as with import tariffs, there is little evidence that export bans or LCRs improve domestic welfare. Two potential reasons stand out. First, the economics literature shows that productivity spillovers from supply-chain linkages often occur without these policies. Multinational businesses already have incentives to improve their suppliers' productivity and capabilities to deliver higher-quality inputs, while suppliers have incentives to sell their inputs to downstream customers.[112] Second, most job creation from FDI often occurs within foreign businesses themselves, not through supply chain links with upstream suppliers.[113] This suggests that supporting industries directly may be more effective than attempting to indirectly support them through linkages.

Local content requirements

In the case of LCRs, businesses failing to comply may face penalties, such as loss of tax benefits, exclusion from government procurement, or an outright ban on their products. Even in theoretical models, however, LCRs do not necessarily increase domestic employment or value added, and they can reduce welfare.[114] While LCRs boost local input industries, they can also raise costs for final goods producers if those local suppliers are less competitive than imports. If the reduction in final goods output and the rise in consumer prices outweigh the uncertain gains to domestic input producers, overall welfare will fall. Eventually, declining final goods output can even reduce demand for the local input industries that the LCRs were meant to support. For a case study of how these dynamics unfold in practice, refer to box 3.4.

Box 3.4 Local content requirements in video-on-demand: Little harm except potentially to consumers

Local content requirements (LCRs) in the film industry date back to at least the 1920s, when European countries—pioneered by the United Kingdom, amid a growing influx of American films—introduced screen quotas that required theaters to show a minimum share of domestically produced films.[a] With the global rise of video-on-demand platforms like Netflix and Disney+, similar debates and requirements have emerged. Governments argue that local video products are essential for preserving local culture, a social benefit that markets underprovide. The creative industry is also presented as a key source of jobs.

The clearest example of video-on-demand LCRs is a 2018 law passed by the European Parliament requiring providers' catalogues to contain at least 30 percent "European works" and ensure their prominence.[b] The law also empowered member states to require streaming platforms to reinvest a portion of their domestic revenues into national content production. France, for instance, mandated that 20–25 percent of local streaming revenues be allocated to French audiovisual production. By mid-2021, major providers like Netflix had met or exceeded the quota in most large European markets.[c] Similar rules are now being considered in other countries, including Brazil, Mexico, and South Africa.[d]

While such policies can promote domestic production, they also highlight a potential downside: reduced value for consumers. In many contexts, consumers may value local video-on-demand content less than governments. If streaming platforms are required to replace some global content with local products that consumers value less, overall satisfaction and engagement may decline.[e] These costs can be substantial, but they are rarely measured, given the complex demand analysis required.

a. UNESCO (2022).

b. Directive of the European Parliament and of the Council amending Directive 2010/13/EU on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the provision of audiovisual media services (Audiovisual Media Services Directive) in view of changing market realities.

c. A 2024 proposal in Brazil outlined specific requirements linked to the size of a platform's content library: catalogs with at least 2,000 titles must include a minimum of 100 Brazilian productions; those with 3,000 or more titles must offer at least 150 local works; and platforms exceeding 7,000 titles would need at least 300 Brazilian productions. Available at https://www12.senado.leg.br/radio/1/noticia/2024/04/16/senado-aprova-cota-para-obras-nacionais-no-streaming. (accessed November 12, 2025).

d. Ampere Analysis (2022).

e. This has been an explicit industry concern in video-on-demand (Katz and Jung 2020).

Indonesia has applied LCRs extensively in manufacturing, often targeting foreign businesses selling to the local market.[115] In some respects, this approach has worked. Evidence suggests that foreign businesses operating in Indonesia source 83 percent of inputs locally, compared with 71 percent for

domestic businesses.[116] But restricting access to cheaper, higher-quality imported inputs has hurt performance: industries with stronger presence of LCRs have lower output, exports, value added, productivity, and employment.[117] Analyses using difference-in-differences estimates (comparing the performance of targeted industries with that of similar but nontargeted industries) show that use of LCRs by an industry is associated with declining exports over the following five years.[118]

Extractive industries are another area where LCRs are common, often with disappointing results. For example, Tanzania first introduced LCRs through its 1997 Mineral Policy, initially relying on voluntary compliance. In 2018, mandatory quotas were added, requiring foreign mining businesses to purchase a minimum share of goods and services from domestically owned providers.[119] But these LCRs are creating minimal value upstream, since the mining industry requires relatively few goods and services. Most of the goods that local businesses do supply are imported, adding little local value. Moreover, many local providers employ most of their staff and return most of their profits to Dar es Salaam rather than to the mining communities.[120] By contrast, Chile's mining industry has developed world-class engineering businesses without relying on LCRs. Out of 8,500 registered mining suppliers, between 400 and 500 regularly export[121]—suggesting they emerged organically through Chile's enabling business environment, not through government mandates.

Principles of practice for LCRs include the following:

- **Exhaust other approaches to capture value from FDI before relying on LCRs.** While governments typically use LCRs to maximize the domestic benefits of FDI, they often leave significant value untapped through other channels. In the extractive industry, tax concessions to miners are particularly important. For instance, Tanzania was Africa's third-largest producer of gold in 2008, but it collected less than US$30 million in annual tax revenues from the industry.[122] One drawback of LCRs is that, because they are an imposition on foreign investors, foreign investors may use them to extract additional tax concessions on their investment. These concessions could be larger than the social value of local content.
- **Exhaust direct approaches to promoting upstream industries before relying on LCRs.** For countries with adequate fiscal space and

government bandwidth, alternatives to LCRs include investments in public inputs (for example, skills development programs, market access assistance, and QI) and targeted subsidies for production or innovation. Where concerns persist, the World Bank recommends a four-pillar framework for strengthening FDI linkages with domestic businesses. This approach emphasizes joint efforts by host-country governments, multinationals, and local businesses.[123]

- **Anticipate retaliation from other countries.** Subsidies tied to LCRs have frequently been challenged under WTO rules by several members, including in the energy, pharmaceutical, retail, and telecommunication industries.[124]

Commodity export bans

Commodity export bans are indirect, second-choice tools intended to promote downstream industries, but they often carry significant risks and may do more harm than good. Export bans increase the domestic supply of a given commodity, lowering domestic prices and reducing producer profits. If the country is a major global exporter and the ban increases global prices, this effect can be partially offset.[125] But in most contexts, export bans can eventually reduce businesses' incentives to invest and expand capacity to produce the targeted commodity.

There are very few rigorously studied examples of commodity export bans. Indonesia's raw nickel ore export ban succeeded in attracting FDI to nickel processing smelters, boosting exports of processed nickel, and raising the share of domestic value added in overall exports (refer to box 3.5). However, its impacts on total employment and overall welfare remain unclear. China's export ban on rare earth elements in the 2010s illustrates how this policy tool can have unintended consequences. The ban led to innovation abroad: businesses outside China developed new ways to use rare earth inputs more efficiently and actually expanded downstream industries that rely on them.[126] Economic theory helps explain this mechanism: when countries can develop new technologies, and inputs have complementarity, restricting the supply of a critical input spurs innovation in downstream industries, ultimately dampening the restriction's effectiveness.

Box 3.5 Indonesia's nickel ore export ban: Short-run benefits in foreign direct investment and domestic value added, but potential efficiency losses

Restrictions and bans on commodity exports—especially on minerals critical to digitalization and modern energy infrastructure—are becoming increasingly common. Indonesia is at the forefront of this trend: anticipating surging global demand for nickel, the government imposed a ban on raw nickel ore exports in 2014. The goal was to attract foreign investment in smelters and downstream industries while promoting job creation and economic growth.[a] In addition to developing the domestic steel industry as part of a broader import substitution strategy, the policy also sought to lay the groundwork for electric vehicle (EV) battery production and, eventually, EV manufacturing—industries that depend heavily on nickel inputs.[b]

Initial results show short-run gains in foreign investment and domestic value added, but the policy's long-term effects are less clear. Data show that the ban led to rapid growth in Indonesia's production and export of processed nickel products, alongside increased foreign direct investment (FDI) in nickel extraction and processing.[c] Likewise, econometric analysis indicates that it increased domestic value added in exports from industries using iron and steel inputs between 2014 and 2020.[d] However, the ban also reduced average business size in downstream industries and encouraged entry by smaller businesses that likely benefited from artificially low nickel prices.[e] Because small businesses are often less productive, modeling suggests the policy likely led to inefficient resource allocation and productivity losses—though no direct measures of productivity are yet available.[f] Interviews with Indonesian private sector representatives suggest that downstream industries still rely heavily on imported steel, even a decade after the ban, due to continued limited domestic capacity.[g] Difference-in-differences estimates show the nickel export ban shifted employment from agriculture to manufacturing in nickel processing smelter districts and increased employment in upstream coal energy districts.[h] But those estimates are unable to identify the impacts on total employment. The ban's broader impacts on overall welfare also remain unassessed.

a. The surge in global demand was driven by China's rapid urbanization and industrialization and by rising global needs for lithium-ore batteries (which require raw nickel ore) used in electronic products and electric vehicles. Guberman et al. (2024) find that between 2014 and 2017, Indonesian businesses could export concentrates associated with certain mineral ores (including nickel) only if they paid an export tax and met other requirements, such as demonstrated progress in constructing nickel smelters. In 2017, the government temporarily relaxed the export ban, requiring businesses to obtain a new mining license that permitted them to export mineral concentrates and construct domestic smelters by 2022. However, the full ban on raw nickel ore exports was reinstated in 2020.

b. Guberman et al. (2024).

c. Guberman et al. (2024) document that this foreign investment originates mostly in China.

d. Kee and Xie (2025) show that this increase occurred relative to a downward trend in the country's domestic value added in exports.

e. Kee and Xie (2025) measure average business size based on total employment or total output.

f. Kee and Xie (2025) propose a theoretical model showing that the nickel export ban lowers the domestic price of nickel, which in turn reduces the price of steel (for which nickel is the main input). This effect ripples into the car industry, as businesses switch from using imports to domestic nickel. While this increases the domestic value added in car exports, the cheaper domestic steel also enables less productive businesses to enter the industry, which reduces aggregate productivity in equilibrium.

g. Kee and Xie (2025).

h. Bosker et al. (2025).

Principles of practice for commodity export bans include the following:

- **Exhaust direct approaches to promote downstream industries before relying on export bans.** For countries with fiscal space and government bandwidth, more direct alternatives include investments in public inputs and subsidies for production or innovation.
- **Commodity export bans are only effective when countries have significant market share and can attract investment in commodity processing.** Alongside nickel, in 2014 Indonesia also banned the export of another commodity: bauxite, which contains aluminum. Nevertheless, the ban initially failed to stimulate investment in domestic bauxite processing, as foreign buyers shifted to alternative sources, reflecting Indonesia's relatively small share of the global bauxite market.[127] Governments contemplating commodity export bans should carefully consider domestic processing capabilities and the prospects for foreign investment, which hinge on expected reactions from international buyers. In the nickel market, if another country with large market share were to attempt the same policy as Indonesia, it might get very different results, since buyers have already secured processing capacity in Indonesia.
- **Take commodity price trends into account.** If global demand for a commodity rises faster than supply, then prices for products that rely on that commodity will also rise. In this scenario, downstream industries may become viable without the cost reduction induced by the export ban. Of course, expecting governments to design industrial policies around long-term forecasts of commodity prices sets a high bar: such forecasts are highly uncertain, especially for commodities prone to price fluctuations or unexpected innovations.[128]
- **Anticipate retaliation from other countries.** Export bans are prohibited under most interpretations of WTO rules.[129] Importing countries affected by a ban can retaliate by restricting imports of other products from the banning country. For example, the European Union challenged Indonesia's nickel export ban as a WTO violation in 2021. Indonesia appealed the charges through the body's dispute settlement mechanism, invoking general WTO exceptions for policies to conserve exhaustible natural resources and promote the development of domestic processing industries.[130]

Consumer demand subsidies are difficult to target to the most responsive consumers.

Consumer demand subsidies are indirect, second-choice approaches to promoting business activity. To target and implement them effectively, they require fiscal space, a large domestic market, and government bandwidth.

Consumer demand subsidies

Consumer demand subsidies, often given as household tax credits, encourage consumers to purchase locally produced goods with certain attributes, like EVs or energy-efficient appliances. By increasing demand, they typically seek to expand local industries and reduce negative externalities like pollution. However, these goals can be pursued through more direct policy tools: the first-choice approach for expanding local industry is production subsidies, while the first-choice way to reduce pollution is to tax it (for example, taxing per kilowatt-hour of electricity generated with coal).

A large body of evidence shows that demand subsidies can increase demand for energy-efficient goods, from EVs and appliances to residential solar panels.[131] Yet the impacts of such subsidies vary widely depending on the price sensitivity of demand, or how strongly consumers respond to price changes on a given product. This can make demand subsidies less cost-effective, since they often benefit "inframarginal" consumers—people who would have purchased the product anyway. For example, a study of Mexico's subsidy for energy-efficient appliances estimated that roughly half of participating households would have upgraded their appliances anyway.[132]

Principles of practice for consumer demand subsidies include the following:

- **Target subsidies toward consumers who face barriers.** For products like cars or large household appliances, the main barrier is often the high up-front costs to realize long-term benefits, such as lower fuel costs or energy bills. In particular, lower-income households and individuals are especially likely to delay or avoid such purchases without a subsidy.[133]
- **Estimate consumer demand and conduct a cost-benefit analysis, if possible.** If consumer preferences are very strong, subsidies may not change consumer behavior, limiting a policy's impact on local industries. For example, while China and the United States have implemented similar EV demand subsidy programs, Chinese consumers appear more willing to adopt EVs than are US consumers.[134]

- **Exhaust alternative approaches to boost consumer demand before relying on subsidies.** Other interventions may be more cost-effective for supporting a local industry. In Norway, for example, research suggests that during the early EV rollout, each US$1 spent subsidizing charging stations generated more than twice as many EV purchases as a dollar spent on consumer demand subsidies.[135]

Macroeconomic interventions

Competitive exchange rate devaluation **is feasible only when other fundamentals are in place, and it risks triggering retaliation.**

Competitive exchange rate devaluation

Exchange rates have long been discussed as a tool to foster development.[136] Competitive exchange rate devaluation, often called "exchange rate industrial policy," occurs when governments deliberately lower their currency's value, typically by accumulating foreign reserves, with the aim of making their exports cheaper in global markets and spurring export-led growth. Like other industrial policy tools, this approach can be justified as a way to address key market failures. For instance, if exports of goods and services increase, exporting businesses may generate network benefits for each other (that is, Marshallian externalities), become more efficient over time (that is, learning-by-doing), and overcome financial constraints that can prevent them from growing.[137] Many economists argue that these spillovers tend to be larger in the early stages of development, which provides some rationale for governments in developing economies to induce them through exchange rate devaluation. This policy tool can be implemented by the central bank, and so requires less government bandwidth compared to other policies that require coordination across agencies and interaction with the private sector.

This approach is an indirect, second-choice tool for fostering industrial development. Competitive exchange rate devaluation helps exporters by making their goods and services cheaper abroad—but, like import tariffs, it also raises import costs, both harming producers using imported inputs and reducing consumer purchasing power. Production subsidies targeted to specific industries can generate production spillovers more directly, without imposing these costs on consumers.

Nonetheless, competitive exchange rate devaluation has been a component of several successful growth stories. Most notably, the East Asian "growth miracles"—in Korea, Singapore, and Hong Kong SAR, China—and China's growth all featured real exchange rate depreciation.[138] These included discrete devaluation events as well as pegs and managed floats that delayed appreciation. In East Africa, Tanzania and Uganda demonstrate a strong correlation between growth and a measure of exchange rate undervaluation over time.[139] A more recent example is Viet Nam, where rapid growth over the past decade coincided with a substantial accumulation of foreign reserves (increasing by about 8 percentage points of GDP), exchange rate depreciation, and sustained trade surpluses.

Note that some economies pursue strategic overvaluation of their exchange rates, though this is typically done to benefit affluent consumers by making imported goods cheaper, rather than as part of an industrial policy. Historically, import tariffs to create a protected market for domestic manufacturing were combined with an overvalued exchange rate. The overvalued exchange rate served as a subsidy for domestic manufacturers importing intermediate inputs, equipment and machinery, but simultaneously made their output less competitive with imports, necessitating import tariffs to offset this effect. Separately, commodity exporting countries may have overvalued exchange rates during commodity booms, which makes it more difficult to develop new export industries.

Principles of practice for competitive exchange rate devaluation include the following:

- **Pursue competitive exchange rate devaluation only when there are preconditions for success.** Competitive exchange rate devaluation is most effective where production spillovers can generate dynamic patterns, as in growth convergence processes where developing economies gradually catch up to advanced ones.[140] By contrast, in economies that are stagnating or already at the technological frontier, the benefits are limited even if spillovers occur. Effectiveness also depends on labor supply elasticity, or how willing and able workers are to shift into industries with higher wages, and whether spillovers are concentrated in industries that can absorb additional labor. These conditions help explain why competitive exchange rate devaluation has seen less success in

Latin America—where growth convergence processes have been absent, labor reallocation is more costly, tradable production leans toward commodities, and spillovers are typically smaller. Moreover, many Latin American countries pursued exchange rate devaluation through monetary expansion instead of accumulating foreign reserves, a strategy that risks inflation and instability if sustained.[141]

- **Carefully manage the capital account.** Governments pursuing competitive exchange rate devaluation should properly calibrate how open their capital account is. When an economy is very open to financial inflows, attempts to weaken the currency by buying foreign reserves are often offset, weakening the policy's impact. Conversely, if an economy is relatively closed to FDI it may be easier to devalue, but domestic interest rates will also likely be higher, dampening investment by potential exporters.
- **Anticipate retaliation by other countries.** Competitive exchange rate industrial policy relies on accumulating foreign assets, which cannot be pursued indefinitely on a global scale and lead to imbalances.[142] Trading partners may impose tariffs on exports of countries with devalued exchange rates, reducing opportunities for export growth. If multiple countries devalue at the same time, it can lead to "currency wars," undermining the policy's potential benefits.

Unwinding industrial policy tools

Automatic termination rules may end policies too early.

For any policy tool that supports businesses, a crucial question is when to end support. In some cases, certain market failures actually justify permanent subsidies. A classic example is Marshallian positive externalities that vary across industries. In this view, industries producing the greatest spillovers should always receive more support, and those producing smaller externalities should be taxed instead of subsidized.[143] Similarly, industries generating negative externalities (for example, pollution) should be permanently taxed more than others. As long as these market failures persist, there is little justification for making subsidies temporary.

More often, however, industrial policy is motivated by the infant industry argument, where support to businesses helps them learn over time. But it is very difficult to predict in advance which businesses will succeed, even with competitive selection processes.[144] Most of the industrial policy tools discussed in this report are initially available industrywide: any business can access a public input, benefit from subsidies like tax credits, or receive tariff protection. In this context, as Dani Rodrik argues, the question is "not whether a government can always pick winners—it should not even try—but whether it has the capacity to let the losers go."[145] How should governments decide when and how to end support for industry-tailored public inputs, cancel a subsidy, or lower an import tariff?

The standard recommendation is to build sunset clauses, or automatic termination dates, into the policy design. Currently, sunset clauses remain relatively rare in developing economies. A notable example is Nigeria's Pioneer Status Incentive, which grants a corporate income tax holiday for three years after businesses start production in about 100 industries, with an optional two-year extension.[146] In the United States, the Inflation Reduction Act (IRA) included tax credits for renewable energy equipment manufacturing that were scheduled to expire after 10 years. Sunset clauses can also create incentives for businesses to act quickly, accelerating their investments before support runs out.

However, phasing out industrial policies too early can dampen their long-term benefits. Industrial policies can boost productivity through learning-by-doing while also directly reducing input costs. Both effects enable businesses to lower prices and expand sales—but it can be difficult to distinguish whether higher sales are driven by temporary cost reductions or lasting productivity gains. Moreover, productivity among global competitors will continue rising. To maintain competitiveness, policies must help businesses match international price and quality levels while also keeping pace with global improvements over time.

For example, a prospective impact evaluation of the IRA's subsidies for domestic manufacturing of solar panel components found that subsidies could initially raise the US global market share to a peak of 32 percent. But by 2050, after the subsidies expire, the share was projected to fall back to about 10 percent—still higher than the baseline of 2 percent but well below the peak. Even with learning-by-doing, the IRA's 10-year subsidy period would be too short to keep pace with foreign competitors' projected

productivity improvements.[147] The study estimated that sustaining the peak market share would require subsidies lasting much longer than a decade.

When policies need to be in place for a long time, say 10 years, to show results, the biggest challenge may be for a government to keep the policy in place. In the United States, the IRA's green industrial policy provisions were canceled after just three years following an election. Government commitment beyond one electoral cycle can be a major challenge even for high-income countries.[148]

When government commitment to a policy is less of a concern (for instance, because it has broad political support), automatic termination clauses can avoid wasting money. Specifically, automatic termination clauses can include criteria under which a policy can be extended. The most common recommendation is the Mill-Bastable test, which requires showing that: (1) the targeted industry is learning and could eventually become internationally competitive, and (2) the benefits of the policy outweigh its costs.[149] In practice, however, these conditions are difficult to measure, especially for governments with limited bandwidth or insufficient data on businesses' inputs and outputs. A more practical test is to check whether input use per unit of output is declining faster in the beneficiary industry compared to other industries—though this approach does not guarantee that the Mill-Bastable test is satisfied.[150] Such tests can also help avoid arbitrary decision-making. Repeated extensions driven by political pressures to preserve employment, for example, pose a risk to sunset clauses in industrial policies. In Argentina, the Tierra del Fuego special incentive regime—established in 1972—has been repeatedly extended for more than 50 years, as discussed in chapter 5.[151]

Historically, governments often relied on export performance as a proxy for international competitiveness ("export discipline"), but this approach is now prohibited under WTO rules (except for LDCs) (refer to box 1.1). It may also create perverse incentives, such as businesses deliberately limiting exports to continue receiving subsidies. Some countries instead rely on self-reported productivity indicators from participating businesses. For instance, Nigeria's Pioneer Industry Status can be extended for two years if businesses meet criteria like steady expansion and efficient operations. Though these criteria also do not guarantee that an industry is internationally competitive, and industrial policy is costly to continue in this case.

Any extensions beyond automatic termination dates should depend on measured productivity improvements and on the government's willingness to wait for an industry to become internationally competitive. Automatic termination dates may be less important, however, when policies take the form of exemptions from taxes, duties, or rules that will eventually be extended to all businesses.

Principles of practice for ending industrial policies include the following:

- **Establish automatic termination dates of 10 years.** This window provides businesses with enough time to gain experience with production processes while avoiding prolonged subsidies. Many studies of "progress curves" showing how production efficiency improves over time suggest most improvements occur within five years.[152] In the US tinplate example, it took 10 years under a tariff of about 50–70 percent for domestic production to replace imports from the United Kingdom, a stated goal of the policy (Irwin 2000). Termination should also consider that production may not start immediately (for example, if there are construction lead times) or at full capacity, since learning-by-doing only is a function of cumulative output rather than time elapsed.
- **Government should commit, ideally across political parties, to retain the policy and also continue investments in fundamentals until the automatic termination date.** A commitment will be especially important to motivate private investment in settings where there is limited trust in government. If governments pursue industrial policy as a temporary fix for fundamentals, like energy or transportation infrastructure, they should commit to keep the focus on improving those fundamentals over the planned length of the industrial policy.
- **Allow extension only when there is clear evidence of productivity gains, and a case that the industry can eventually become internationally competitive.** Subsidies should be extended beyond their automatic termination date only if productivity (measured by input use per unit of output) is improving more rapidly in the targeted industry than in untargeted industries. Applying this principle requires both government bandwidth and cooperation from businesses to collect data on output and inputs. Currently, such data are not available in most developing economies, forcing governments to rely on productivity trends reported by industrial policy beneficiaries, without a comparison group.

- **Avoid automatic termination clauses when subsidies are exemptions from taxes, duties, or rules that may eventually be extended to all businesses.** In such contexts, it may be more effective to extend benefits to other businesses rather than removing them from the initial beneficiaries. For example, during Korea's drive to develop its heavy and chemical industry, production subsidies allowed targeted businesses to borrow abroad when untargeted businesses could not. Similarly, apparel manufacturers in Ethiopia's SEZs can import inputs duty-free, while businesses producing for the domestic market pay high import duties.

Pro-competition industrial policy is open to trade.

Many contend that industrial policy is more effective when it promotes competition, whether in domestic or international markets. This argument is supported by evidence from China, where subsidies were more effective at raising productivity when allocated to competitive industries or when dispersed across many businesses within an industry.[153] In large economies, subsidies that are narrowly targeted to a small number of businesses can weaken incentives for innovation, as they effectively guarantee those businesses a competitive advantage over others. Benefits restricted to small and medium-size businesses or young businesses may also have less impact when an economy is already competitive and its most capable businesses have already achieved scale—for example, diversified conglomerates in many developing economies.

Public inputs and market and macroeconomic interventions can often be made available to all businesses within an industry, rather than selected beneficiaries, helping to avoid entrenching incumbents or new entrants. In small economies that can sustain only a few businesses per industry, competition can be further encouraged by lowering tariffs and/or requiring businesses to export.

Japan's experience offers a more nuanced perspective. While implementing industrial policy after World War II, the government weakened the 1947 Antimonopoly Law imposed by the Supreme Commander for the Allied Powers. This allowed government-organized cartels to coordinate bulk purchases of raw materials, standardize quality, and restrict quantities to avoid investment in excess capacity.[154] These actions reduced domestic competition,

but the government's insistence that cartels compete internationally helped ensure that they remained innovative and expanded. As one study noted:

> Antitrust legislation is a controversial subject. Western theory asserts that is an indispensable tool of industrial policy to maintain competition. Former MITI [Ministry of International Trade and Industry] Vice-Minister Sahashi Shigeru has argued, on the other hand, that Japan's industrial policy, which is hostile to antitrust legislation, has produced higher levels of both competition and growth than the economies of Japan's Western critics.[155]

The requirement that cartels export seems to be an important part of this argument.

Some caveats about new evidence

It is important to note that assessing the effectiveness of industrial policy in any context is challenging, given the gaps and limitations in the available evidence. For instance, much of the early empirical work focused narrowly on whether import tariffs can support the growth of new industries. The broad conclusion was that they are generally not effective, and this conclusion was extrapolated to other industrial policy tools, resulting in broad skepticism about industrial policy. More recently, research has emerged that some interpret as offering a "more positive" perspective on industrial policy.[156] This research, which has been featured in this chapter, differs in two important respects. First, it examines a wider range of industrial policy tools beyond import tariffs (refer to table 3.1). Second, it applies more advanced econometric techniques to identify the causal impacts of industrial policy. To assess the narrow question of whether policy interventions expand targeted industries, many of these studies use a "difference-in-differences" methodology—comparing the performance of targeted industries before and after policy implementation with that of similar but untargeted industries.[157]

Recent difference-in-differences studies show that tools like production subsidies and commodity export bans can increase sales or labor productivity in certain contexts. However, with a few exceptions, they typically do not conduct an ex-post cost-benefit analysis nor do they assess the distributional consequences of such tools, namely their effects on workers, consumers, or owners of businesses. It can be said that while these papers provide evidence of policy "effectiveness," they typically do not study policy "efficiency," the extent to which overall benefits exceed costs.

A reason for this is that difference-in-differences estimates may not accurately quantify the impacts of policy interventions on the broader economy. This can be referred to as a "missing intercept" problem.[158] Industrial policy tools can create a "crowding out" effect, where gains for supported businesses are offset by losses elsewhere, leaving little or no improvement in overall productivity. For instance, a subsidy may raise labor productivity among certain businesses, but their competitors may lose skilled labor and see reduced productivity. In extreme cases, the subsidy may do little more than allow recipients to cut prices, capturing market share at their competitors' expense. In an experiment in China, researchers varied the share of businesses that received subsidized credit across 78 retail markets—finding that treated businesses performed better, but that direct competitors to treated businesses performed worse.[159] Aggregate productivity across the industry was likely no higher, even though consumers benefitted from lower prices. A study of a subsidy program in India similarly found almost complete crowd-out within products that were not internationally traded. However, there was less crowd-out for goods that were internationally traded.[160]

More fundamentally, even when crowding out does not occur, an industrial policy that works in one country may not work elsewhere. Success often depends on underlying fundamentals like the size of the local market, fiscal capacity, and government bandwidth but also comparative advantage and other industry characteristics. Given the paucity of studies on industrial policy in developing economies in particular, good benchmarks for effectiveness and efficiency in those contexts are absent.[161] Some cross-country and cross-industry studies are emerging, for instance comparing whether policy impacts are greater in industries with and without revealed comparative advantage, but these rely on policies selected with an intent-based filter in the Global Trade Alert, an approach that has limitations discussed in box 2.1.[162]

Notes

1. Rodrik (2009) poses this same question and suggests an answer in the form of institutional design features for industrial policy. These issues are addressed in chapter 5.
2. For a comprehensive coverage of place-based policies which channel support to specific geographic locations but are not tied to a particular industry or activity, refer to Grover et al. (2022) and World Bank (2009).

3. Solving this failure is known as a "big push." Refer to Buera et al. (2021) and Murphy et al. (1989). Refer also to Duranton and Venables (2018) on spatial spillovers in a context.
4. Fanuel et al. (2022).
5. The "Entrepreneur Board" is the main decision-making body during the development phase, usually chaired by the Province Governor. As the OIZ reaches 50 percent occupancy, entrepreneurs within the zone obtain the right to form a "General Assembly" comprising industrial parcel owners. This Assembly replaces the Entrepreneur Board and becomes the zone's main decision-making body. In the OIZ model, industrial parcels are sold to entrepreneurs rather than rented through long-term leases.
6. Reed (2024).
7. Indonesia, Malaysia, and the Philippines (Warr 1989); China, Indonesia, Malaysia, Republic of Korea, and Sri Lanka (Jayanthakumaran 2003). Lu et al. (2019) estimate that China's Special Economic Zone (SEZ) program generated about US$22.60 billion in benefits, compared to a total cost of US$6.98 billion, but this covered more than just industrial parks.
8. Garg (2025).
9. Brautigam and Tang (2014) discuss the reform piloting idea in the context of China.
10. Farole and Dobronogov (2012).
11. Case studies for countries as diverse as Bangladesh (Shakir and Farole 2011), Costa Rica (Monge-González et al. 2005), the Dominican Republic (Reyes et al. 2017), Mauritius (Baissac 2011), Morocco (Rodríguez-Pose et al. 2022), Poland (Velamuri and Zeng 2021), Rwanda (Robinson 2022; Steenbergen and Javorcik 2017), and Viet Nam (Tien and Hoang 2020) highlight how SEZs helped attract foreign direct investment (FDI) or expand export-oriented manufacturing.
12. Rothenberg et al. (2017) argue that KAPET areas would have delivered greater benefits for welfare and growth if they had been paired with broader local improvements.
13. McCaig et al. (forthcoming).
14. Ethiopia's preferential trade access to the US market under AGOA was suspended in 2022 over human rights concerns related to the conflict in Tigray.
15. Próspera was founded by a Delaware-based corporation in 2017 with a semiautonomous legal status under which it allows businesses to customize their own regulatory framework, and has been the target of a national protest movement (Corbett 2024). Farole (2011) and Wahba (2009) discuss inter-jurisdictional disputes in different countries.
16. For India, refer to Gallé et al. (2024) on SEZs and Garg (2025) on industrial parks. For Poland, refer to Ciżkowicz et al. (2017). For Viet Nam, Tafese et al. (2025) focus on the impact of SEZ exposure on local labor market outcomes, while McCaig et al. (forthcoming) study industrial zones, showing that one-third

of the increase in employment and two-thirds of the increase in businesses occur within the location (ward) but outside the industrial zone. For Türkiye, EBRD (2024) shows that technology development zones improved performance measures for nearby businesses.

17. Abagna et al. (2025) also show that SEZ establishment is associated with better household access to utilities, higher ownership of durable goods (that is, long-lasting items like furniture or cars), and higher levels of educational attainment.
18. Fanuel et al. (2022).
19. Frick and Rodriguez-Pose (2023).
20. The "cattle-based industrial complex" included the idea of transporting cattle hides 500 miles from Ghana's northern abattoirs to tanneries in the south, then leather would be transported 200 miles to the footwear factory in Kumasi, and then finished shoes would have to be transported 200 miles south again to the major market in Accra (Killick 1978, 252).
21. Oqubay (2015, 171).
22. Farole (2011) discusses Nigeria's SEZ program, which was promoted with the promise of the Calabar Free Trade Zone, linked to a deepwater port. Decades later, however, the port was still not dredged, and the zone—designed to cover 200 hectares—never filled more than a quarter of its capacity with active businesses.
23. Some of those challenges are overly optimistic demand assumptions, a low skills base, low business take-up, and governance challenges.
24. Moberg (2017) provides details.
25. Rodrik (2022) notes that even when businesses do invest in training, it is not profitable for workers to acquire these skills with uncertain employment opportunities.
26. Caicedo et al. (2022) provide evidence of this underinvestment in Colombia. Brown et al. (2024) provide evidence of businesses underinvesting in worker skills in Ghana's apprentice system.
27. Abarcar and Theoharides (2024) focus on the Philippines, and Khanna and Morales (2024) focus on India. In these countries, a "brain gain" has actually resulted since not all trained skilled workers emigrate. Ross and Martinez (2025) discuss how Kenya has also started working with vocational schools to tailor their courses to meet foreign labor demands as part of a new goal to dramatically expand emigration job opportunities.
28. Fan (2025).
29. For Brazil, refer to Cirera et al. (2025); for China, refer to Kong et al. (2022) and Ma (2024).
30. Carranza and McKenzie (2024).
31. The Shenzhen Polytechnic University has established 16 Specialized Industry Colleges—such as BYD and Huawei Industrial Colleges—each aligned with a specific industry chain. These colleges are developed and operated in partnership

with Fortune 500 or leading industry companies. Industry needs guide every aspect of the programs, from trainee recruitment to curriculum design, teaching methods, and program delivery. Collaboration covers a wide range of areas, including the development of new courses and standards, "Masters of Craftsmanship" training, critical technology and process R&D, industry standards, and instructional methodologies.

32. Spar (1998) discusses this approach in more detail.
33. Hjort et al. (2024) show that weak middle management is a bottleneck to industrial upgrading in developing economies. Historical evidence from US assistance to Italian factories shows the strong complementarity between technology and management training (Giorcelli 2019), while randomized control trials providing management consulting services find improvements in management, productivity, and employment in India (Bloom et al. 2013) and Colombia (Iacovone et al. 2022). Another study finds that reducing language barriers improves transfers of management knowledge at multinationals in Myanmar (Guillouët et al. 2024).
34. Acosta et al. (2025).
35. Economic models of how businesses decide to export, such as Melitz (2003) and Arkolakis (2010), treat the costs of acquiring information about foreign markets as part of the fixed costs of exporting.
36. Based on interviews of World Bank staff with the Surgical Instruments Manufacturers Association of Pakistan (SIMAP) in March 2025 as background for the 2025 *World Development Report* on standards.
37. For Peru, refer to Volpe Martincus and Carballo (2008); for Uruguay, refer to Volpe Martincus and Carballo (2010b). The services included buyer matching, market research, and logistics information. Both studies find that assistance tends to benefit small businesses the most, since they face greater obstacles to exporting—a finding also observed in Chile (Volpe Martincus and Carballo 2010a).
38. Ali et al. (2025b) evaluate the Tasdir+ program, which gave grants for two types of business plans: (1) support for exporting or (2) setting up an affiliate abroad. Approximately 75 percent of businesses chose the former. For this type of plan, eligible expenses included visits to expositions and trade fairs; market research expenditures; marketing expenditures; creation of websites and other forms of online marketing; and certification and regulatory compliance expenditures for products. For the second type of plan, eligible expenses included rent and other costs of maintaining the foreign office; travel abroad to monitor the foreign office; costs of trademark registration in the foreign country; and technical assistance required to set up or maintain the foreign office.
39. The matching service analyzed involves caseworkers located in foreign countries reaching out to Danish businesses to offer export support services (Munch and Schaur 2018). However, Buus et al. (2025) study the same services and show no effect on Danish businesses' export pricing, quality, markups, and marginal cost.

40. For instance, Austria (Badinger and Url 2013), Germany (Felbermayr and Yalcin 2013), the Republic of Korea (Choi and Kim 2021), and the United States (Matray et al. 2024).
41. Monge-González and Rodríguez-Álvarez (2013) and Hess (2015). Cirera et al. (2020) offers more details on supplier development programs, including practitioner toolkits.
42. Volpe Martincus and Carballo (2010b) argue that offering bundled services helps businesses at every step of the export process, from getting started to building relationships with foreign buyers.
43. Monge-González and Rodríguez-Álvarez (2013) estimate the impacts of Provee and PROPYME separately and in combination.
44. The impacts of the Tunisia FAMEX program are studied by Cadot et al. (2015).
45. World Bank (2025).
46. QI also addresses the information gaps that arise when buyers are unsure of quality by setting minimum quality standards and establishing conformity assessment procedures (for example, testing, certification, and recognition by laboratories and certification bodies). Importantly, compliance with foreign requirements depends heavily on how effective accreditation bodies are at ensuring domestic QI efforts are internationally accepted. Details on QI are provided by Artopoulos et al. (2013), Harmes-Liedtke et al. (2024), ITC (2005), Maskus and Wilson (2001), Sabel and Ghezzi (2021), Sanetra and Marbán (2007), and World Bank (2005).
47. *World Development Report 2025* on standards (chapter 3) provides a review of the evidence on the impact of subcomponents of QI on business performance and on aggregate trade and productivity (World Bank 2025).
48. Davalos et al. (2021).
49. IFC (2023).
50. UNIDO (2018).
51. Gutman and Hallak (2025).
52. For the Americas, for example, refer to UNIDO (2017).
53. World Bank (2025).
54. Romania offered a personal income tax break for workers holding eligible university degrees employed in software development and related industries. Four years after the subsidy's introduction, businesses in eligible industries had hired 13 percent more workers and increased revenues by 24 percent more than businesses in ineligible industries, indicating higher labor productivity (Manelici and Pantea 2021). Tunisia fully covered social security contributions (normally shared by employers and employees) for workers at promising start-ups in innovative high-tech industries. The subsidy resulted in increased survival and job creation (Ali et al. 2025a).
55. Ali et al. (2025a) show mixed effects of the Tunisia wage subsidy on labor productivity.
56. Barwick et al. (2024).
57. Camino-Mogro (2023).

58. Namuname et al. (2023).
59. Evidence is available from the United Kingdom (Maffini et al. 2019) and the United States (Zwick and Mahon 2017).
60. Aldy et al. (2023).
61. Aghion et al. (2015) also show that industrial policies are more effective in raising productivity when allocated to industries that are more competitive.
62. Adams and Ichimura (1983). Given exposure to international competition, government-organized cartels caused only small changes in prices and had no impact on industry margins (Weinstein 1995).
63. Grover (2025).
64. Akcigit et al. (2020).
65. Barwick et al. (2025).
66. Banares-Sanchez et al. (2026).
67. The Cash Incentive Scheme for Exports in Nepal studied in Defever et al. (2020) was provided to exporters conditional on their selling of eligible products to eligible destinations with a given share of local value added. Smaller businesses struggled to access the scheme, and there was no overall effect on firm-level export values, prices, or quantities. This scheme made an export subsidy be conditional on a local content requirement, a tool addressed in this chapter's section "Commodity export bans and local content requirements shape downstream and upstream markets at significant cost."
68. Kronfol and Steenbergen (2020) provide a detailed manual on cost-benefit analysis of tax incentives.
69. IMF (2015); OECD (2022).
70. Eads (1983) argues that this is the reason tax credits rather than cash grants are used as subsidies in the United States. Alexander Hamilton made the same observation in 1791 (Sylla 2024).
71. Despite rebates reaching 7 percent of export value—and over 20 percent relative to value added, Lovo and Varela (2025) show that the scheme did not lead to large aggregate export effects but instead led to a reallocation of exports toward products with higher rebate rates, which were traditional garment products.
72. McKenzie and Puerto (2021).
73. Carter et al. (2021) find long-run benefits from fertilizer vouchers in Mozambique.
74. Olcott and Liu (2024) document local governments in China providing vouchers to use data centers to train and run large language models.
75. Researchers have studied the effects of vouchers for accounting in Nigeria (Anderson and McKenzie 2022) and for creative services, including advertising, in the United Kingdom (Bakhshi et al. 2015).
76. Kremer and Glennerster (2004) introduce the distinction between "push" and "pull" incentives in the context of medical innovation. Their Market Shaping Accelerator (https://www.marketshapingaccelerator.org/ideas/) seeks to identify the correct balance of push and pull incentivies for specific innovations where

commercial benefits are estimated to be lower than overall social benefits. Examples include national policies to decarbonize the concrete and cement industry, and advance market commitments to reduce methane produced by cattle or tackle antimicrobial resistance.

77. Escobar et al. (2022).
78. Akerman et al. (2025).
79. More than 350 businesses have participated in the program, reporting an average 22 percent increase in labor productivity—double the rate of Israel's manufacturing industry overall (Szczupak 2024).
80. Appelt et al. (2026).
81. Existing diagnostic methods to evaluate the effectiveness of innovation subsidies in Public Expenditure Reviews of Science, Innovation and Technology that follow the guidance note of Correa (2014) capture well the administrative and operating costs of such tools but track progress on the efficiency in the use of inputs and in the generation of outputs only for beneficiaries, therefore falling short of a causal impact evaluation. Such review for Croatia provided in World Bank (2021) acknowledges that the analysis "cannot assess the effects attributed to the programs or the impacts of the programs" due to lack of data on outcomes for a group of nonbeneficiaries.
82. Cannone and Ughetto (2014).
83. Campos et al. (2014).
84. Bajgar and Criscuolo (2025).
85. Appelt et al. (2025).
86. De Souza and Garber (2025) also show the patenting increased only for products subject to high tariffs in Brazil. Hence import tariffs played a role in increasing the effectiveness of this innovation subsidy.
87. In Brazil, but especially in poorer economies, businesses often use means other than patents to appropriate the returns from innovation: utility models, registration of design, copyright, trademarks, secrecy, complex design, and lead-time advantage (Barros 2021).
88. For Brazil, refer to Ferraz et al. (2015); for Kenya, refer to Mensah et al. (2026); for Uganda, refer to Hoekman et al. (2024). There is also evidence that contracts help businesses increase their borrowing capacity by providing them with accounts receivable, as shown in studies from Spain and Portugal (di Giovanni et al. 2025; Duque Gabriel 2024).
89. Ilzetzki (2024).
90. Bombardini et al. (2024) also find that "Buy American" provisions do not target industries with external economies of scale, which the authors interpret as not targeting the very industries where industrial policy could have its greatest impact.
91. di Giovanni et al. (2025).
92. Mazzucato and Rodrik (2023).
93. Melitz (2005).

94. The optimal tariff argument is described by Johnson (1953) and reviewed by Irwin (1996). Broda et al. (2008) find evidence of this argument for countries setting tariffs in a unilateral, noncooperative way prior to WTO membership.
95. Evidence of such effects is available for different episodes of US tariff increases: by Cox (2025) for 2002–03 tariffs on steel and by Handley et al. (2025) for 2018 tariffs on multiple goods. The fragmented nature of modern international production—with goods crossing borders multiple times within global value chains—amplifies these costs, as emphasized in World Bank (2020).
96. Lahiri (2025).
97. Rigorous evidence that tariffs are largely passed on to consumers as higher prices is available for the 2018 US tariff increases (Amiti et al. 2019; Cavallo et al. 2021; Fajgelbaum et al. 2020) and for tariff increases on specific products in South Africa (Edwards et al. 2022).
98. For tinplate in the United States, refer to Irwin (2000); for semiconductors in Japan, refer to Baldwin and Krugman (1986).
99. Head (1994) studies the impact of these tariffs on the US steel rail industry, finding small but positive effects on overall welfare.
100. Juhász (2018) shows the Napoleonic blockade from 1803 to 1815 increased capacity in mechanized cotton spinning, and this increased value-added productivity especially after 1860. Becuwe et al. (2021) document trade liberalization under the Cobden-Chevalier Treaty after 1860.
101. Examples include Luzio and Greenstein (1995) and Irwin (2021). Furceri et al. (2022) estimate persistent macroeconomic effects of tariff increases across countries: declines in domestic output and productivity, higher unemployment and inequality, and real exchange rate appreciation.
102. Kilumelume et al. (2025).
103. Vélez and Torres (2018) show that, instead of removing tariffs, the Colombian government raised them further in 2023, highlighting the difficult political economy and policy inertia around tariffs, and the enforcement challenges in customs.
104. Lahiri (2025).
105. The importance of Korea's mixed tariff regime, whereby exporters were granted duty-free imports of capital and intermediate goods while they benefitted from higher protection of final goods, was pointed out by Page et al. (1993) and more recently by Lee (2024).
106. Sylla (2024).
107. Taglioni et al. (2025).
108. Ignatenko et al. (2025).
109. For instance, Buera and Trachter (2024, 1) argue that technology adoption subsidies are "the most cost-effective instrument for promoting economic development."
110. Bai et al. (2025) estimate that improved quality due to knowledge transfers through joint ventures increased sales of domestic models by 0.9–3.9 percent between 2007

and 2014. Gains in domestic sales due to knowledge transfer could be much larger if attributed to the full time of the quid pro quo policy, which began in the 1980s.

111. Brandt and Thun (2010).
112. Javorcik (2004) shows evidence of vertical spillovers from FDI in European emerging economies, whereas Blalock and Gertler (2008) show evidence of such spillovers for Indonesia (though they do not assess the extent to which these effects are due to LCRs). Concerns about limited spillovers from FDI usually arise within the same industry, where businesses have less incentive to share knowledge with potential competitors. As Saggi (2002) notes in his survey, several plant-level studies find little evidence of positive productivity spillovers to local businesses that compete directly with foreign affiliates.
113. Reed et al. (2024) find in Indonesia that three-fourths of jobs from FDI were created directly within foreign businesses, and only one-fourth upstream.
114. Grossman (1981) demonstrates this result theoretically, along with several other propositions about LCRs. Refer also to Qiu and Tao (2001) and Ing and Grossman (2024). Flaig and Stone (2024) document negative impacts of LCRs on the long-run competitiveness of targeted industries, and a global computable general equilibrium model shows only modest spillover effects from seven new LCRs imposed by Argentina and Indonesia (in the automotive industry), Brazil (telecommunications and public procurement), Saudi Arabia (health), South Africa (mining), and the United States (public procurement).
115. Refer to Aswicahyono et al. (2023) for details on LCRs in Indonesia. Some apply broadly to government procurement, while others target specific industries like construction, machinery, motor vehicles, electricity, oil, gas, franchise businesses, and telecommunication.
116. Reed et al. (2024) also show that in many industries the share of locally sourced inputs has increased dramatically over time—for example, from 32 percent in 1999 to 81 percent in 2019 in automobile manufacturing.
117. This evidence provided by Aswicahyono et al. (2023) is only suggestive, since it relies on simple correlations between the presence of LCRs and industry performance. A reverse causality mechanism may also be at work, with LCRs more likely to be imposed in industries already struggling with low output and productivity.
118. Vadila and Christian (2024).
119. Miners are required to submit annual local content plans detailing procurement, employment, and training activities and to develop a revolving three- to five-year R&D program.
120. Kinyondo (2024) and works cited therein.
121. Bnamericas (2025).
122. Lange and Kinyondo (2016).
123. World Bank Group (2022, 46).
124. Limenta et al. (2024).

125. Kee and Xie (2025) provide evidence on the fast growth in nickel prices after the Indonesia export ban was imposed. In such cases, the country imposing the export ban may see an improvement in its terms of trade.
126. Alfaro et al. (2025).
127. Bosker et al. (2025). More recently, some investments in aluminum smelting have been announced.
128. Arezki et al. (2014).
129. These rules are set out under Article XI of the General Agreement on Tariffs and Trade (GATT 1994).
130. These refer to exceptions allowed under Article XX of the GATT (1994).
131. For EVs, refer to Barwick et al. (2024) and Helveston et al. (2015); for appliances, refer to Boomhower and Davis (2014) and Houde and Aldy (2017); for solar panels, refer to Langer and Lemoine (2022).
132. Boomhower and Davis (2014). Houde and Aldy (2017) find that 70 percent of consumers claiming an energy efficiency rebate from a 2009 program would have purchased the appliance anyway.
133. In the context of energy efficiency, Allcott and Greenstone (2012) argue for targeting, and Gerarden et al. (2017) provide examples of situations where certain groups could face barriers to consumption.
134. Helveston et al. (2015).
135. Springel (2021).
136. Classic papers on exchange rates as a tool for development include Hirschman (1958), Krugman (1987), and Rodrik (1986, 2008).
137. Recent papers considering market failures as rationales for exchange rate policies are Benigno et al. (2022), Itskhoki and Moll (2019), Korinek and Serven (2016), Michaud and Rothert (2014), and Ottonello et al. (2024).
138. Ottonello et al. (2024) estimate that observed reserve accumulation raised annual growth by more than 1 percentage point during 2000–08.
139. Rodrik (2008).
140. Ottonello et al. (2024).
141. Calvo et al. (1995); Uribe (2003).
142. Benigno et al. (2025).
143. Bartelme et al. (2025) as well as Lashkaripour and Lugovskyy (2023) explore this case.
144. McKenzie and Sansone (2019) find that business plan scores from judges and modern machine-learning methods have very low predictive power over business survival, employment, sales, or profits three years later.
145. Rodrik (2009, 22).
146. Government of Nigeria (2017). The Pioneer Status Incentive was recently replaced by a new Economic Development Incentive that provides tax credits proportional to qualified investment values.
147. Hong (2025).

148. The political science literature examines how the policymaking process, including the feasibility of long-term commitment, depends on the features of the political system (Coelho, Ratnoo, and Dellepiane 2015). For example, consensus-building approaches in areas of policy where longer-term commitment, extending beyond one electoral cycle, is crucial for policy effectiveness can be more difficult to achieve in political systems with concentration of power in single-party majority governments, the stylized "UK Westminster model" of Lijphart (1999).
149. Melitz (2005) shows how the net benefit of infant industry protection depends on the shape of the learning curve, and the degree of substitutability between domestic and foreign goods, which must be estimated. For further discussion of the Mill-Bastable test, refer to Corden (1997, ch. 8) and Kemp (1960).
150. This formulation is due to Krueger and Tuncer (1982).
151. Hallak et al. (2024).
152. Thompson (2010).
153. Aghion et al. (2015) show these findings defining industries that are more competitive as those with a lower rate of profit.
154. Adams and Ichimura (1983). The law imposed by the Supreme Commander for the Allied Powers also included provisions that did not even exist in the United States, such as a ban on exclusive patent licensing. This stipulation would have made it impossible for Japan to import technology.
155. Johnson (1982, 227).
156. Juhász et al. (2024).
157. Baker et al. (2025) provide a frontier review of this methodology.
158. Erten et al. (2025) discuss this in evaluating the aggregate employment effects of the US CHIPS act.
159. Cai and Szeidl (2024) measured business performance by sales and profit.
160. Rotemberg (2019).
161. The lack of evidence from developing economies is consistent with a broader pattern in economics research. Das et al. (2013) show the bias of economic research toward the United States and other advanced economies until 2005. Advancing two more decades Stacy et al. (2024) show the pattern persists: the number of articles on a country is highly correlated with its GDP per capita, population, and national statistical system quality.
162. Baquie et al. (2025) and Huang et al. (2025) summarized in IMF (2025).

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CHAPTER 4

Which Activities to Target?

When the motivation for industrial policy is economic development, deciding which activities to target is a complex undertaking. Governments must first determine which activities are most likely to generate the desired positive spillovers, or which are held back by coordination failures or information asymmetries. Next, they must decide which activities to prioritize and how to allocate scarce resources across a wide range of industrial policy tools and potential beneficiaries. These overlapping challenges illustrate why the familiar critique that "governments can't pick winners" often carries weight.

By contrast, targeting industrial policy motivated by external impacts, like efforts to reduce pollution or promote security, is considerably more straightforward. To strengthen resilience against economic or geopolitical shocks, for instance, governments can identify essential goods and either support domestic production or reduce reliance on single foreign suppliers. For food security, they can support domestic agriculture to ensure sufficient production and diversify imports. For military preparedness, they can invest in strategic industries like shipbuilding or semiconductors to ensure production capacity during war. Governments can also target complementary measures, like supporting irrigation or semiconductor manufacturing equipment, as part of broader security planning.

This chapter examines how governments can identify and target activities to support when designing industrial policies for development. First, it offers a framework to identify strategic business activities or industries to promote development. Second, it presents considerations for articulating an industrial strategy that may include many business activities, along with guidance on how to communicate such a strategy. Third, it discusses complementary investments and policies to build comparative advantage. Finally, it concludes

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with a concrete example of how the Indian state of Tamil Nadu applied the chapter's concepts—and the policy tools from chapter 3—to attract production of Apple's iPhone 16.

A framework to identify strategic business activities for development

Deciding which business activities are strategic is perhaps the most difficult and contested topic in industrial policy. As Nobel laureate Paul Krugman remarked about industrial policy in 1983: "While there is a valid case for targeting grounded in economic theory, the theoretical basis is too complex and ambiguous to be useful given the current state of knowledge".[1] Of course, the last four decades have seen significant progress in economic measurement, and recent years have seen a resurgence of interest in industrial policy among economists. Nonetheless, Krugman's argument still largely holds.

In general, scientific targeting—where economic benefits from an intervention are calculated for each industry and then ranked—is not feasible. As a result, governments often rely on ad hoc or intuitive heuristics when deciding which industries to support. Such methods might occasionally deliver on a government's development objectives, but they also risk wasting scarce fiscal resources on unpromising strategies.

Recognizing this uncertainty, the following sections outline a simple framework for more deliberate targeting. Specifically, the framework proposes indicators across two key criteria for identifying strategic business activities for development: (1) the activity's benefits and (2) its feasibility given the local context (refer to table 4.1). While some of the indicators are difficult to measure and are therefore best described qualitatively, others—particularly those related to feasibility—can be measured more precisely.

Measuring the benefits of strategic business activities

The benefits of an activity being targeted for development can be broken down into two categories: (1) the industry's development potential, measured by proxies for knowledge spillovers, and (2) its external impacts, measured by more narrow industrial policy goals, such as foreign exchange earnings, job creation, pollution reduction, or economic resilience and security (refer to chapter 6).

Table 4.1 Criteria to identify strategic business activities for development

Criteria		Indicator
I. Benefits from business activity	Positive spillovers	• Business activity is new and has not been done in the economy before • Diversification of the economy through new products, processes, and inputs, creating knowledge spillovers • Learning-by-doing with advanced production methods (for example, through worker training, research and development) • Contribution to industrial upgrading (for example, experience producing for a leading international buyer signals ability to produce high quality)
	External impacts	• Foreign exchange earnings • Job creation • Pollution reduction • Economic resilience and security
II. Opportunity	Market potential	• Current value of world imports and/or domestic demand • Growth of world imports and/or domestic demand • Limited competition in international market measured by number of exporters
III. Feasibility	Risk based on evolving comparative advantage	• Low-risk activities have revealed comparative advantage[a] • Medium-risk activities use adjacent technology in "product space"[b] • High-risk activities lack both revealed comparative advantage and adjacent technology

Source: Original table for this publication.
a. Balassa (1965).
b. Hausmann and Klinger (2006).

Positive spillovers and rules of thumb

The primary justification for targeted support is that some activities have positive spillovers that create external economies of scale, driving down costs industrywide through factors like clustering, knowledge spillovers, shared labor pools, or shared markets for key inputs. These spillovers represent a canonical market failure, in which the private benefits from businesses' decisions are smaller than the associated social benefits. As discussed in chapters 1 and 3, a range of policy tools can be used to address such market failures.

In theory, industries with stronger positive spillovers merit greater government support. This logic was articulated more than 100 years ago by Arthur Pigou. When subsidies are budget neutral, or funded by taxes on industries with weaker positive spillovers, aggregate social benefits—such as increased gross domestic product (GDP) per capita or, equivalently, increased aggregate productivity—are roughly proportional to the product of the size of the

positive spillovers and the change in the amount of the activity being subsidized. For this reason, targeting activities with positive spillovers is sometimes called "productivism" or "productive development"—that is, industrial policy aimed at raising existing productivity.[2] In this report, it is referred to simply as "industrial policy for development."

However, while this approach is straightforward to describe in the abstract, it has proven difficult to put into practice. Two recent efforts to estimate the size of positive spillovers have yielded little clarity:

- **Measurement of external economies of scale.** One cross-country study using industry-level data found that scale economies were nearly largest in the rubber and plastics industries and lowest in the petroleum industry.[3] By contrast, a study using firm-level data for Colombia found nearly the opposite pattern: scale economies were largest in petroleum and near the lowest in rubber and plastics.[4]
- **Measurement of learning-by-doing.** Positive spillovers are often related to learning-by-doing, when a business lowers its costs by accumulating more production experience—for instance, when workers are trained and then move to other businesses, or when research and development (R&D) in one business sparks innovation in another nearby. Supporting and protecting infant industries can give them time to learn from experience until they can lower costs and compete internationally. However, estimates of learning effects exist for only a handful of industries and vary widely across time and product types. In semiconductors, for instance, analysis of data from 1974 to 1992 found that learning effects in the homogenous memory chip (DRAM, Dynamic Random-Access Memory) industry were large—but analysis of the central processing unit (CPU) chip industry between 2005 and 2015 exhibited relatively modest learning effects.[5]

Taken together, these examples illustrate how the estimated gains from industrial policy can vary widely across industries, countries, and contexts. Moreover, measuring these gains requires sophisticated econometric techniques and often relies on proprietary or restricted data. As a result, it is not possible to make general statements about which industries are most important in terms of the positive spillovers they generate. Ultimately, this reaffirms Krugman's early skepticism about a purely scientific approach to targeting

industries—one in which governments could calculate in advance the expected gains from an industrial policy.

To deal with this issue, governments rely on simple rules of thumb to target activities expected to have greater positive spillovers. While these approaches can be helpful in proxying for an activity's potential positive spillovers, or in telling a qualitative story, it is not feasible to rank positive spillovers with any precision or certainty. Nonetheless, at least two rules of thumb are used:

- **New activities.** Dani Rodrik suggests that incentives should go only to "new activities"—those that diversify the economy through development of new products or use of new production processes and inputs.[6] The idea behind this is that new activities create larger industry- or economy-wide spillovers.
- **"Advanced," "sophisticated," or "complex" activities.** A related rule of thumb is to target advanced production methods or industries. For instance, Reda Cherif and Fuad Hasanov advocate channeling government support toward "sophisticated industries," which go beyond a country's initial comparative advantage but may ultimately become competitive in export markets.[7] Like economies of scale generally, these knowledge spillovers are not measured precisely. However, studies do find that exports coincide more with economic growth when they are in sectors like manufacturing or skill-intensive goods, rather than in primary products or commodities, and that countries diversify their exports as they grow.[8] Two measures have been developed to assess how advanced an industry is: (1) the average GDP per capita of countries that export that product[9]; and (2) complexity, a measure of whether the product is exported by countries that are themselves diversified into many products.[10] Countries exporting products that are advanced according to these measures tend to grow faster. This is consistent with the idea that, because they require more knowledge to produce, their production creates positive spillovers for the rest of the economy.

Overall, these measures are helpful in proxying for, or telling a qualitative story about, potential positive spillovers from an activity. At a minimum, a government should focus on promoting new activities. These are sure to provide at least some knowledge spillovers. It is worth mentioning two

additional economic rationales for targeting activities that have emerged in the literature. Given their caveats, however, these rationales are generally less attractive for targeting:

- **Upstream activities.** Lowering costs for upstream or "linkage" industries can reduce costs for many other industries—suggesting that targeted support (for example, through subsidies for more efficient technologies) can yield broad benefits. This argument has long motivated support for nontradable sectors that play an enabling role for many others, including energy, finance, telecommunications, and transportation. Recent measures of "upstreamness" typically identify steel and mining as the most upstream tradable industries, though this depends on context.[11] It should be noted, however, that the argument to support them mainly applies to closed economies, where domestic businesses are the only producers of inputs. In open economies, where businesses can import inputs freely, industrial policy for upstream tradable industries will have broader benefits only if it makes them competitive with foreign suppliers.
- **Monopoly industries.** Another rationale argues that subsidies for industries with monopoly power—which restrict output to raise prices—can, in theory, encourage them to expand output and lower prices.[12] While subsidizing monopolies may seem politically untenable, this approach resembles the regulation of natural monopolies like electricity or water utilities, which are typically given a guaranteed rate of return in exchange for providing access at regulated prices. However, outside of natural monopolies, openness to trade or enforcement of competition law (for example, by blocking mergers or removing barriers to market entry) may reduce prices at a lower fiscal cost than providing recurring subsidies to dominant businesses. Moreover, efforts to control prices may have dynamic effects, reducing incentives for innovation.

External impacts

Despite the clear case to target industries with the most costly market failures, as measured by the size of positive spillovers, "policymakers tend not to think in terms of fixing market failures"—as noted in a 2025 World Bank note on industrial policy.[13] Instead, they focus on concrete development objectives, including those discussed in chapter 6: foreign exchange

earnings, job creation, pollution reduction, and economic resilience. When governments pursue industrial policy, they often target industries expected to deliver on these goals.

Two general caveats about targeting based on expected external impacts are worth stating. First, just because an industry is large, as measured by some desired outcome—export industries, for example, earn foreign exchange, while personal services like taxi driving provide mass employment—that does not mean there is a large market failure in the industry. As a result, gains from subsidizing the industry may be less than the cost of the subsidy. Second, and related, policy makers interested in external impacts may focus on measuring policy effectiveness related to those impacts, without measuring efficiency in the sense that benefits are greater than costs.

Sizing the opportunity by market potential

While measuring the development benefits from an activity is fraught with difficulties, measuring the size of an economic opportunity is straightforward. Business executives do it all the time. As a rule of thumb, realized benefits will be proportional to the size of the obtainable market. To realize benefits, therefore, it is necessary that the obtainable market is large. This market has three components: the current value of the world imports and/or domestic demand; its growth; and the intensity of competition, which shrinks the market share that is obtainable. One useful approach to identify large opportunities is to find global themes that point to large and growing markets with limited competition. Doing so is outside the scope of this report, but an obvious example is the energy transition, which today is creating new demand for a variety of new energy technologies, where there is limited competition among producers precisely because technology is changing rapidly. The Made in China 2025 project followed exactly this approach to identify a fairly narrow set of new business activities, which were assumed but not proven to generate knowledge spillovers.

Find market potential by being an early mover in a growing market

At a minimum, when governments target a specific activity, they should be able to make a strong case that global demand in that industry is expanding rather than contracting. This growth can be measured not only in terms of global imports but also in domestic or regional sales trends. Two rationales are relevant here:

- **Limited competition.** The advantages of being a first mover have long been recognized as a source of economic success. As early as 1848, John Stuart Mill observed: "The superiority of one country over another in a branch of production often arises only from having begun it sooner. There may be no inherent advantage on one part, or disadvantage on the other, but only a present superiority of acquired skill and experience."[14] This insight formed the basis of his argument in favor of supporting and protecting infant industries: entering a market early allows businesses to develop advantages before their competitors. In contrast, it is more difficult to enter markets with more competitors. Recent evidence shows that complex products are also produced by more countries, implying more competitive markets that may be difficult to enter.[15] A measure of limited competition can be used to filter out activities identified by other rules of thumb, such as whether an activity is complex or new.
- **Demand growth.** Even when a country is not the first mover, entering growing markets can offer powerful advantages. Countries grow faster when they export to markets where import demand is growing.[16] Such markets are typically easier for new exporters to enter than declining markets, where incumbents may dominate. Historically, some success stories involved government entrepreneurship in industries with strong growth potential, as forecasted by consultants. In Taiwan, China, a 1953 report from the US J.G. White Engineering Corporation suggested there was a future in plastics. By one account, the chief economic planner used bank deposits to identify an entrepreneur with enough savings to undertake the project, and "told" him to start an enterprise. By another account, the entrepreneur approached the government asking for advice on which industry to pursue, and plastics were recommended. Either way, today the Formosa Plastics Group is a diversified conglomerate with overseas investment in the United States. In 1954, the government similarly saw potential in the rayon industry and brought together an American synthetic fiber company with several local textiles to form a joint venture, which by 1957 became the largest business on the island.[17] Today, many governments pursue strategies that target new and growing industries, particularly those where relatively few countries export—such as processing minerals into critical components for modern transport and energy infrastructure.

Targeting growing markets can be a challenge for governments, since businesses in declining or mature industries have stronger incentives to lobby for support.[18] As a result, much industrial policy has focused on industries in decline. For example, in Serbia in the late 2010s, nearly half of all cash subsidies went to cover losses in land, rail, and air transportation—mature industries with limited prospects for innovation. Tax exemptions were directed to industries like manufacturing, agribusiness, and information technology, yet 92 percent of their value supported businesses that did not invest in R&D, and 31 percent went to businesses that did not invest in intangible assets like patents, copyrights, or trademarks.[19] These examples suggest considerable scope for redirecting subsidies toward more innovative industries.

Balance policy risk using evolving comparative advantage

Many industries have strong potential, but not all countries have the capabilities to develop them competitively. These capabilities include factors that are fixed, like natural endowments, and others that can be developed over time, like installed infrastructure, human capital, basic research institutions, or liberal trade policy (refer to box 4.1). Economists summarize these capabilities through the concept of comparative advantage: the extent to which certain industries are relatively more productive than others in an economy, which has been shown to be a key driver of production in an open economy.[20]

Box 4.1 Measuring comparative advantage and identifying adjacent related technology

Recent analysis by one of the report's authors reviews many measures of comparative advantage. The two most important are highlighted here. The Balassa (1965) measure of revealed comparative advantage (*RCA* in the equations that follow) estimates industry productivity in the original Ricardian trade model. The measure is equal to the share of national exports in an industry (for example, 2.4 percent of exports from Guatemala are in business services), divided by the share of world exports in that industry (for example, 1.7 percent of total world exports are in business services). The purpose of the denominator is to adjust for the size of global demand for the sector. In the example, Guatemala has an RCA of 1.4 in business

(Continued)

Box 4.1 Measuring comparative advantage and identifying adjacent related technology *(continued)*

services, because it exports 1.4 times more business services than all other countries combined. Formally, the measure for country i in industry k is defined as:

$$RCA_i^k = \frac{\left(x_{i,World}^k \Big/ \sum_{k'=1}^{K} x_{i,World}^{k'} \right)}{\left(\sum_{i'=1}^{I} x_{i'World}^k \Big/ \sum_{i'=1}^{I} \sum_{k'=1}^{K} x_{i,World}^{k'} \right)} \qquad \text{(B4.1.1)}$$

where $x_{i,World}^k$ are the total exports of country i in industry k. A country is said to have a revealed comparative advantage in an industry when RCA is greater than 1.

Governments also want to identify new export industries, not just industries that are already successful. To identify potential new opportunities, Hausmann and Klinger (2006) proposed a clever and transparent measure of the probability that a new capability might emerge. The measure refers to the probability, for any given country and product, that the country has a RCA greater than one, conditional on the other industries in which the country has a RCA greater than one. The probabilities are calculated based on the comparative advantages of other countries (for example, Senegal is less likely to move into electronics assembly because it does not export electronics compared to other exporters, but can likely succeed in fertilizer production because it has significant exports of raw phosphates).

The measure is a summary statistic for **technological relatedness** in the "product space," which is a matrix with elements indicating the industries in which countries have a comparative advantage. In the example above, fertilizer is an "adjacent" industry in Senegal's "product space." The product space can be defined in any year, suppressing time notation. The element of row i and column k is given by

$$x_i^k = \begin{cases} 1 \; if \; RCA_i^k > 1 \\ 0 \quad otherwise \end{cases} \qquad \text{(B4.1.2)}$$

Each row gives a vector of country capabilities. Using the product space, the adjacent related technology measure between two products k and k' is defined as

$$\varphi_k^{k'} = min\left\{ P\left(x_i^k \middle| x_i^{k'} \right), P\left(x_i^{k'} \middle| x_i^k \right) \right\} \qquad \text{(B4.1.3)}$$

where the conditional probability is calculated over all countries. This measure captures the idea that production capabilities are related across industries: if a country has a comparative advantage in one sector, it has a higher probability of having comparative advantages in proximate sectors. In the product space, low-income countries have fewer adjacent products. This observation reinforces the argument that it is more challenging for a low-income country to move into a new product: with fewer capabilities, there are fewer new capabilities nearby.

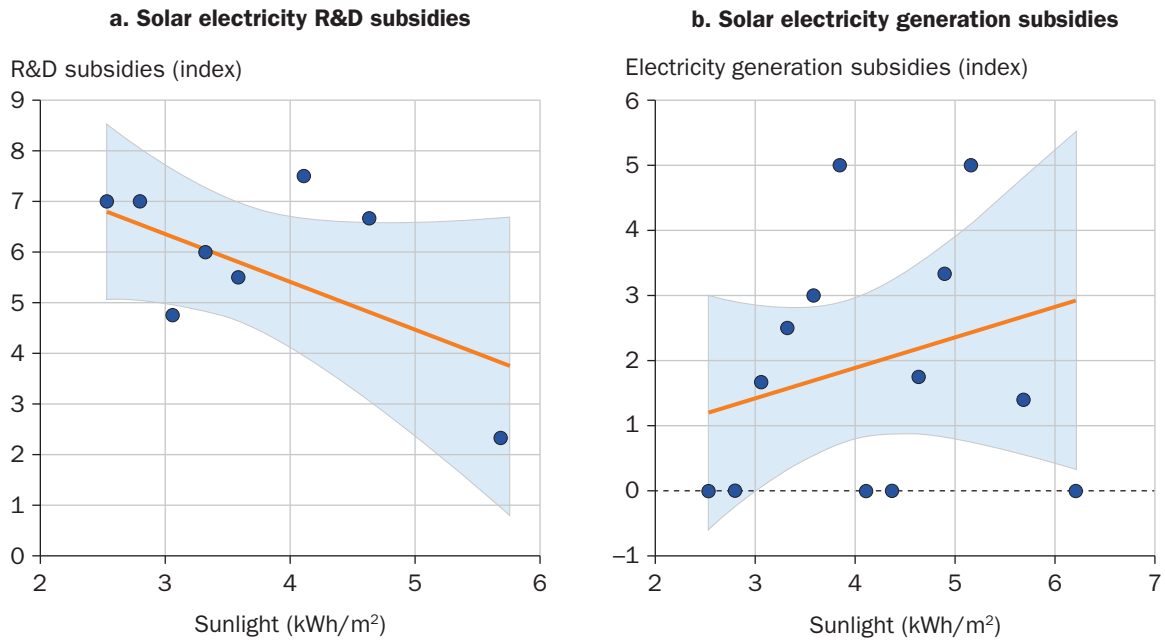
Measuring comparative advantage is useful for assessing an industry's feasibility in a specific country—and thus its potential to deliver development benefits. Activity feasibility here refers to the likelihood that the activity can become economically competitive in a country, distinct from the feasibility of industrial policy tools discussed in chapter 1. Two particular metrics, revealed comparative advantage (to identify current strengths) and latent comparative advantage (to predict future strengths), are used in recent analysis[21] to categorize industries as having a low, medium, or high risk of failing to develop in a given context:

- **Low-risk activities** are those in which a country has already demonstrated comparative advantage. Revealed comparative advantage has a standard measure (refer to box 4.1). In the context of export-oriented industrial policy, low-risk activities include products the country is already successfully exporting. At first glance, targeting such activities with government support may seem unnecessary, since they already perform well—yet market failures may still exist that constrain their growth. Low-risk industrial policy could also focus on new activities within an existing product line, for instance transitioning from assembly to product design.

Global Trade Alert (GTA) data show that advanced economies often target industrial policy toward existing areas of comparative advantage.[22] Difference-in-differences estimates (comparing the performance of targeted industries with that of similar but nontargeted industries) suggest that such policies boost exports only for industries with revealed comparative advantage, confirming lower risk.[23] Targeting low-risk activities also reduces the likelihood of supporting unproductive businesses. Critics may argue this approach reduces dynamism by diverting resources away from new opportunities—but evidence suggests that comparative advantage changes too slowly for this to be a concern if government support has an automatic termination date of 3–5 years.[24]

The solar electricity industry is an industry where governments do target industrial policy toward activities with a comparative advantage. Countries rich in sunlight may not have strong R&D capabilities, which often depend on complementary inputs like skilled labor and institutional capacity. Rather than subsidize solar R&D, these countries instead subsidize solar electricity production using feed-in tariff (FiT) schemes—policies that subsidize solar electricity production with a fixed payment for each unit of solar electricity fed into the grid (refer to figure 4.1).

Figure 4.1 Sunlight and prioritization of subsidies for solar electricity research and development versus production



Sources: Global Solar Atlas 2.0, Solargis, https://globalsolaratlas.info/map; OECD Climate Actions and Policies Measurement Framework (database), Organisation for Economic Co-operation and Development, https://www.oecd.org/en/data/insights/data-explainers/2025/04/the-climate-actions-and-policies-measurement-framework-capmf.html.

Note: The two panels present binscatter regression coefficients of either solar electricity R&D subsidies (panel a) or solar electricity generation subsidies (panel b) on sunlight. Each marker indicates the average of a bin of a roughly equal number of observations. Sunlight is measured as global horizontal irradiation, the sum of a country's direct and diffuse irradiation components received by a horizontal surface, in kilowatt-hours (kWh) per square meter, calculated for a period from 1994, 1999, or 2007 (depending on the satellite region) to 2018. Solar R&D subsidies measure public expenditure for research, development, and demonstration in 2023, normalized by GDP. The use of feed-in tariffs measures the subsidy per kWh offered to solar energy producers in 2023. Both indices are scaled from 0 (not stringent) to 10 (very stringent), based on actual subsidy levels across 50 countries (OECD + G20 + OECD-accession countries) from 1990 to 2023. GDP = gross domestic product; G20 = Group of 20; OECD = Organisation for Economic Co-operation and Development; R&D = research and development.

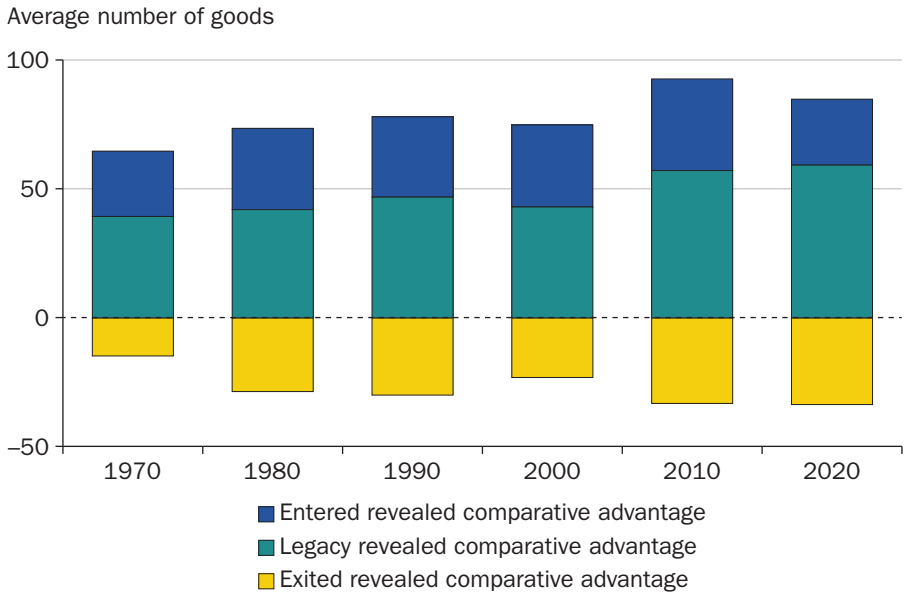
- **Medium-risk activities** are new activities that are technologically related to existing comparative advantages. Justin Yifu Lin recommends a focus on these activities, or industries appropriate for countries' level of development, and advises that "targets in developing countries should not necessarily draw from those that exist in high-income countries."[25] Costa Rica's successful expansion into avocado and pineapple exports, for instance, relied on similar agricultural technology as bananas, the country's long-term

comparative advantage. To quantify these relationships, Ricardo Hausmann and Bailey Klinger developed "technological relatedness," a probabilistic measure that predicts which industries are most feasible for a country to develop over time, controlling for other factors (refer to box 4.1).[26] For example, if a country has a revealed comparative advantage in piston engine parts, this measure predicts that it has a 78 percent chance of having a revealed comparative advantage in other parts and accessories for passenger motor vehicles—but only a 4 percent chance of having a revealed comparative advantage in computers.[27] From this perspective, industrial policy that targets activities with low current productivity but high technological relatedness can be considered medium risk.

- **High-risk activities** are new activities that are not technologically related to existing comparative advantages. For instance, in addition to leaping from bananas to pineapples and avocados, Costa Rica also gradually built up its capabilities in electronics, medical devices, and business services. Not all new sources of comparative advantage can be predicted with precision in advance. Indeed, research finds that GDP per capita growth is faster in countries that develop advantages not predicted by technological relatedness.[28] Industrial policies targeted at activities that venture beyond technological relatedness are high risk and harder to predict, but if successful, they can yield high returns.

Depending on its risk tolerance, a government can balance its targeting across low-, medium-, and high-risk activities. A roughly even division of about one-third in each category would be a reasonable starting point. Figure 4.2 shows that in any given decade, roughly half of the products exported with revealed comparative advantage in developing economies have been exported for 10 years or more, while the other half emerged more recently. This reflects the dynamic yet slow-moving nature of how industrial productivity develops over time.

Figure 4.2 Dynamic comparative advantage in developing economies



Source: Reed 2024.

Note: The sample includes all countries with less than US$10,000 in GDP per capita measured in 2017 dollars at purchasing parity in a year. Goods with legacy revealed comparative advantage had revealed comparative advantage in the previous decade as well as the current decade. Goods that entered revealed comparative advantage had revealed comparative advantage in the specified decade but not the previous decade. Goods that exited revealed comparative advantage had revealed comparative advantage in the previous decade but not the specified decade. GDP = gross domestic product.

Considerations when articulating industrial strategy

Government officials often speak of industrial (or agricultural, or tourism, or mining) "strategy" rather than industrial policy. Such strategies are often motivated by the economic rationales described in the previous section but ultimately follow the model of the competitive strategies of businesses, which seek to develop a value proposition—that is, a specific set of assets, capabilities, and circumstances in the business environment that lead customers to choose a local product over others. The main value of an industrial strategy is to provide diverse government agencies with a common understanding of the value proposition that allows them to align their actions with improving the value proposition. The following sections outline key considerations for governments seeking to articulate their industrial strategies.

Target important problems in an industrial strategy, but don't be too specific

How specific should an industrial strategy be? National development plans often identify a wide range of priority industries, sometimes targeting as many as 31 (refer to figure 2.1). Industrial targeting can be an even more detailed process, with analysts often estimating comparative advantage at the four- or six-digit level of the Harmonized System (HS) classification for trade data, where products are coded with considerable specificity. This breadth is appropriate, since not all targeted industries will succeed.

However, given the inherent uncertainty over which industries will ultimately succeed, it is often more effective to target broad sector categories rather than specific industries, emphasizing the underlying advantages that can be leveraged.

An historical example of this is Alexander Hamilton's 1791 *Report on Manufactures*. Rather than arguing for specific products, Hamilton advocated a general expansion of US manufacturing using the latest technologies to alleviate the effects of European trade restrictions. This approach may be called an "industrialization policy" rather than an "industrial policy," because it did not target specific industries.[29] Similarly, Japan and the Republic of Korea pushed for heavy and chemical industries, a broad term for anything that did not include the light manufacturing industries they had already specialized in. In the literature, Mariana Mazzucato's approach to "mission-driven" industrial or innovation policy is similar in spirit. "Missions" are aimed at tackling social problems that require new technological solutions, like meeting Sustainable Development Goals. This approach calls for a diverse portfolio of projects, resulting in investment and innovation across industries.[30] Any activity contributing to a well-defined "mission" to tackle a broad challenge would be eligible.

One advantage of not being too specific is that it disciplines public inputs and market incentives to avoid conferring privileges to narrow industries or even individual businesses, hence avoiding political capture. Bangladesh is an example of an economy where one industry—apparel exports—succeeded in part due to industrial policy, but where the economy has struggled to diversify.[31] This may be due to industrial policy that has been tailored too much to the needs of apparel exporters. Specifically, apparel exporters benefit

from a bonded warehouse facility that allows them to import textiles and other intermediate goods duty free, ensuring they can price competitively in global markets. While there is no specific law that prohibits other exporters from using the facility, 90 percent of users were in the apparel export industry as of 2018, due to 320 statutory rules and orders that give apparel manufacturers special advantages not available to other industries—including the leather industry, the country's second-highest manufacturing export revenue earner.[32]

Though developing economies have fewer industries and capabilities, the amount of tailoring of public inputs may paradoxically increase with development. For example, when Singapore established its first industrial park at Jurong in 1961, the area was targeted simply because it offered abundant low-cost labor nearby. But in its first decade, Jurong attracted a diverse mix of manufacturing industries, from garments and ship repair to timber processing. Only more recently did Singapore develop specialized zones like Jurong Island, focused on chemicals, and Tuas Park, focused on biomedical industries. Beyond public inputs, market incentives—notably subsidies and import tariffs—may, like macroeconomic interventions, be more effective when targeted broadly at the sector level rather than toward narrow product categories.

Within a strategy, experiment with a portfolio of new activities identified primarily through a bottom-up rather than top-down approach

Once a strategic sector is identified—such as tourism or manufacturing—say, for its external impacts such as potential to earn foreign exchange, create jobs, or generate value from natural assets, a government should experiment with a portfolio of new activities in this sector. Experimentation involves engaging the entrepreneurs in an industry to understand market failures, track their progress, and potentially—though not necessarily—offer public inputs, market incentives, or macroeconomic interventions to support them.

Priority activities can be identified through either a top-down or bottom-up approach. The top-down approach, sometimes called "state entrepreneurship," involves the government identifying industries with positive spillovers and external benefits and directing entrepreneurs to set up businesses in those industries, either through exhortation, narrowly targeted market incentives like production subsidies, or even direct undertakings by state-owned enterprises.

In contrast, the bottom-up approach involves responding to entrepreneurs, including foreign investors, and tailoring public inputs to the challenges they face while keeping market incentives more broadly targeted. For example, in the top-down approach, a government might offer production subsidies for specific manufactured goods, like pharmaceutical formulations, specialty steel, or mobile phones, as with India's production-linked incentive program. By contrast, in the bottom-up approach, the government would work through an investment promotion agency to provide key public inputs needed by entrepreneurs in a sector—identified through foreign investor surveys, for example—while not targeting subsidies to the production of specific goods. The example of Tamil Nadu in India attracting production of the Apple iPhone 16 illustrates how successful industrial policy balances both top-down and bottom-up approaches (refer to box 4.2 at the end of this chapter).

In principle, the balance between top-down and bottom-up targeting depends on the information available to the government. The top-down approach is information intensive, requiring many credible diagnostics that identify the development benefits and feasibility of many potential activities. While consultancy businesses, academic institutions, and international organizations offer approaches for producing such diagnostics, implementing them effectively remains a significant challenge.[33]

In the bottom-up approach, by contrast, the government engages entrepreneurs about the opportunities they see and the constraints they face. Governments distinguish between "my problems," which it commits to address, and "your problems," which it does not.[34] "My" problems (from the perspective of government) are related to missing public inputs or regulatory issues. By contrast, "your" problems are related to the underlying competitiveness of an industry, which can be addressed only by market incentives. Since entrepreneurs have a strong incentive to lobby for market incentives like subsidies and protective tariffs, the bottom-up approach requires stronger safeguards like the "my"/"your" problem distinction to avoid costly interventions with limited benefit.

Advocates for industrial policy tend to emphasize the top-down approach over to the bottom-up approach.[35] While not discounting the potential for successful state entrepreneurship, too much emphasis on the top-down

approach risks ignoring the information available to entrepreneurs, and potentially concentrates policy support too much in certain activities, as in the Bangladesh apparel example.

Expect failure and communicate this expectation

Diversification across industries also offers a potential political advantage: reducing emphasis on any single investment can reduce the risk that failures will undermine broader industrial policy goals. A cautionary example comes from the United States, where the Department of Energy issues loan guarantees to new energy technology businesses.[36] In 2009, the Department approved a US$535 million loan guarantee to Solyndra, a solar panel manufacturer explicitly endorsed by the government. But Solyndra's business model relied heavily on continued high silicon prices. When global silicon production expanded, the company's technology became uncompetitive and it filed for bankruptcy—with the episode being widely cited as evidence against governments "picking winners." Yet less noticed was the Department's US$465 million loan guarantee to Tesla in 2010, which was repaid in full by 2013 and helped launch the world's largest electric vehicle manufacturer.

This case highlights a broader lesson about industrial policy: governments should expect some of their efforts to fail, but a portfolio approach increases the likelihood of overall success. Targeting a broad set of activities—and communicating this approach rather than emphasizing individual projects—can also help sustain political support when failures occur.

Complementary investments and reforms to build comparative advantage

Often, comparative advantage depends as much on policy choices as on natural endowments and previously installed infrastructure. Capabilities of some businesses that open today will define advantages 3–5 years from now, when industrial policy begins to pay off. While certain policies are foundational for all economic growth—including sound macroeconomic frameworks, a business-ready regulatory environment, investments in education and health,

and the provision of electricity and transport infrastructure—several also stand out in case studies of industrial development.[37]

- **Technical and managerial human capital.** Historical examples show that broad technical and managerial skills are essential for developing new industries. In China during the 1950s, for example, the Soviet Union supported the creation of large, capital-intensive industrial clusters. When Soviet support was abruptly cut off in 1960—after some steel plants received both advanced technology and skills transfers while others obtained only technology—it created a natural experiment that allowed researchers to trace outcomes over the next four decades. They found that plants receiving only technology quickly lost their initial advantage, while those that received technology and training continued to grow—producing 49 percent more output and operating at 46 percent higher productivity by 2000.[38] Conversely, in Nigeria, limited investment in skills development has been identified as one factor undermining the country's import-substitution efforts.[39]
- **Basic research institutions and universities.** Innovation subsidies are often motivated by the idea that businesses underinvest in R&D, the results of which are not easily patented and may be appropriated by competitors. Underinvestment is even more likely for basic research, which has little immediate financial reward and typically occurs in universities.[40] Yet basic research is especially important for developing economies, since the type done in advanced economies does not focus on adapting technology to their specific context. For these reasons, broad support for universities, including funding and basic research grants, can complement industrial policy. An innovative model of university support is Switzerland's Innosuisse, which offers grants that create incentives for universities and local businesses to collaborate in developing basic and applied research agendas. The agency cofunds joint projects between businesses and public research institutions. Critically, funds flow to the academic partner, while businesses contribute cash and in-kind resources and act as implementation partners.
- **Liberal trade regime.** Foreign investors are attracted to countries that are signatories of preferential trade agreements that guarantee access to large markets. Several countries have utilized liberal trade policies to

successfully attract first movers that establish new industries. For instance, Intel's investment to produce semiconductors in Costa Rica was facilitated by that country's unilateral US-preference programs, especially the Caribbean Basin Initiative; Renault launched automotive manufacturing in Morocco, which has a free trade agreement with the European Union; and Samsung entered Viet Nam only a few years after the country joined the Association of Southeast Asian Nations Free Trade Area. Even as global foreign investment has slowed, liberal trade regimes offer incentives that can potentially help turn the tide, fostering investment in new industries. Further, new technologies create new opportunities to capture export-oriented foreign direct investment (FDI). China's outbound FDI stock grew at about 11 percent annually from 2014 to 2024 in real US dollar terms.[41] It remains to be seen whether this delivers similar opportunities for growth and technology transfer compared to previous waves of FDI.

- **Intellectual property rights.** Intellectual property rights (IPR) may or may not complement industrial policy. On the one hand, IPR may encourage investors, especially foreign investors with advanced technology, to invest locally, complementing measures to attract investors. On the other hand, stronger IPR could curtail the ability of local businesses to adapt and build on these advanced technologies, reducing the impact of policies supporting these businesses. The best evidence on which effect dominates comes from the World Trade Organization (WTO) Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) of 1995, which required members of the WTO to comply with a set of minimum standards of IPR. After these reforms, multinationals expanded foreign investment. Countries where they invested experienced an overall expansion in industrial activity, suggesting the benefit of IPR outweighed the cost in terms of lost local business activity.[42] However, this evidence is limited to middle- and high-income economies. In the Indian pharmaceutical industry, TRIPS implementation led only to very small impacts on prices and quantities sold and did not change the number of businesses operating in the large generics segment.[43] More broadly, the impact of IPR on local businesses is uncertain, and will likely vary with fundamentals, like the size of the local market.

Box 4.2 Tamil Nadu attracts iPhone 16 production

A case study helps illustrate the considerations discussed in this chapter. While India has not established a global manufacturing presence, instead specializing in services, the national government has always pursued manufacturing-led growth through a top-down approach. Until 1991, it was a case of failed import substitution: despite a massive domestic market, import tariffs failed to catalyze economic growth or internationally competitive manufacturing and were subsequently liberalized. Eventually, India's fiscal space improved, with tax revenue rising from 11 percent of GDP in 1980 to 21 percent in 2023, creating greater scope for first-choice policy tools like production subsidies.

In 2020, India announced the Production Linked Incentive (PLI) scheme, which involves production subsidies paid on incremental sales of eligible domestically manufactured products relative to a base year. Businesses that are approved receive a percentage of their incremental revenue—often in the range of 4–6 percent—for a fixed period (typically five years after the base year). Initially, mobile phones, active pharmaceutical ingredients, and medical devices were targeted, with eligibility eventually covering 14 manufacturing industries.

Though India has not specialized in manufacturing, some states and municipalities have—including Tamil Nadu, on India's southeast coast. Tamil Nadu has the most manufacturing employment of any state in the country, and 24 percent of its gross state value added comes from manufacturing (about twice the share of manufacturing in national value added). This manufacturing specialization is built on comparative advantages for manufacturing, such as education (among the highest number of engineering and technical graduates in India each year), multiple seaports and international airports, dense highway connectivity, logistics parks (offering reliable power and plug-and-play infrastructure), and a responsive state government. Hyundai and Ford both set up their first production facilities in Tamil Nadu during the 1990s.

Recently, Foxconn, a major supplier for Apple, has benefited from PLI while bringing assembly of the iPhone 16 to Tamil Nadu. Producing for Apple, one of the world's most demanding international buyers, provides a major positive market signal that Tamil Nadu is open for business. This event will surely have positive spillovers, but is it an industrial policy success story?

Notably, the PLI did not bring all mobile handset manufacturing to India. Foxconn began operations in Tamil Nadu in 2006, more than a decade before PLI, to manufacture mobile handsets for Nokia. It is hard to know whether Apple would eventually have brought production to Tamil Nadu on its own, given Tamil Nadu's comparative advantages. Rather, what PLI may have helped Foxconn do was upgrade into new

The authors are grateful to Vishnu Venugopalan for sharing his experience of this case.

(Continued)

Box 4.2 Tamil Nadu attracts iPhone 16 production *(continued)*

products and move up the value chain in a competitive market.

There was also a catalytic event: in 2020, there was a surge in press mentions of the expressions "China plus one," "onshoring," and "reshoring."[a] Foxconn sought diversification of production that could have gone to Mexico or Viet Nam; what may have made a difference was the local government.

In 2019, the State of Tamil Nadu invested in the largest industrial housing project in its history, with plans to recoup costs through future rents: accommodations for 18,000 people in small (3–4 person) dormitories for site-adjacent factory employees (according to a subsequent legal definition). This solved a coordination problem: a private developer would not have built such accommodations without a guarantee of a paying employer. The state government also offers a training subsidy: 6,000 rupees per month for women for 6 months; 4,000 rupees per month for men. (Electronics manufacturers prefer female employees, so they are in shorter supply.) While Tamil Nadu has attracted iPhone and Google Pixel assembly, the average domestic value added across products is relatively low at just 4–5 percent. The state is organizing a subsidy—in addition to the PLI—for domestic value added greater than 20 percent.

A trio of state government agencies collaborated to share the risk of investment before iPhone production scaled up: state-owned enterprise State Industries Promotion Corporation of Tamil Nadu, local development bank Tamil Nadu Industrial Development Corporation, and the state's outward-looking agency for investment promotion, Guidance. The delivery unit is the Department of Industries, Investment Promotion, and Commerce, the central agency for industrial policy design and investment facilitation related to large-scale, capital-intensive, and strategic industrial sectors. The effort explicitly excludes micro, small, and medium enterprises (MSMEs), which fall under the purview of a separate MSME Department.

This case demonstrates the role of comparative advantage in targeting industrial policy, and why enthusiasts call industrial policy a "process of discovery"—and it highlights the differences between high- and low-risk strategies. At the national level, India is making a high-risk bet on manufacturing: recent commentary, for instance, argues that using the PLI to bet against national comparative advantage is a waste of resources.[b] The PLI is considered to be a short-term fix only, but it is worth considering whether fiscal resources at the national level could be more effectively invested toward addressing longer-term challenges like quality power, limited design capabilities in industry, and inadequate skills of Indian workers. By contrast, Tamil Nadu's government made a relatively low-risk bet, beyond what the national government targeted, on an industrial park (that is, the housing project) to solve a coordination problem and tailored subsidies to help the state move up the value chain.

(Continued)

Box 4.2 Tamil Nadu attracts iPhone 16 production *(continued)*

Nationally, India hosts about 40 percent of iPhone production, but it is still a minor player in the Apple ecosystem, having only six Apple supplier assembly plants and one Apple supplier semiconductor plant, compared to China's 34 and 55, respectively. Yet, the industry still means everything to its local community.

a. Goldberg and Reed (2023).

b. Rajan and Lamba (2024).

Notes

1. Krugman (1983, 153).
2. Crespi et al. (2014) define "productive development policy."
3. Bartelme et al. (2025).
4. Lashkaripour and Lugovskyy (2023). Earlier work by Antweiler and Trefler (2002) estimates external economies of scale based on trade theory and trade data, finding them to be large for one-third of industries (including pharmaceuticals and machinery) but imprecisely estimated for many industries, ultimately preventing the results from being of practical use.
5. Goldberg et al. (2024); Irwin and Klenow (1994).
6. Rodrik (2004) emphasizes that "new activities" can be both new products as well as new technologies to produce existing products.
7. The definition of "sophisticated industries" from Cherif and Hasanov (2019) includes those that would be conducive to high productivity gains and spillovers to tradable and nontradable sectors.
8. Refer to studies in appendix table A.1 of Harrison and Rodríguez-Clare (2010).
9. This measure is called "PRODY" in Hausmann et al. (2007). An alternative measure of sophistication is proposed by Lall et al. (2006).
10. Hidalgo and Hausmann (2009). Hidalgo (2021) reviews the metrics capturing economic complexity.
11. For example, refer to Liu (2019) on East Asia and Buera and Trachter (2024) on India. In some advanced economies, like Chile, mining is actually downstream to service industries such as engineering.
12. This argument motivates subsidies in Liu (2019), Lashkaripour and Lugovskyy (2023), and Buera and Trachter (2024).
13. Moorty and Varela (2025, 9).
14. Mill (1909, book 5, chapter VI, section 4).
15. Atkin et al. (2025)
16. Reed (2024).
17. Wade (1990, 80).
18. Baldwin and Robert-Nicoud (2007) model this phenomenon.
19. World Bank (2019).

20. For example, Costinot et al. (2012) show that countries export more products in which they exhibit greater total factor productivity.
21. Reed (2024).
22. Evenett et al. (2024); Juhász et al. (2023).
23. Baquie et al. (2025).
24. Hanson et al. (2015, 32) analyze how long it takes for a country's revealed comparative advantage to adjust. They find that it takes about 5.5 years for half of an initial change in comparative advantage to fade, and roughly 18.4 years for 90 percent of that change to fade. In other words, patterns of comparative advantage evolve slowly. To meaningfully influence them, government support would likely need to last longer than 4 or 5 years (the typical term of an elected administration in most democracies).
25. The approach in Lin (2011) can be understood as targeting industries that are technologically related in the sense of Hausmann and Klinger (2006).
26. Hausmann and Klinger (2006). Bahar et al. (2019) show that technological relatedness has predictive power in explaining export transitions over time.
27. Reed (2024). These probabilities average over all countries from 1992 to 2000 using HS2 product classification.
28. Coniglio et al. (2021).
29. Sylla (2024).
30. The key premise of Mazzucato (2018) is that for a mission-oriented approach the government must move beyond correcting market failures to creating and shaping markets for addressing technological challenges.
31. Export processing zones and tax holidays were some of the industrial policy tools pursued by Bangladesh in promoting the apparel industry.
32. Advantages for the apparel industry include: (1) longer audit cycles with the Bond Commissionerate; (2) exemption from the annual entitlement process for accessing imported inputs for direct exporters; (3) right to set utilization rates used to acquit duty liability by an industry body with industry expertise; (4) permission to have multiple premises (within 60 kilometers) on one license; (5) permission to send goods to subcontractors as part of the process; and (6) no requirement to house full-time Bond Commissionerate staff on site (World Bank 2018).
33. Examples include diagnostics from the Growth Lab at Harvard University's Center for International Development and the World Bank Group's Country Private Sector Diagnostics and Growth and Jobs Reports.
34. Refer, for example, to Ghezzi and Utterwulghe (2017) on Peru.
35. Refer, for example, to Mazzucato (2013) and rebuttal by McCloskey and Mingardi (2020).
36. Rodrik (2014).
37. The Slovak Republic illustrates how strong fundamentals and comparative advantages, combined with targeted industrial policies, can foster the development of specific activities. Proximity to the European Union (EU) market, an improving

business environment, and availability of skilled labor created favorable conditions for the growth of the country's automotive industry. But industrial policy tools also mattered: generous fiscal incentives and major government investments in local infrastructure were crucial in attracting key foreign investors, such as PSA Peugeot Citroën and Kia (Jakubiak et al. 2008).

38. Giorcelli and Li (2024).
39. Chete et al. (2014).
40. Akcigit et al. (2020) argue, for instance, that France oversubsidizes applied research compared to basic research.
41. UNCTAD (2025). Dollar values deflated using the US GDP deflator from the World Development Indicators.
42. Branstetter et al. (2011).
43. Duggan et al. (2016).

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CHAPTER 5

How to Get the Institutions Right?

It is said that for every example of industrial policy success, there is an example of failure. As discussed in chapter 3, such uneven performance may partially reflect poor choice of policy tools—for instance, relying on import tariffs rather than subsidies in contexts with small local markets. As discussed in chapter 4, it could also reflect the absence of comparative advantage or demand growth. Yet differences in policy or industry choice alone cannot explain the wide variation in results. After all, the decision to adopt any tool or target an activity is not merely a technical one; it is a political choice made by governments. As such, it is widely assumed that the underlying strength of government institutions—and the degree to which those institutions are influenced by political pressures—often determine whether industrial policy succeeds or fails.[1]

This chapter examines the role that institutions play in designing and implementing industrial policies effectively. The discussion is structured around the three criteria that Dani Rodrik identified as essential: embeddedness, appropriate use of incentives as "carrots and sticks," and accountability.[2] After reviewing the roles historically played by finance and trade ministries, the chapter reflects on what has changed in recent years—particularly the emergence of smaller government agencies and institutions with specific mandates for providing direct support to the private sector. Delivery units and seven types of agencies and institutions are highlighted.

These aspects of institutional design attempt to align the interests of economic power and political power so that effective and efficient policy is in both of their interests. A separate—and much more ambitious—question is whether

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outside actors, like economists, lawyers, or international organizations, can recommend industrial policies that shift politics in a direction more conducive to industrialization, for instance by strengthening the political influence of groups that benefit from it. Nobel laureate James A. Robinson proposes this approach, observing provocatively: "This may seem like a radical idea but in fact the World Bank has few reservations in adopting policies aimed at strengthening the power of poor people (for example, by generating more accountability and better service delivery)."[3]

There has been some experimentation with this approach in the context of "green industrial policy," but the results are not encouraging. As discussed in chapter 6, such policies seek to build a political constituency that is more favorable to environmental regulations like carbon taxes.[4] Along these lines, the United States Inflation Reduction Act (IRA) targeted subsidies for wind and solar energy generation investment to "energy communities," which had historical employment in fossil fuel extraction, processing, or transportation—under the rationale that job-creating investments in renewable industries would shift political support in such areas. While subsidies certainly encouraged investment in solar but not wind (likely due to local comparative advantages), employment gains were modest. While political support for renewables was not measured after the subsidies were introduced, there was no impact on voting outcomes in the 2024 election in the communities involved.[5] One explanation is that electricity generation is not labor intensive, so few voters benefited from jobs associated with this investment. The search for other approaches to shifting politics with industrial policy is a fertile area for policy and research experimentation.

Technocrats insulated from politics

The institutional archetype most often associated with successful industrial policy is a meritocratic technocracy: a body of skilled civil servants with broad authority over industrial policy tools, insulated from political and interest-group pressures. The leading example is Japan's Ministry of International Trade and Industry (MITI), which oversaw the government's industrial policy from 1949 to 2001. At its peak, MITI's staff were described in a leading study as follows:

> The model is… a small, inexpensive bureaucracy staffed by the best managerial talent available in the system… demonstrated academically and competitively… the majority should be generalists… they should be educated in law and economics, but it would be preferable if they were not professional lawyers or economists, since as a general rule professionals make poor organization men. The term that best describes what we are looking for here is not professionals, civil servants, or experts, but managers.[6]

Despite its modest size, MITI's elite cadre exercised centralized authority over most levers of industrial policy in Japan—including development planning and access to capital, as well as energy, trade, and tax policy. Though the finance ministry continued to oversee the national budget, MITI wielded extraordinary influence through its control of incentives, including foreign-exchange allocations, low-interest financing, tariff protection, and tax holidays. By 1980, MITI had "no precise equivalent in any other advanced industrial democracy".[7]

A key factor in MITI's effectiveness, as emphasized in the World Bank's 1993 *East Asian Miracle* report, was its insulation from special interests:

> Institutional traits have been critical… Foremost among them is technocratic insultation… the ability of economic technocrats to formulate and implement policies in keeping with politically formulated national goals with a minimum of lobbying for special favors from politicians and interest groups… In Japan, insulation characterizes not only the economic technocracy but nearly the entire bureaucracy.[8]

By contrast, many documented cases of failed industrial policy were characterized by nonmeritocratic bureaucracies vulnerable to political interference. A prominent example is Ghana's Industrial Development Corporation (IDC), which was established prior to the country's independence and oversaw industrial policy until 1961. While economist Arthur Lewis, who later won the Nobel Prize, was an early adviser to IDC, he ultimately criticized it for succumbing to political influence:

> The IDC has suffered greatly from outside interference, in the shape of members of Parliament and other influential persons expecting staff appointments to be made irrespective of merit, redundant staff to be kept on the pay-roll, disciplinary measures to be relaxed in favor of constituents, businesses to be purchased at inflated prices, loans to be made irrespective of security, etc.[9]

A more recent example is the Tierra del Fuego special incentive regime established in 1972 in Argentina's remote southernmost province through substantial tax and customs benefits that encouraged industrial employment. A study finds its fiscal cost to be substantial (about US$1.07 billion annually) and its design to be flawed, rewarding gross sales instead of local value added.[10] As a result, the regime led to a concentration of assembly-type activity, particularly in electronics, without fostering innovation or exports. The regime had an initial sunset clause for 2007, but since then it has been extended multiple times: first to 2021 and most recently to 2038, with industry-specific extensions (for example, for textiles) through 2028. These extensions largely reflect political pressures to preserve employment and regional economic support.

Analysis of cases like these led to deep skepticism about industrial policy in developing economies. Former World Bank President Lewis Preston, for instance, concluded that the success of East Asia's market interventions depended on a unique combination of "culture, politics, and history" that was unlikely to be repeated elsewhere.[11] Subsequent research documenting further cases of government failure reinforced the view that such outcomes were typical of industrial policy in developing economies, perhaps due to cultural, political, and historical factors.[12]

New optimism about industrial policy institutions

As governments around the world revisit industrial policy, the central question is whether developing economies can now "get the institutions right." Encouragingly, recent evidence suggests that small government agencies—with mandates far narrower than Japan's MITI—can have positive impacts with certain policy tools. This suggests that effective institutions can be built over time and are not entirely determined by context. Ghana, for example, has moved beyond postcolonial institutions like the IDC.

Such findings can be explained by at least three broad shifts in recent decades: talent, political environment, and openness. First, the talent available to government has improved substantially amid rising education levels globally. Since the 1960s, the share of national leaders without a college degree has fallen from roughly 42 percent to only 28 percent, reflecting higher education levels as well as declines in military rule.[13] At the technical level, nearly all senior

officials in central banks and finance ministries now hold tertiary degrees, with 24 percent of finance ministers having obtained a master's degree from a foreign university and 11 percent having obtained a foreign doctorate.[14] The results of stronger staff talent and capability are apparent: stronger macroeconomic management by central banks and finance ministries has driven down inflation, and other ministries have contributed to large, broadly shared gains—such as reduced infant and maternal mortality—through improved service delivery. Smaller specialized agencies, which can sometimes offer salaries above standard civil service scales, are even better positioned to attract top talent.

Second, the political environment in many countries has become more conducive to development. In line with Lewis Preston's view mentioned above that culture, politics, and history shape policy effectiveness, James A. Robinson argued:

> The problem of underdevelopment cannot be solved by economists coming up with better policies for poor countries to adopt or endlessly hoping for benevolent "leadership"… From my perspective, promoting industrialization, to have an "industry policy," is an endogenous outcome of the political choices of a society. If interests and institutions are not aligned then industry will not get promoted, whatever the normative consequences are.[15]

While attribution is difficult, broad improvements in macroeconomic stability, economic growth, and health care likely reflect alignment of politics with development goals, rather than merely talent. Therefore, political systems appear more capable of delivering effective and efficient industrial policies.

Third, most economies today are open rather than closed. This openness both narrows the scope for industrial policy and reduces the need for a single agency to control every policy lever, as with MITI. In the mid-20th century, many economies had high import tariffs and restrictions on businesses' access to foreign exchange or foreign borrowing. This meant that industrial policy was often implemented indirectly, by granting selected businesses exemptions from these restrictions.[16] In that context, small agencies could not achieve results unless they controlled all the key policy levers.

A classic example is the Brazilian government's attempt to develop a computer industry in the 1980s. The Special Secretariat for Informatics (SEI), a small agency staffed by "frustrated nationalist *técnicos*," was tasked with creating a protected space for domestic computer manufacturing through a "market

reserve" system that restricted imports.[17] Yet SEI lacked full control over trade and investment policy. The central monetary authority allowed foreign investors to import freely and receive tax rebates, enabling them to flood the market with goods containing imported parts, even as domestic manufacturers continued to pay import tariffs on the same inputs. Meanwhile, the Ministry of Economy, pursuing regional development goals, concentrated foreign investment in the remote Manaus Free Economic Zone, located far from São Paulo's manufacturing base, cutting off domestic manufacturers from developing supply-chain linkages and technology transfers. As a result, Brazil never became a competitive computer exporter, persistently lagging international market averages in price and performance by 3–5 years.[18]

By contrast, today's more open economies have lower import tariffs and fewer capital controls or currency restrictions, making them less reliant on selective exemptions to implement industrial policy. Consequently, smaller agencies have a broader scope to design and implement more targeted and impactful efforts.

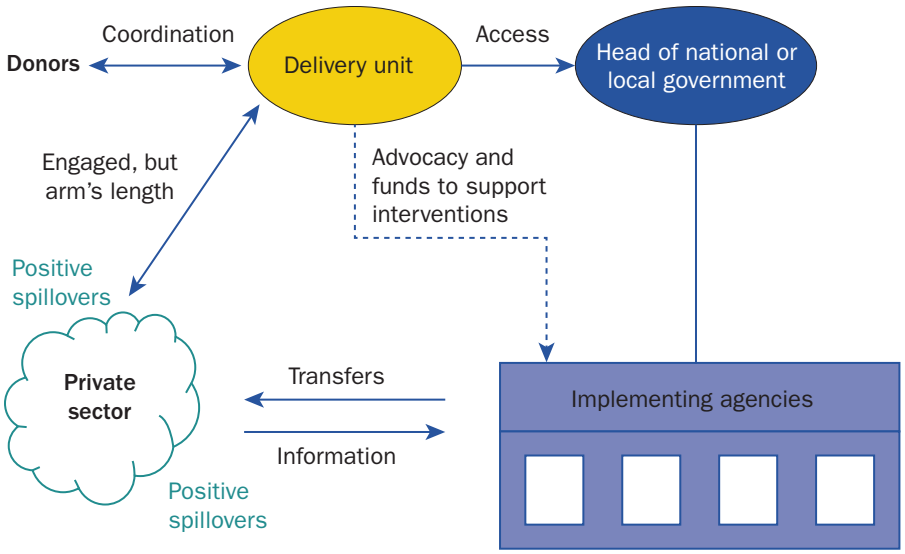
An additional benefit of openness is that it makes it easier to evaluate whether industrial policy has been successful, when measured by the ability of a targeted industry to compete in export markets or at least substitute for imports in the local market.

Government delivery units for strategy setting and high-level oversight

Even if smaller government agencies today have more autonomy to implement policy, overall industrial strategy is still often set and overseen by a team close to the head of government, either at the national or local level. These teams are sometimes called "delivery units" or "reform teams" and report directly to the head of government (refer to figure 5.1).[19]

The crucial feature of these teams is that they do not implement policies themselves but rather provide strategic guidance to implementing agencies. There are many historical and contemporary examples, and in smaller economies, teams can be quite small. For instance, in 1975, Cabo Verde—which would go on to grow income per capita at about 5 percent over the next three decades based on fishing and tourism—relied on three diaspora returnee advisers working with the prime minister, who was also the minister of

Figure 5.1 Role of the delivery unit in industrial policy



Source: Adapted from Criscuolo and Palmade 2008.

planning and development assistance. A more recent example is the Executive Office in Dubai, a government think tank reporting directly to the emirate's ruler that tracks industry performance and promotes industry development initiatives. Larger economies tend to have larger, institutionalized delivery units. For example, China's National Development and Reform Commission is responsible for drafting five-year plans that are then implemented by local governments. Similarly, Brazil's National Council for Industrial Development—comprising 20 ministries, the national development bank (NDB), and entities representing civil society, businesses, and workers—formulated the recent New Industry Brazil strategy.

Delivery units have three key functions, which are distinct from policy execution:

1. **Diagnostics.** Delivery units commission studies of industries with growing global demand, in order to identify strategic industries where the country may have comparative advantages and constraints that could be addressed by government action. Diagnostics may be completed in-house or procured from consultants.
2. **Planning and coordination across government.** Following diagnostics, delivery units propose specific actions to be taken by implementing

agencies and line ministries. Proposed actions can include the provision of public inputs (industrial parks, skills development, market access assistance, or quality infrastructure) but also market and macroeconomic interventions, as well as reforms to industry-specific laws like mining and forestry codes. Delivery units may advise the head of government on which implementation agencies should receive funds to undertake these actions.

3. **Monitoring results and recommending corrective actions.** Agencies track the performance of actions, such as measuring declines in the input cost per unit of output in target industries relative to comparators. When increased productivity is not observed in a reasonable amount of time, the team can withdraw support and recommend new priorities.

Smaller implementing agencies that can have big impacts

Once strategy is set, finance ministries, trade ministries, and central banks continue to play central roles implementing industrial policy, especially through market and macroeconomic interventions. But in today's open economies, a set of smaller, more specialized agencies often hold mandates for providing direct support to the private sector. These institutions often bear much of the responsibility for implementing industrial policy: they supply public inputs, design targeted programs, and collect information from the private sector. Unlike most finance and trade ministries, such agencies often have independent charters and can hire outside standard civil-service pay structures—including recruiting from the diaspora—leading to more meritocratic hiring and insulation from politics.

The remainder of this chapter briefly reviews the roles played by these institutions, which are classified into seven key types: NDBs, state-owned enterprises (SOEs), cluster initiatives, public-private dialogue (PPD) and coordination, innovation agencies (IAs), investment promotion agencies (IPAs), and export promotion agencies (EPAs) (refer to table 5.1). Broadly, there is a shortage of rigorous research on the effectiveness of the specialized agencies that implement industrial policy today—representing a promising opportunity for future experimentation and learning. The chapter summarizes the available research on effectiveness that covers only EPAs and IPAs, agencies that have proliferated in recent decades (refer to figure 5.2).

Table 5.1 Embeddedness, incentives as carrots and sticks, and accountability in seven government agencies

	National development banks (NDBs)	State-owned enterprises (SOEs)	Cluster initiatives including by local governments	Public-private dialogue and coordination	Innovation agencies (IAs)	Investment promotion agencies (IPAs)	Export promotion agencies (EPAs)
Industrial policy tools in scope	• Public inputs via financing • Production, innovation, and export subsidies via concessional financing	• Public inputs via own activities • Production, innovation, and export subsidies via concessional own activities	• Public inputs • Production, innovation, and export subsidies	• Public inputs • Market interventions • Macroeconomic interventions	• Skills development • Quality infrastructure • Innovation subsidies • Research and development tax credit	• Public inputs • Technology transfer quid pro quo • Local content requirements	• Public inputs • Export subsidies
Embeddedness	• Diagnose unmet financing needs through surveys indicating business: (1) declined to apply for finance given expectation of denial; (2) has been rejected; or (3) has been partially rejected or faced barriers	• Participate directly in market through sales to consumers and purchases from suppliers • Join in trade associations	• Include in executive committee and general assembly representatives of both incumbent and entrant businesses to limit potential capture, and relevant local regulators • Support with technical secretariat led by skilled manager and dialogue facilitator • Produce online maps of clusters, activities, and policy initiatives for national and regional visibility	• Limit general assembly size to ~20 participants based locally to build trust and ease collaboration	• Diagnose local innovation capabilities through surveys • Serve as platform to connect ecosystem stakeholders (that is, businesses, research institutes, regulators) • Target innovations with high social value, and limited private incentive for innovation	• Establish foreign offices in foreign investment source and/or export destination countries, ideally with representatives located in embassies for coordination with own government and diplomats • Adopt system to identify and resolve investor complaints or disputes	• Publish automated export readiness test that directs potential exporters to permits and resources

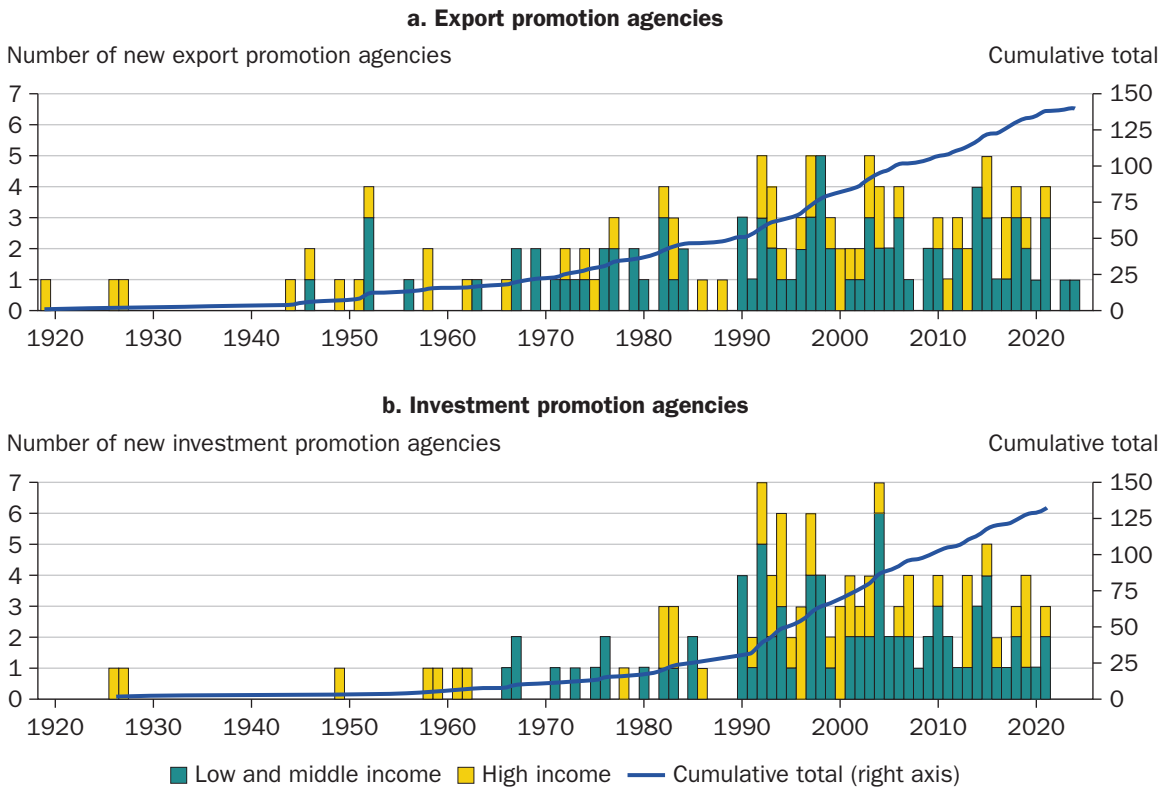
(Continued)

Table 5.1 Embeddedness, incentives as carrots and sticks, and accountability in seven government agencies *(continued)*

	National development banks (NDBs)	State-owned enterprises (SOEs)	Cluster initiatives including by local governments	Public-private dialogue and coordination	Innovation agencies (IAs)	Investment promotion agencies (IPAs)	Export promotion agencies (EPAs)
Appropriate use of incentives as carrots and sticks	• New financing subject to tight eligibility criteria (for example, certain activities, private coinvestment) • Future finance and/or terms contingent on performance (for example, productivity growth, job creation)	• Impose discipline through public equity listing • Allow bankruptcy • Hire competitively and lay off underperforming staff	• Prioritize clusters with businesses diversifying into new fields • End initiative if cluster loses competitiveness measured by productivity or international competitiveness	• Improved public input design • Consult about design of repeal or reform of market or macroeconomic interventions	• Provide access to industrial, technology, or scientific parks, export processing zones and/or special economic zones • Evaluate short, simple, and competitive grant applications on scientific merit • Balance "push" and "pull" initiatives	• Condition investment licensure on technology transfer quid pro quo and local content regulations	• Provide industry-specific assessments of export market opportunities
Accountability	• Report value of credit/price subsidies and profitability before subsidies using comparisons to private market benchmarks		• Adjust targets and workplans when cluster growth slows or accelerates • Produce both quick-win proposals and longer-term policy papers		• Survey beneficiaries and users regularly about quality of services • Adjust mandate as the innovation ecosystem matures	• Monitor total foreign direct investment value and number of projects	• Monitor export value, new product and market counts

Source: Original table for this publication.

Figure 5.2 Growth in export promotion and investment promotion agencies, by income group



Source: Agency websites.

As noted, the discussion is structured around three criteria that Dani Rodrik argues are essential for effective industrial policy:

- **Embeddedness.** Effective industrial policy relies on effective two-way communication between government and business: businesses must reveal their constraints and opportunities, while the government must clearly communicate regulations and available incentives and services. Sociologist Peter Evans defined *embeddedness* as the ideal institutional arrangement for this two-way exchange—an agency deeply connected to entrepreneurs and their networks.[20] Practical approaches to embeddedness include having both public and private sector representatives on an institution's board (often with a private sector majority), as well as holding regular, structured consultations with businesses, regulators, and other stakeholders within narrowly defined industries. Such consultations

should focus on identifying constraints and designing policy interventions that promote growth. The value of embeddedness is based on the idea that industrial policy is not a fixed set of tools but—in Rodrik's words—a "process of discovery" aimed at "learning about the binding constraints and eliciting information on the private sector's willingness to invest" if those constraints can be removed.[21] The appropriate tools to adopt, and how they should be targeted, emerge through this iterative process.

- **Appropriate use of incentives as carrots and sticks.** Effective industrial policy must also be able to encourage investment in new areas (the "carrot") while also discouraging and phasing out investments that fail (the "stick"). In the closed economies of earlier periods, carrots often took the form of duty-free imports or preferential access to foreign-exchange credit, while sticks involved the withdrawal of such privileges. Today, carrots often include improved public inputs, while sticks can take the form of sunset clauses (automatic termination dates) or, within market and macroeconomic interventions, performance-based conditionality based on clear criteria that are regularly monitored, benchmarked, and evaluated. Cofinancing—where businesses invest their own resources alongside public support—is an additional screening tool.
- **Accountability.** Even when insulated from politics, agencies implementing industrial policy must remain accountable within government and to citizens for their decisions—especially regarding which businesses or activities are supported. Strong accountability mechanisms include clear mandates and targets linked to public policy goals, with annual reporting on performance that explains deviations from targets. Public disclosure of detailed information about supported activities and related expenditures allows governments to adjust tools or reverse course when progress is off track. Finally, many analyses emphasize the importance of a high-level government champion—such as a cabinet member or, at the local level, a deputy mayor or governor—who can both enforce accountability and resolve coordination issues across agencies. Government delivery units discussed in the "Government delivery units for strategy setting and high-level oversight" section can play a critical role in ensuring the accountability of industrial policy.

Refer to table 5.2 for a summary of these three criteria.

Table 5.2 Criteria for industrial policy institutions

Criteria	Indicator
Embeddedness	• High-quality industry diagnostic studies, produced in-house or by consultants • Surveys of beneficiaries and other market participants • Private sector membership in executive committee and/or general assembly • Managerial expertise in government
Appropriate use of incentives as carrots and sticks	• Automatic termination dates of 3–5 years • Allow extension only when there is clear evidence of productivity gains, measured by declining input cost per unit of output compared to nontargeted industries • Successful exports or import substitution can proxy for productivity gains • Avoid automatic termination clauses when subsidies are exemptions from taxes, duties, or rules that may eventually be extended to all businesses
Accountability	• Reporting of outcomes, targets, and workplans • Clear, publicly available criteria for policy decisions and program participation • Government membership in executive committee and/or general assembly • Independent oversight bodies like supreme audit institutions, judicial oversight

Source: Original table for this publication building on Rodrik (2008).

National development banks

NDBs are public financial institutions with mandates to promote national development. They can finance public inputs and provide direct support to businesses—including subsidies for production, innovation, and export—through concessional loans, equity investments, and guarantees. NDBs exist in most economies, including high-income countries. There are about 340 NDBs worldwide, with several countries hosting more than one.[22] The World Bank Group undertakes some similar activities, though it is classified as a multilateral development bank given its ownership by member countries (refer to box 5.1).

Box 5.1 Industry targeting and industrial policy in World Bank Group projects

The World Bank Group promotes private sector growth in developing economies through four main channels: (1) direct investment in businesses by the International Finance Corporation (IFC), its private investment arm; (2) guarantees for businesses by the Multilateral Investment Guarantee Agency (MIGA), its insurance arm; (3) investment loans to governments for projects targeting industries like agribusiness or tourism; and (4) policy loans to governments that provide general budget support, conditional on governments enacting policy reform "prior actions" to strengthen the business environment.[a]

Activities by IFC and MIGA can be considered quasi-industrial policies since they channel public resources into specific businesses. By contrast, World Bank policy loans are generally seen as industry-neutral and, especially in the late 20th century, often aimed to reverse developing economies' existing industrial policies. More recently, as industrial policy has gained prominence globally, the World Bank's focus has shifted.

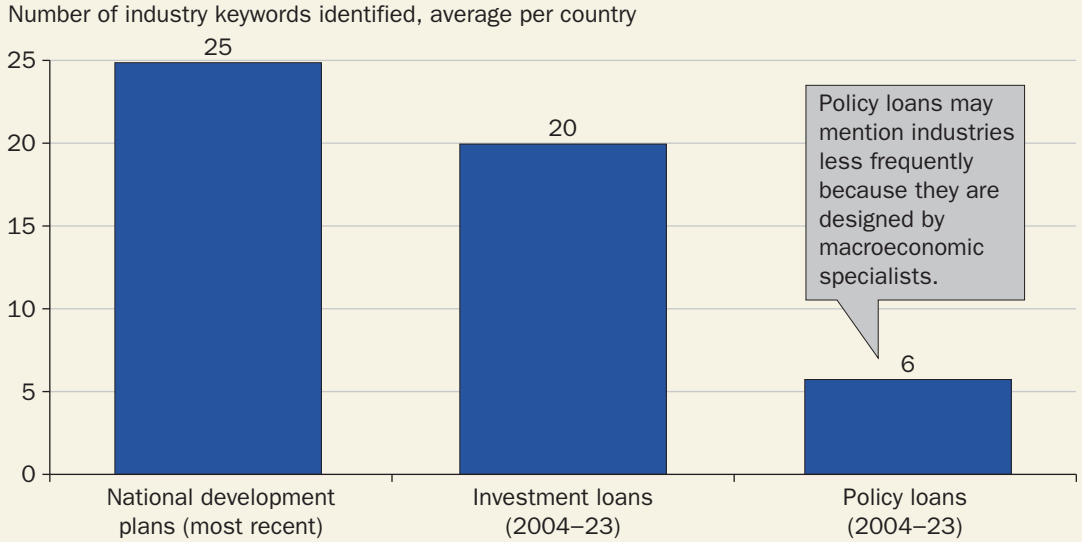
Text analysis of loan documents for all World Bank loans made over the last two decades show that they do target specific industries—but fewer than those prioritized in country clients' national development plans (refer to figure B5.1.1). On average, World Bank client governments targeted about 25 industries in their most recent development plans (the industry classification used here is more granular than in figure 2.1, and treats any keyword as a unique industry, rather than grouping together multiple keywords under a unique HS2 code). From 2004 to 2023, by contrast, World Bank investment loans targeted an average of 20 industries, with policy loans targeting just 6 industries. The difference between investment and policy loans reflects how these loans are prepared: investment loans are often designed in collaboration with sectoral ministries (for example, for industry and agriculture), whereas policy loans are typically designed by macroeconomic specialists in finance ministries that are less focused on specific industries.

Further text analysis of World Bank investment loans shows that they often involve two categories of industrial policy: public inputs and market incentives. Investment projects often have components that: (1) finance rehabilitation and modernization (for example, matching grants in Jordan to upgrade manufacturing operations and improve product quality); (2) provide technical support (for example, a project in Mozambique to strengthen tourism literacy and business skills at the community level); (3) expand access to finance (for example, a credit line in Nigeria to improve businesses' productivity across the livestock value chain); and (4) provide material inputs (for example, a project in Türkiye to switch to lower-emission fuel and raw materials for improved energy and resource efficiency).[b]

(Continued)

Box 5.1 Industry targeting and industrial policy in World Bank Group projects *(continued)*

Figure B5.1.1 Industries targeted by World Bank sovereign loans



Sources: National development plans; Development Policy Operations: Prior Actions Database, World Bank, https://www.worldbank.org/en/what-we-do/products-and-services/financing-instruments/development-policy-financing; Projects and Operations Database, World Bank, https://projects.worldbank.org/en/projects-operations/projects-list?os=0.

Note: A unique industry is defined as a keyword for a product or industry (for example, cocoa, mining, tourism). The sample for the national development plans is restricted to low- and middle-income countries for comparability to World Bank projects. The sample of investment loans covers only those made during the 2004–23 period with some component targeting "agriculture" or "industry, trade, and services." The sample of policy loans covers all loans made during the same period.

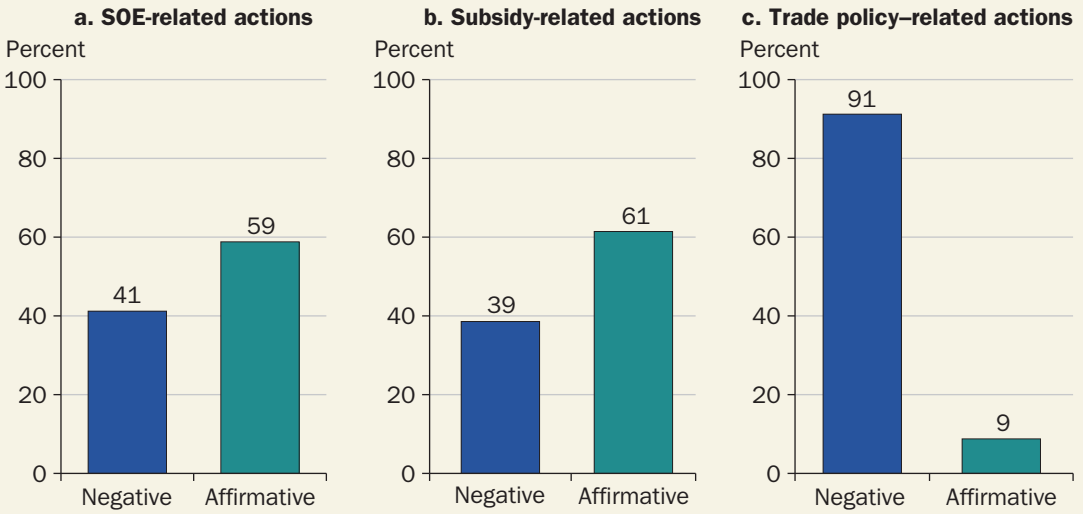
As noted, World Bank policy loans target specific industries less frequently—and such instances can either support industrial policies or seek to reverse them. Text analysis of more than 10,000 prior actions across all policy loans made between 2004 and 2023 found that less than 4 percent focused on three topics potentially related to industrial policy (refer to figure B5.1.2). Of these, the most frequent topics were state-owned enterprises (SOEs), subsidies, and trade policy (including tariffs and nontariff measures). Across these policy areas, however, the stated goals of the policy reforms diverge significantly. For those focused on SOEs and subsidies, most prior actions affirm client governments' use of industrial policy (for example, by supporting subsidies for fertilizer, mortgages, or research and development (R&D) rather than abolishing

(Continued)

Box 5.1 Industry targeting and industrial policy in World Bank Group projects *(continued)*

them, or by establishing regulations that require greater financial transparency at SOEs rather than privatizing them). For prior actions focused on trade policy, by contrast, 91 percent reverse client governments' use of industrial policy (for example, by reducing tariffs rather than increasing them). Notably, these trends suggest that prior actions often affirm first-choice industrial policies (for example, subsidies) while seeking to reverse second-choice industrial policies (for example, tariffs).

Figure B5.1.2 Affirmation and negation of industrial policy in World Bank projects



Sources: Development Policy Operations: Prior Actions Database, World Bank, https://www.worldbank.org/en/what-we-do/products-and-services/financing-instruments/development-policy-financing; World Bank manual classification of stance toward policy area.

Note: Among 10,830 prior actions across 1,158 policy loans from 2004 to 2023, the majority concerned public sector management rather than industrial policy topics. Text analysis identified 284 SOE-related actions containing relevant keywords (divestiture, sale of, privatization, privatize, SOE, government ownership, state ownership, state enterprise, and state-owned); 70 subsidy-related actions with relevant keywords (subsidy, subsidies, state aid, and tax exemption); and 57 trade policy-related actions with relevant keywords (tariff, non-tariff, duty, duties, duty free, quantitative restriction, trade liberalization, license, trade policy, WTO, and trade agreement). SOE = state-owned enterprise; WTO = World Trade Organization.

a. Moorty and Varela (2025) argue that while the World Bank does not directly invest in industrial policy, it funds public investments related to industrial policy. Using the technical jargon of World Bank's core lending instruments, policy loans are Development Policy Loans (DPLs), and investment loans are Investment Project Financing (IPFs).

b. For Jordan, refer to World Bank (2022a); for Mozambique, refer to World Bank (2005); for Nigeria, refer to World Bank (2022b); for Türkiye, refer to World Bank (2024).

In principle, NDBs can have higher risk tolerance and provide longer-term capital compared to private banks because they are backed by the government. NDBs typically focus on "crowding in" private investment, using public financing to mobilize additional capital from private lenders and investors. For example, Colombia's Financiera de Desarrollo Nacional articulates as a guiding principle that it "will promote the participation of other sources of financing, through mechanisms such as the organization of consortia for the granting of credits, the subscription and guarantees of securities and participations and other forms of association".[23] In terms of carrots and sticks, NDBs can apply tight eligibility criteria for new financing, such as requiring cofinancing from private investors or setting performance benchmarks to determine future access to public financing. Brazil, Chile, Colombia, and Mexico are examples of countries where NDBs have used different instruments like structured finance, factoring, credit guarantees, and correspondent banking to coordinate private sector players and expand access to credit.[24]

Despite their prevalence, there is limited systematic information on NDBs' effectiveness beyond what is available in their own annual reports. Most research to date has examined government-owned commercial banks, which differ from NDBs in that they do not have an explicit development mandate. The ideal assessment of NDBs' performance would capture the economic impacts of their activities, compare those with operational costs, and measure the additionality of their financing—that is, the extent to which it generates overall investment levels beyond what private markets would have provided on their own. While annual reports often highlight development outcomes such as infrastructure built or beneficiaries reached, they rarely measure whether NDB financing is truly concessional relative to private benchmarks.

Case studies assessing the impacts of specific NDBs offer a mixed picture. The Korean Development Bank, for instance, guaranteed foreign loans to businesses investing in the heavy and chemical industry in the 1970s, producing lasting benefits: businesses that received guarantees experienced increased sales, stronger exports, and employment growth, with effects visible even 30 years after the program ended.[25] By contrast, the experience of Brazil's National Bank for Economic and Social Development (BNDES) has been more ambiguous—perhaps reflecting its outsized role in the economy. Large publicly traded businesses receiving BNDES investment loans did not increase

investment but instead used the loans to replace private credit, suggesting crowding out rather than crowding in.[26] While the loans led to increased exports and employment, particularly for previously credit-constrained businesses, they did not improve productivity.[27]

State-owned enterprises

SOEs can directly implement industrial policy, including the provision of public inputs as well as subsidies for production, innovation, and exports. SOEs with activities across different industries—such as state holding companies, state investment funds, and development financial institutions—often have explicit mandates for strategic coordination, and can play a role in linking industries through financial channels and value chains. However, the overall evidence on SOEs' effectiveness is mixed.

At their best, SOEs target emerging industries where businesses are reluctant to enter but where social returns to investment are high. For example, Singapore's Government-Linked Companies (GLCs) were established as vehicles for economic transformation and have co-invested with businesses in industries with uncertain profits, such as steel, agroprocessing, textiles, ceramics, and polymers.[28] In contrast, Peru's experience, where SOEs covered traditional industries including fishing, mining, hotels, and wholesale trade, demonstrates the consequences of establishing and expanding SOEs that are not driven by the goal of addressing market or government failures. By 1990, SOEs in Peru generated annual losses averaging 2 percent of gross domestic product (GDP).[29]

Assessing whether market failures exist that would justify SOE involvement requires a careful analysis of the market structure involved: market size, number of existing players, profitability, and overall competitiveness of the value chain. A so-called subsidiarity assessment determines whether private businesses are capable and willing to supply goods and services that meet demand adequately.[30]

Many SOEs emphasize medium-term profitability in their operations as a measure of their success. Singapore's petrochemical industry is an example of the government's co-investment helping to establish the country as a leader in high-value downstream industries. Ultimately, the government sold its stake to private companies, emphasizing that its role was primarily in catalyzing early

investments rather than operating companies over the long term.[31] In contrast, when Indonesia's government positioned SOEs as vehicles for coordinating its re-industrialization strategy in 2014, it specified vital industries and shifted SOEs' goals toward development—but made clear that profitability and privatization were *not* priorities.[32]

Accountability for SOEs can be achieved through mechanisms for monitoring their financial and nonfinancial performance. In Singapore, for instance, Temasek Holdings consolidates and manages government shares in various GLCs, monitoring these investments.[33] Likewise, comprehensive reporting of SOEs' fiscal costs—including direct transfers, subsidies, tax exemptions, and fulfillment of public-service obligations—enables governments to assess their fiscal impact and adjust policy as needed.[34] Corporate governance and anticorruption policies ensure that SOEs are managed transparently and efficiently, preventing misuse of public resources.[35] More broadly, open trade and investment policies discipline behavior, requiring SOEs to compete with imports and foreign investors, providing incentives to operate more efficiently.[36]

Cluster initiatives

Cluster initiatives are public-private platforms, often managed by local rather than national governments, designed to strengthen the competitiveness or productivity of industries in a specific geography.[37] They can involve government provision of both public inputs and subsidies for production, innovation, and export. Examples of cluster initiatives include the flower industry in Kenya's Lake Naivasha, medical devices in Pakistan's Sialkot region, food products in Peru's coastal region, electronics in the north and footwear in the south of Viet Nam, business process outsourcing in Manila, the capital of the Philippines, ecotourism in Costa Rica, and information technology (IT) services in India's Bangalore region.

Cluster initiatives are designed to be embedded: they are organized efforts involving coordination and collaboration across cluster businesses, government agencies, and the research community to identify and address the growth opportunities and barriers faced by businesses in the cluster.[38] They typically have a local board with public and private sector participation, as well as a technical secretariat. Accountability of cluster initiatives—as well as potential improvements to their effectiveness—can be pursued through monitoring

efforts, such as the effort recently established by the Economic Commission for Latin America and the Caribbean that publishes a map of initiatives online.[39]

In practice, most cluster initiatives focus on the provision of tailored public inputs, and on addressing coordination failures within the private and public sectors, though they can also provide market incentives (for example, tax holidays for investment in a specific geography).[40] Cluster initiatives are more effective when addressing specific local needs, rather than copying a policy blueprint. When they focus narrowly on specific policy tools—such as supporting small and medium-size enterprises while neglecting broader infrastructure or regulatory constraints—they tend not to be transformative.

Public-private dialogue and coordination

PPD and coordination mechanisms bring together business executives and relevant regulators to address industry-specific issues, supported by professional coordinators with high-level oversight. As a flexible mechanism, PPD can provide support to the full range of industrial policy tools, including public inputs, market incentives, and macroeconomic interventions. They are often used within cluster initiatives but can also be part of broader national industrial development efforts. PPDs have a historical precedent in the "deliberation councils" used by Japan and other East Asian economies to achieve policy consensus between government and private sector stakeholders. In 1990 Japan's MITI had 17 major regular deliberative councils, covering, for instance, coal mining, data processing promotion, large-scale retail stores, traditional craft, and the aircraft industry. Deliberation councils were used to design incentive-compatible industrial policies, such as when import protection for the automobile industry was agreed in exchange for a commitment by automobile manufacturers to export.[41]

More recently, PPDs were established by the World Bank beginning in the 2000s to guide policy and build trust between the public and private sectors where it was lacking. This effort began in East and West Africa, where PPDs chaired by national presidents initially focused on economywide issues like land reform and foreign investment rules.[42] Starting in the 2010s, PPDs began to be supported by bilateral aid agencies as well, with some focusing on specific industries as in Japan's deliberation councils, typically bringing together technical-level civil servants and domestic businesses. Despite its apparently important role in East Asia, there is reason to view such dialogue skeptically.

In Sierra Leone, public-private dialogue in the form of community meetings coincided with worse economic outcomes at the local level, as meetings were used by unaccountable leaders to create the illusion of consensus where there was none.[43]

Effective PPD design has three goals: maximizing information exchange, motivating participation, and minimizing rent-seeking.[44] To maintain contestable markets, they should include not only large incumbent businesses but also small and new ones. At the same time, an exclusive focus on young and small businesses may reduce impact, since diversified business groups are often important sources of entrepreneurship, given their expertise and resources to expand into new industries. Recent experience suggests that focusing PPDs on public inputs, such as regulatory reform and infrastructure accessible to all businesses across an industry, can help reduce the risk of rent-seeking. At the same time, if PPDs are unable to influence the design of market incentives, like tariffs and subsidies, motivation for private sector participation may also be reduced.

PPDs in principle are relatively low cost, as illustrated by Tunisia's experience: four PPDs that generated substantive policy reforms were supported by a grant of just US$750,000, suggesting a high return on investment. Examples from Peru and Tunisia show that such dialogues have successfully established or streamlined industry-specific regulations in industries such as aquaculture and pharmaceuticals.[45]

Yet the link between regulatory reforms and growth is uncertain. A recent study pooling dozens of industry-specific PPDs including in Peru and Tunisia finds that after the PPDs began, exports from targeted industries stayed flat or declined relative to exports of other countries from the same industries. Only in a few contexts did PPDs have a positive effect, those where targeted industries were small at baseline, suggesting PPDs may be best at developing new activities rather than growing existing ones.[46]

Innovation agencies

IAs provide financial and other technical support to catalyze or drive innovation through a range of industrial policy tools, including skills development, quality infrastructure, innovation subsidies, and research and development tax credits.[47] IAs seek to strengthen what is often called the

innovation ecosystem—the interactions between businesses, government institutions, and research organizations that drive the invention and adoption of technology. More than 50 countries operate IAs, with lower prevalence in lower-income economies.[48]

An IA's mandate typically reflects its country's level of development and the maturity of its innovation ecosystem. In advanced economies, IAs often focus on fostering knowledge generation through research. In developing economies, their emphasis tends to be on supporting technology adoption and upgrading business capabilities to absorb new technologies.[49] Since IAs' missions evolve alongside their innovation ecosystems, measures of success vary across countries, posing challenges for cross-country comparability of effectiveness.[50] More evidence is also needed on what constitutes a successful IA within different types of innovation ecosystems.

Accountable IAs have clear mandates but maintain flexibility to adjust to changing innovation ecosystems. For instance, SPRING Singapore was established as a quality standards agency to promote industry-led export growth but ultimately evolved into an IA supporting innovation-driven transformation across the country's key industrial sectors.[51] Incorporating external stakeholders into the grantmaking process can also strengthen accountability. In Serbia, for example, the government's Innovation Fund vets proposals using external technical committees. In Türkiye, Teknoloji Geliştirme Vakfi's use of evaluation and impact assessments provides a similar function.[52]

Hiring staff with private sector experience and establishing private sector advisory boards increases IAs' embeddedness and their credibility to foster innovation. Likewise, regular data collection on the innovation ecosystem can help guide their work. For example, Sri Lanka's Information Communication Technology Agency finances two industry surveys annually. In Malaysia, the Technology Development Corporation established a department for internal data collection and analysis, aimed at better understanding the country's innovation ecosystem.

Investment promotion agencies

IPAs seek to attract and facilitate foreign direct investment (FDI) and occasionally promote domestic investment, as well. Their primary functions are to reduce information barriers that deter investment—including those related

to host-country regulations, market demand, and supplier networks—and to lower transaction costs for multinationals through proactive facilitation, such as by accelerating business licensing.[53] Given their mandate to promote foreign investment, IPAs can also be responsible for licensing, enforcement of local content requirements, or technology transfer quid pro quo policies. They have become increasingly prevalent in recent decades: as of 2024, 132 countries operated IPAs.[54] IPAs have a median budget of US$7 million in 2017 dollars and median staff size of 100 employees, and most prioritize certain industries or source countries.[55]

Case studies from Costa Rica, Malaysia, and Morocco illustrate the role IPAs can play in attracting FDI and shaping economic development.[56] Econometric estimates show that IPAs' activities foster greater FDI inflows in targeted industries and increase the likelihood that multinational companies establish a presence in a host country.[57] Resources and strategy play an important role: IPAs with larger per capita budgets and more intensive targeting strategies tend to achieve stronger inward FDI stocks and attract more foreign affiliates.[58] IPAs are also more effective when their role incorporates policy advocacy. In Ethiopia, a targeted policy reform helped the government's investment commission unlock investment in new industries.[59] Yet there are still gaps in accountability. Only about three-quarters of IPAs, for instance, systematically compile and track total FDI value and number of investment projects—two easy-to-measure outcome indicators.[60]

IPAs increase their degree of embeddedness in private sector networks when they provide investor-facing services, such as addressing investor complaints or disputes, and when they maintain foreign offices in major FDI source countries. For instance, the IPAs of Colombia, Ecuador, and Mexico allocate roughly one-quarter of their staff to foreign offices. Collaboration with a wider network of host-country counterparts across the targeted industries can also help IPAs deliver better-tailored assistance.[61]

Export promotion agencies

EPAs are mandated to promote exports, typically by helping businesses expand their product offerings or enter new markets.[62] EPAs can often utilize a range of industrial policy tools, including public inputs, export subsidies, and commodity export bans. On average, they operate with a median budget of

US$5 million and a median staff size of 49 employees.[63] Their growth in recent decades has been partly driven by governments' interest in promoting exports while remaining consistent with WTO rules, which limit the types of export promotion activities that can be used (refer to box 1.1).[64]

Early studies were critical of EPAs' capacity to promote exports in developing economies, as they tended to be underfunded, poorly led, and overly bureaucratic, with limited responsiveness to businesses' needs.[65] However, more recent evidence suggests they can successfully promote exports when adequately resourced—though the marginal benefits of additional funding appear to diminish at higher spending levels.[66] Budget composition also matters: EPAs achieve higher returns when their resources are concentrated on a limited number of industries.[67] Difference-in-differences estimates show better export performance for EPA-supported exporters relative to that of similar but unsupported businesses for Chile (PROCHILE), Peru (PROMPEX), and Uruguay (URUGUAY XXI).[68]

Export credit agencies are another type of EPA that can be effective even in countries with well-developed financial markets. Businesses engaged in exports deal with a long time lag between production and receiving payment from the foreign buyer and as such require credit. Export credit agencies fill a void when private commercial banks are unable or unwilling to provide credit to such business. Such agencies are very common. In the Organisation for Economic Co-operation and Development (OECD), there is at least one such agency per country.[69] The shutdown of such an agency in the United States, the Export-Import Bank (EXIM), reduced substantially beneficiary firms' exports, total revenues, investment, and employment.[70] The evidence suggests that EXIM support was effectively mitigating a market failure as its shutdown led to a larger contraction for more financially constrained firms.[71] However, its largest beneficiaries may not be financially constrained, suggesting potential improvements from targeting.[72]

Joint public-private governance of EPAs, such as by including private sector participants in the agencies' management, increases their embeddedness and results in more effective export promotion. In Costa Rica, for example, half of PROCOMER's board members are from the private sector—but the board is chaired by the minister of foreign trade, who reports directly to the president and can thus coordinate across ministries.[73]

Internally, EPAs can incorporate carrots and sticks through performance-based management in their contracts with staff. For example, evidence from the Republic of Korea's KOTRA shows that more capable bureaucrats played an outsized role in improving export performance, and that KOTRA's export promotion efforts strategically targeted specific destination markets.[74] Outside EPAs, government employees at foreign diplomatic missions can also support exporters by providing market intelligence and identifying sales opportunities.[75]

Notes

1. This argument is elaborated, for example, by Juhász and Lane (2024), Krueger (1993), and Robinson (2009).
2. Rodrik (2008).
3. Robinson 2009, 10.
4. Juhász and Lane (2024) make this argument.
5. Keuzenkamp et al. (2026).
6. Johnson (1982, 315).
7. Johnson (1982, 320).
8. Page et al. (1993, 167–69).
9. As quoted by Killick (1978, 268).
10. Hallak et al. (2024).
11. Foreword by President Lewis Preston to Page et al. (1993, v).
12. For more on Argentina, refer to Robinson (2009); Mozambique, refer to Shleifer and Vishny (1993); and Tunisia, refer to Rijkers et al. (2017).
13. Further, about 20 percent of national leaders today have degrees in economics, compared to 5 percent in 1960 (Li et al. 2020).
14. Arezki et al. (2012). Foreign degree statistics based on a survey by the report team of Wikipedia entries of current finance ministers in 113 low- and middle-income countries.
15. Robinson (2009, 9).
16. Page et al. (1993) discuss this approach in the context of the Republic of Korea.
17. Evans (1995, 107–09).
18. Luzio and Greenstein (1995).
19. Criscuolo and Palmade (2008) survey historical cases of "reform teams," especially in small economies.
20. Evans (1995) argues that the Republic of Korea's government during the 1960s and 1970s was an ideal example of embeddedness, where the government had deep relationships with major business groups.
21. Rodrik (2008, 28).

22. Data from the Public Development Banks and Development Financing Institutions Database (Xu et al. 2021). NDBs have expanded in recent decades, with emphasis on their ability to provide countercyclical financing and play a role in financing the Sustainable Development Goals. For instance, following the global financial crisis, the European Union issued guidelines for all EU countries to set up NDBs.
23. Gutierrez and Kliatskova (2021, 20).
24. Gozzi et al. (2017).
25. Choi and Levchenko (2025).
26. Lazzarini et al. (2015) show that BNDES loans and equity investments result only in lower financial expenses, due to the subsidies accompanying the loans, but have no effect on business performance and investment. They also show, however, that BNDES does not systematically lend to underperforming businesses but rather to businesses which would have other sources of capital to fund their projects.
27. De Negri et al. (2011) show that access to BNDES credit lines has a positive impact on business employment growth and exports but no impact on total salary expenditure or total exports, which are proxies for business productivity. Ottaviano and Lage de Souza (2014) show that businesses receiving BNDES support are more credit-constrained than comparable businesses in the control group, but the support does not improve their performance.
28. Paiva-Silva (2022). Pioneer GLCs included the Keppel, Sembawang, and Jurong shipyards, which spurred the development of Singapore as a major shipbuilding and ship repair center, and Neptune Orient Lines, which was formed to leverage on the island's strategic location (Ramirez and Tan 2004).
29. Abusada-Salal et al. (2000); Torero (2003).
30. The Business of the State toolkit (World Bank 2023) offers a comprehensive framework for assessing and reforming the role of SOEs to foster private sector growth. The World Bank has also developed a taxonomy and toolkit by Dall'Olio et al. (2022) that emphasizes alternative policy instruments to SOEs.
31. Gautam and Sinha (2004); Pillai (2006); Vu (2018).
32. ADB (2022); Kim and Sumner (2021). Indonesia's government labelled certain SOEs as "agents of development" and assigned them roles within the national development strategy.
33. Chen (2016).
34. World Bank (2023, 2025).
35. Baum et al. (2024); OECD (2024).
36. World Bank (2025).
37. Meier Zu Koecker et al. (2021) provide a practical guide on implementing cluster initiatives. ECLAC (2024) emphasizes an important difference between a natural cluster and a cluster initiative. A natural cluster or agglomeration of businesses is an economic phenomenon whereby businesses in the same (or a related) industry and businesses in support industries tend to cluster geographically as an

efficiency-seeking strategy to take advantage of "Marshallian externalities." Cluster initiatives introduce a dimension of intentionality to increase the benefits of natural clusters and to generate more value added and accelerate learning, innovation, and productivity via collaboration and coordination. As an example, the Colombian government has created a national network of cluster initiatives (https://redclustercolombia.gov.co/).

38. Lindqvist et al. (2013).
39. Refer to https://geo.cepal.org/dp-clusters/index.html?lang=en.
40. Llinás (2021).
41. Campos and Root (1996, 84–88).
42. These councils, chaired by each participating country's president and including primarily foreign investors, met semiannually and drove important economywide reforms, like a law in Ghana making the central bank independent, revisions to the Land Act in Tanzania, and the establishment of an anticorruption commission in Senegal.
43. Acemoglu et al. (2014).
44. Schneider (2013). Herzberg and Wright (2005) review the experience of 40 countries with public-private dialogue to suggest a set of best practices, some of which are reflected in table 5.2.
45. Ghezzi and Utterwulghe (2017) focus on Peru's *mesas ejecutivas* with achievements in forestry and aquaculture. Dourai and Salhab (2017) focus on Tunisia's PPD in the pharmaceutical industry.
46. Gwee and Reed (forthcoming).
47. Best practices in IAs are discussed in Aridi and Kapil (2019). This definition of IAs follows Aridi and Kapil (2019) in that it focuses on agencies whose target beneficiaries are businesses. A complementary type of institution in the field of innovation are countries' national science or research foundations, whose primary beneficiaries are scientists and researchers. IAs can be heterogeneous. In some countries, they are horizontal (cross-industry), such as Serbia's Innovation Fund or South Africa's Technology Innovation Agency. In others, they are vertical (with a specific industry focus), including those with a focus on biotechnology, nanotechnology, or information technology—like India's Biotech Industry Research Assistance Council. As such, IAs are often more than a simple government agency; they can take many institutional forms, as discussed in Aridi and Kapil (2019).
48. Aridi and Kapil (2019) provide a list of the 50 agencies that act as IAs.
49. The importance of a country's private sector capabilities for what types of actions and tools IAs can effectively support is illustrated in Cirera and Maloney (2017).
50. The effectiveness of IAs and countries' national research and innovation systems is assessed in Public Expenditure Reviews in Science, Technology and Innovation. Refer to World Bank (2021) for an example of such review for Croatia.
51. Aridi and Kapil (2019).
52. Aridi and Kapil (2019).

53. Best practices in IPAs are discussed in Volpe Martincus and Sztajerowska (2019). IPAs can also engage in broader advocacy within the government to remove regulatory obstacles or encourage new policies to improve the host country's investment climate. For example, IPAs may lobby to reform visa regulations or to introduce specific training programs to match a priority sector's need for specialist skills (Wells and Wint 2000).
54. The data appendix describes the collection of information on IPAs.
55. Volpe Martincus and Sztajerowska (2019) describe a survey of 51 IPAs in Latin America and OECD countries as of 2017. Several IPAs exclude certain industries from their activities, including those perceived as not requiring intervention, those involving national security risks, and those that target countries with reputational risk. However, the IPA survey reveals that no consideration is given to the presence of market failures in either targeting efforts or decisions to exclude industries from investment promotion.
56. Freund and Moran (2017).
57. Volpe Martincus et al. (2020) and Carballo et al. (2021) show increased likelihood of multinational entry due to IPAs' actions in Uruguay and Costa Rica, respectively. Harding and Javorcik (2011) and Steenbergen (2023) estimate the impact of IPA presence on cross-country, cross-industry FDI inflows.
58. This evidence by Volpe Martincus and Sztajerowska (2019) is based on conditional correlations across countries that control for country size using GDP.
59. The policy reform was the switch from a positive list to a negative list of industries where FDI is allowed.
60. Volpe Martincus and Sztajerowska (2019).
61. Volpe Martincus and Sztajerowska (2019).
62. Best practices in EPAs are discussed by Lederman et al. (2010). The International Trade Centre provides additional practical guidance and training for EPAs (https://digital.intracen.org/commercial-diplomacy/commercial-diplomacy/).
63. These statistics are based on the Choi et al. (2025b) survey of EPAs in 57 countries as of 2020–21.
64. Belloc and Di Maio (2011).
65. Hogan et al. (1991) provide an early survey of the evidence on EPAs.
66. Lederman et al. (2010) show positive impacts of EPAs on cross-country exports. Olarreaga et al. (2020) and Choi et al. (2025a) show that larger export promotion budgets are associated with stronger export growth.
67. Olarreaga et al. (2020).
68. Chile (Volpe Martincus and Carballo 2010a), Peru (Volpe Martincus and Carballo 2008), and Uruguay (Volpe Martincus and Carballo 2010b).
69. Benmelech and Monteiro (2023).
70. Matray et al. (2024) focus on the US EXIM bank shutdown in 2015–19.
71. The more financially constrained firms were those with higher ex ante marginal revenue product of capital. This evidence was interpreted by Matray et al. (2024)

as indicating that EXIM support was efficiently allocated across exporting firms prior to the shutdown.

72. Benmelech and Monteiro (2023) show that Boeing was less affected by the shutdown.
73. Reed (2024).
74. Barteska and Lee (2024).
75. Rose (2007).

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CHAPTER 6

Applications with Narrow Industrial Policy Objectives

Thus far, the report has considered approaches to grow strategic business activities in general, rather than policies to target specific development outcomes. This chapter discusses the considerations and trade-offs involved when targeting four narrower objectives: generating foreign exchange, creating jobs, reducing pollution, and strengthening economic resilience. These have historically been important objectives of industrial policy in both developing and advanced economies. In principle, the approach described in this chapter can be extended to cover other goals, such digital transformation or women's empowerment.

Unlike industrial policy for development, industrial policy for these specific objectives can imply a trade-off. Development-oriented industrial policy that fixes market failures can be expected to boost growth and benefit society as a whole; the costs of subsidies are, in principle, outweighed by gains in productivity and income. By contrast, industrial policy for narrow goals often means that governments are willing to pay a premium—through subsidies, tariffs, or higher consumer prices—to achieve the policy's goals. These trade-offs are inherently political rather than economic, since the value of foreign exchange, job creation, reduced pollution, and economic resilience depend on subjective assessments about risk, domestic priorities, and global dynamics, which are difficult to quantify or aggregate across society.

Governments sometimes deny these trade-offs, claiming that industrial policy can simultaneously deliver both development and other goals.[1] The main argument against focusing on trade-offs emphasizes that that economies are

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often far away from the "efficient production frontier" where most trade-offs exist. If the focus is entirely on managing trade-offs that are difficult to quantify, there is a risk that discussions become highly political, driven by differences in preferences and political power.

Those arguing to reduce focus on trade-offs believe that there is a potentially large set of policies which can help economies make progress on more than one goal. Conceptually, this view suggests that a range of industrial policy efforts can collectively help move an economy closer to the efficient production frontier, rather than its government needing to choose between objectives. Such scenarios are especially likely in developing economies that are very far from the efficient frontier. As the starting point to a policy debate, this perspective can lead to (often more productive) discussions on which policy tool is best able to drive toward the preferred set of goals. This approach is relevant for many industry-targeted World Bank efforts, like the Resilient and Inclusive Supply-Chain Enhancement (RISE) initiative focused on critical minerals, the Accelerating Action for Affordable & Quality Health (AIM) initiative focused on pharmaceutical production, and AgriConnect focused on agribusiness. These efforts all simultaneously aim for a combination of economic impact (for example, jobs), resilience, and social benefits (for example, energy transition, access to pharmaceuticals, healthy food).

The discussion in this chapter seeks to strike a fair balance, describing evidence for key trade-offs while recognizing that it may be possible to make progress toward multiple objectives at once. However, empirical work is needed to quantify these trade-offs when possible and determine where they are relevant.

Industrial policies for foreign exchange

Historic episodes of rapid and sustained economic growth in developing economies are attributed, at least in part, to openness and trade through what is often called the "export-led" growth model.[2] The export-led model can also be described as "trade-led" growth, since it depends not only on promoting exports but also on maintaining low tariffs on the imported intermediate and capital goods needed to produce exports.[3] This was the case during the classic export-led period of East Asia's industrialization, in the strong performance of European Union (EU) latecomers such as Poland and the Slovak Republic,

and has been a key feature of China's growth, where tariff (and investment) liberalization deepened the country's engagement in global value chains and resulted in strong export growth.[4]

Given these successes, many governments have targeted industrial policy to export-oriented activities as a general development strategy. An underlying objective of this growth model is to alleviate foreign exchange constraints by raising export earnings through specializing in areas of comparative strength, thereby enabling the import of scarce goods and services required for further industrialization.[5] Foreign exchange is also needed to repay foreign loans, which becomes more difficult when a currency unexpectedly depreciates. Historically, the focus has been on export-oriented manufacturing, but more recently governments have also focused on export-oriented services, including tourism, software development, and creative industries that similarly bring in revenue from abroad. Notably, more surplus could also be captured from commodity exports through agricultural and mineral extraction and processing.

This section examines how governments can most effectively pursue industrial policy to earn foreign exchange. It focuses on three key tools: (1) public inputs and preferential trade agreements; (2) import substitution using tariffs, local content regulation, consumer demand subsidies, and public procurement; and (3) export subsidies and competitive exchange rate devaluation. The discussion identifies the conditions under which these tools can be effective for the purpose of generating foreign exchange.

Trade-led growth using public inputs and pursuing preferential trade agreements

Over the past decade, the trade-led growth model has revealed shortcomings, largely driven by structural and policy factors.[6] Structural changes include technological advances, like automation, which have eroded the competitive advantage of low-wage labor in global manufacturing. Policy changes—particularly in advanced economies—include the rise of protectionism and economic nationalism, the growing use of industrial policy, and new policy responses to climate change. (Potential responses to these changes are discussed later in chapter 6.) Together, these trends have made advanced economies less willing to import from developing economies, especially when those imports overlap with their own industrial policy priorities.

For most economies, the trade-led model remains viable, but the scope for supporting it through industrial policy has narrowed. One approach for governments pursuing the export-led growth model today is to rely on World Trade Organization (WTO)-compliant industrial policy tools—including public inputs to help local exporters succeed, such as industrial parks, skills development, market access assistance, and quality infrastructure (QI).[7] Use of WTO-compliant tools is important to avoid countervailing tariffs from trading partners that reduce export market access. Chapter 3 provided evidence that such first-choice policy tools can be effective at fostering export growth as illustrated by the examples of special economic zones (SEZs) in China, skills development for the electronics industry in Costa Rica, exporter support services in Peru and Uruguay, or improved QI for agribusiness in Benin. Export promotion agencies are essential institutions for sustaining an export-led growth model. Investment promotion agencies also play a crucial complementary role, as attracting foreign investment—particularly in countries with small domestic markets—can serve as a powerful catalyst for expanding and diversifying exports.

Governments can also resort to duty-drawback schemes that are acceptable under WTO rules to eliminate the burden of intermediate input tariffs especially in developing economies where on average tariffs remain higher (refer to figure 2.2).[8] The success of the duty-drawback schemes in Bangladesh's apparel industry and in China's encompassing export processing regime are well established.[9]

A complementary approach for governments pursuing the export-led growth model today is to pursue preferential trade agreements with a variety of partners, particularly South-South agreements and agreements that are deep, that is, they cover provisions in several policy areas beyond market access through lower tariffs.[10] For Africa, where geography and scale constrain industrialization and growth, intraregional integration particularly through the Africa Continental Free Trade Area is seen as a structural necessity to increase market size and thus allow for a better possibility of export-led growth. Participation in preferential trade agreements also proves to be a useful shield against protectionist industrial policies in partner countries.[11]

Import substitution using tariffs, local content regulation, consumer demand subsidies, and public procurement

A different approach to relax foreign exchange constraints is by suppressing imports in the "import-substitution" model—where high tariffs protect domestic industries in order to replace imported goods with local production with an expectation that eventually this would lead to industries that are globally competitive. This model was largely abandoned by the 1980s and is widely viewed as having failed.[12] Its shortcomings stemmed from the limited potential for scale in small domestic markets, weak incentives for improving quality in the absence of foreign competition, and limited interest from foreign investors in transferring technology to serve only local markets.[13] The evidence in chapter 3 shows that import tariffs rarely succeeded in promoting infant industries and often had large welfare costs.

Still, in this new era, if the export-led growth model appears more constrained, it is worth speculating whether import substitution might again offer a viable path. The main argument in its favor is that the growth of middle classes in developing economies has expanded domestic markets in recent decades, potentially allowing businesses to achieve greater scale than in the past.[14] Growing middle classes also raise the possibility to target productivity improvement in local services, like health care and retail. Yet it is unlikely economies without large populations like Brazil or India can reach the market size required to attract investors for purely domestic production. Moreover, the evidence in chapter 3 on commodity export bans and local content requirements suggests their use to foster upstream and downstream domestic industries even in a large market as is that of Indonesia is accompanied with high costs for producers and consumers. Buy local rules in procurement are also not a cost-effective tool to promote industry growth.

Export subsidies and exchange rate devaluation tools are less viable

The classic export-led period of East Asia's industrialization had governments maintaining high barriers to trade and investment but granting exemptions and "export-contingent" subsidies to successful exporters (refer to box 3.2). Today, such policies are no longer viable: export-contingent subsidies are now prohibited under WTO rules (except for least developed countries [LDCs])

and can provoke countervailing measures by trading partners (refer to box 1.1). Export subsidies for apparel and textiles in Pakistan discussed in chapter 3 had modest aggregate export effects as they led to reallocation of exports toward products with larger subsidies (rebates) in a context of overall export capacity constraints.

Using competitive exchange rate devaluation as a tool to foster exports and foreign exchange earnings was discussed in chapter 3 as being a component of successful growth in the East Asian miracle countries as well as China, and more recently Viet Nam. But this approach works only when other preconditions for success are present (for example, less costly labor reallocation across industries) and can also trigger retaliation.

Industrial policies to create jobs

Creating stable, well-paying jobs in the private sector is a priority for all governments, and the World Bank Group has made job creation the central focus of its work.[15] Yet this goal is often challenging, particularly in developing economies, and especially where most workers are employed informally—without contracts or benefits and often at low wages.[16] In some countries, high levels of informality and underemployment may stem from regulations and tax systems that discourage businesses from expanding or formalizing.[17] Likewise, disproportionately high public-sector wages can lead some workers to stay unemployed while waiting for government jobs.[18] These patterns suggest that, before pursuing job creation through industrial policy tools, governments should make sure to diagnose and address broader labor-market challenges.

Despite improved regulatory environments globally, however, informality and underemployment persist in most developing economies—suggesting a potential role for industrial policy.[19] In particular, targeting specific activities may help expand employment and boost wages when the underlying challenges are more basic, such as insufficient demand in the formal economy or lack of critical inputs. In such contexts, governments can promote business growth and job creation through industrial policy tools like public inputs (for example, industrial parks) and market incentives (for example, production subsidies).

It is important to recognize, however, that job creation can occasionally conflict with the broader goals of economic development, which often include objectives like investment, productivity growth, and natural resource protection. For instance, public inputs and market incentives are sometimes referred to as "productive development policy" to emphasize their central focus on increasing productivity[20]—which, in some cases, may reduce jobs rather than create them. Conversely, focusing on job creation can sometimes undermine productivity, such as when governments seek to expand employment through unproductive state-owned enterprises. Ghana's State Gold Mining Corporation illustrates this trade-off: though its Bibiani mine was exhausted by 1968, it continued to employ several hundred workers as late as 1973.[21] While job creation is frequently an important objective, it should not always be the central metric for determining policy success.

It can also be difficult to create jobs cost-effectively through industrial policy. "Buy American" provisions in the United States, for instance, were designed to create jobs by requiring the government to procure from local producers. These are estimated to have created jobs, but at a cost of US$111,500 to US$237,800 per job, roughly 2–4 times the average wage.[22] This policy is only justified, therefore, by an argument that the non-economic benefits from holding a job are much larger than the average wage. Regardless, it would be much cheaper in this case to create jobs by subsidizing wages.

This section examines how governments can most effectively pursue industrial policy when job creation is the main objective. It focuses on three key dimensions: (1) balancing trade-offs between labor-absorbing and high-wage activities, (2) choosing when to subsidize labor rather than capital, and (3) assisting workers displaced by trade or technological change. The discussion assesses evidence across these areas and identifies the conditions under which industrial policy can best support employment and wage growth—for specific groups as well as for the economy as a whole.

Balancing trade-offs between labor-absorbing and high-wage activities

Governments seeking to create jobs through industrial policy often face a trade-off between targeting labor-absorbing industries, which can quickly generate a large number of lower-wage jobs, and targeting high-wage, skill-intensive industries. While labor-absorbing activities typically create more jobs,

high-wage activities are typically more effective at boosting productivity, raising average wages, and delivering broader economic benefits.

Efforts to promote labor-absorbing industries can take several forms. A common approach is providing small businesses with subsidized credit or preferential access to government contracts, based on the observation that small businesses account for most employment. Another approach, advocated by Rodrik and Stiglitz (2025) and Rodrik and Sandhu (2024), is targeting service industries like restaurants, retail, and taxi driving, where job creation is often concentrated. Tourism indirectly creates jobs in these industries by increasing demand, while also providing direct employment in the hospitality industry. Publicly supported industries like education and health care are also major employers. Targeting these activities can quickly create jobs, including for workers with limited formal education or skills, without requiring large investments in physical capital or skills development.[23] However, these industries generally have low labor productivity measured at market prices, which limits their prospects for boosting average wages.

Evidence from two types of programs that target labor-absorbing activities confirms that they generate employment but rarely deliver wage gains. The first type are programs that help small businesses expand through microfinance, shorter supply chains, and manager training. Experimental studies find that these programs can help some businesses, but they typically do not raise productivity enough to lift wages substantially.[24] Some programs do not work at all. For example, a platform service in Colombia tried to save time and money for fruit and vegetable vendors by consolidating their orders and buying and delivering in bulk so the vendors did not have to travel to the central market. But soon vendors stopped using the platform. If anything, retailers using the service suffered a reduction in profits and sales in the short term due to a reduction in sales of products not offered by the service, which not going to the central market as often made them less likely to sell.[25] This example highlights the difficulties of improving small business productivity, especially in an industry like retail, where the most productive businesses are very large, achieving economies of coordination and scale.

The second type provides workers with training and job search assistance—but even when implemented at scale, such programs tend to have modest effects. For example, across programs in Colombia, Côte d'Ivoire,

the Dominican Republic, Ghana, and Türkiye, participants' likelihood of employment increased by an average of just 4 percentage points and they saw wage increases of only 8 percent.[26] While stronger results may be achievable through partnerships with employers to ensure that trainings align with labor demand, more evidence is needed. Overall, industrial policy that targets labor-absorbing activities can provide near-term benefits for job seekers but should not be expected to deliver large or lasting wage gains. One way to think about such policies is as a type of essential social support for disadvantaged workers and subsistence entrepreneurs, for which expecting economic growth effects would be unrealistic.

Focusing on high-wage activities, by contrast, can in principle generate more value per worker and growth—but creates fewer jobs, requires additional investments, and may be less politically sustainable. Examples of high-wage activities include the heavy and chemical industries, advanced professional services, and large businesses and multinationals.[27] Promoting such activities or industries directly raises wages for their workers while also increasing demand for the goods and services they consume, indirectly boosting labor-absorbing industries.[28] However, targeting high-wage activities typically requires investments in physical and human capital, since high-wage industries tend to rely on skilled workers and specialized equipment, machinery, or technology. Such efforts may also be harder to sustain politically, given their indirect benefits, despite their greater importance for long-run welfare growth.

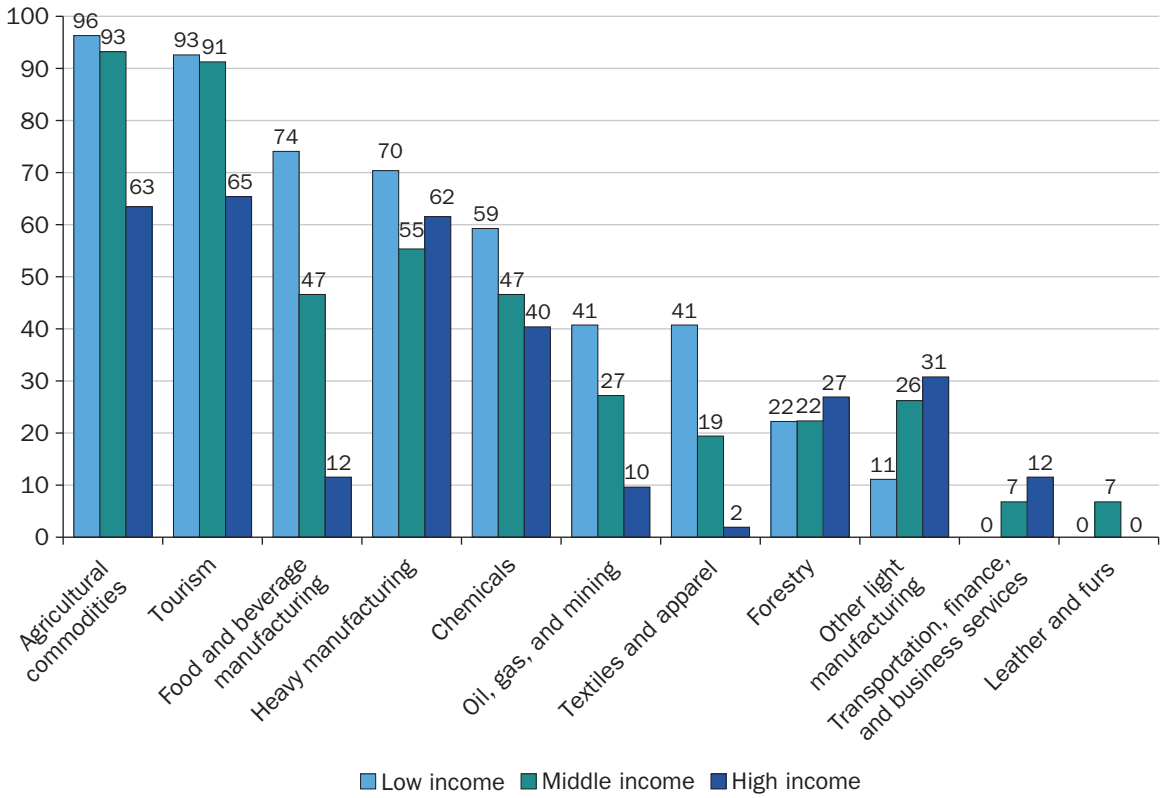
Navigating the trade-off between labor absorption and wage growth often entails costs. Most notably, supporting high-wage activities can lead to a decline in labor-absorbing activities in the same industry. During the Republic of Korea's industrialization, for instance, artisan textile and leatherwork shops were replaced by large factories as wages grew.[29] Similarly, during the early stages of Japan's industrialization, the then-Minister for International Trade and Industry, Hayato Ikeda, was forced to resign after publicly advocating for small businesses to be replaced by large industry—though he later became prime minister in the early 1960s, as the country entered a period of rapid growth.[30]

In practice, developing economies often target both labor-absorbing and high-wage industries, typically with a stronger focus on the former—a mix that suggests a general lack of prioritization. As figure 6.1 shows, low-income

economies are most likely to target labor-intensive industries (for example, food and beverage manufacturing or textiles and apparel) while also being most likely to target high-wage industries (for example, heavy manufacturing or chemicals). Middle-income economies similarly target both categories, but at lower levels, while high-income economies tend to prioritize high-wage industries. Broadly, recent evidence suggests that advanced economies tend to have more large, productive businesses than developing economies, which are often marked by a "missing top" of large businesses that can drive growth.[31]

Figure 6.1 **Industries targeted in national development plans, by income group**

Share of countries targeting the industry (%)



Sources: National development plans (183 total); Harmonized System (HS) codes.

Note: The figure shows shares of countries targeting industries identified in national development plans classified into broad sectors.

The World Bank Group has identified five industries as especially effective drivers of job creation: (1) infrastructure and energy, (2) agribusiness (including farming, processing, and food distribution), (3) health care, (4) tourism, and (5) value-added manufacturing.[32] These industries are defined broadly enough to include both labor-absorbing and high-wage activities—for example, combining manual, technical, and managerial tasks across a wide range of skill requirements—with the exact mix between the two differing across economic contexts. In general, strategic focus on broad industries rather than narrow activities—a principle discussed in chapter 4—can help governments avoid making an explicit choice between prioritizing labor absorption or wage growth. Market interventions, in particular, can often be applied broadly (for example, innovation subsidies for any activity in agribusiness or tourism). Certain public inputs, by contrast, must be tailored more narrowly (for example, skills development programs), in which case governments may still be doomed to choose between targeting labor absorption or wage growth.

Choosing when to subsidize labor rather than capital

Industrial policy often prioritizes helping businesses make capital investments rather than create jobs. For example, subsidy programs often provide corporate income tax holidays or allow accelerated depreciation of machinery and equipment. Subsidies for labor, by contrast—such as Romania's personal income tax break for software developers in the 2000s—are less common. When job creation is the primary objective, however, a natural question arises: should governments rely more on labor subsidies than capital subsidies?

The answer depends on both the type of activity being targeted and the channel through which jobs are created. In some industries, particularly capital-intensive ones, capital subsidies may be a more cost-effective way to create jobs than labor subsidies. Once installed, equipment and machinery can expand employment, boost wages, and potentially increase productivity for many years—whereas wage subsidies must be renewed annually. Labor subsidies or skills development programs are more appropriate when job creation requires investing in workers' skills. Romania's tax break, for instance, made it cheaper for businesses to hire and train software developers while also incentivizing workers to acquire those skills and enter the industry. Ultimately, the balance between subsidizing capital or labor depends on whether the targeted industry relies more on physical capital or skilled labor.

Assisting workers displaced by trade or technological change

One potential motivation for industrial policy is to protect and support workers at risk of displacement from trade liberalization or technological change. This approach was termed "predistribution" by political scientist Jacob Hacker (2011)—protecting workers before they are affected—in contrast to redistribution, which compensates workers after they have been displaced. In the context of trade-related displacement, such efforts often take the form of import tariffs. In Japan and Korea, for instance, average import tariffs declined steadily during the second half of the 20th century. Yet industries like food processing, apparel, and textiles, which had slower productivity growth but large employment historically, continued to receive disproportionately high import tariffs.[33] This suggests that the Japanese and Korean governments sought to protect existing industries even as they promoted new ones. However, as noted throughout this report, protecting industries for reasons other than correcting clear market failures will entail costs: higher prices for consumers and certain producers in the case of import tariffs, and fiscal costs to the government in the case of subsidies.

More recently, many governments have developed targeted programs to help workers and occasionally businesses that have been adversely affected by import competition or offshoring. Such "trade adjustment assistance" programs typically offer extended unemployment benefits, retraining opportunities, and job-search assistance to help displaced workers transition to new industries. Research on the United States' Trade Adjustment Assistance (TAA) program, for instance, finds that participation increases workers' long-run earnings, largely by reducing time spent in unemployment, and that the program is self-financing even under conservative assumptions.[34] However, evidence suggests that TAA's overall impact is limited due to onerous enrollment requirements: in order to receive benefits, displaced workers must petition the government to investigate their employer and certify that displacement resulted from import competition.

Argentina offers another example of TAA. In 2015, the government sought to lower its 35 percent import tariff on computers to reduce costs for other industries. The policy faced strong opposition from workers in domestic assembly plants that produced outdated, expensive computers. To ease adjustment, the government's National Program for Productive

Transformation (PNTP) provided subsidies to eligible businesses and connected displaced workers with employers willing to absorb them. More research is needed to assess outcomes for workers, but anecdotal evidence suggests the policy helped some businesses survive liberalization. For instance, one assembler with 500 employees transformed into an authorized distributor and customer service provider for an international computer brand, reducing its staff to 220 but remaining viable.[35]

In both the United States and Argentina, broad-based social safety nets offering support to all workers might have yielded greater overall benefits, albeit at higher cost. For instance, Brazil's National Industrial Training Service (SENAI), while not designed as a TAA program, offers job training to anyone ages 16 or older. Evidence shows it increases the probability of reemployment for displaced manufacturing workers, with larger gains in industries facing high levels of import competition.[36]

In contrast to TAA, fewer countries have implemented large-scale programs to help workers adjust to technological change. While labor unions in industries like maritime shipping, automobiles, and screenwriting have negotiated agreements to slow automation and protect jobs, similar government-led efforts remain less common.[37]

Green industrial policies

Air pollution causes millions of deaths each year and substantially reduces life satisfaction.[38] While emissions of fine particulate matter are most harmful to human health, greenhouse gas emissions of carbon dioxide and methane add further human and financial costs globally.[39] Emissions are highly concentrated in certain industries, notably fossil fuel-based power generation, cement and steel production, and palm oil cultivation.[40] In this context, "green industrial policy"—government efforts to promote low-pollution production methods and technologies while advancing national economic goals—are gaining momentum.

Many approaches to green industrial policy resemble traditional industrial policy: they aim to expand industries that align with growing global demand, with the added focus on industries that also have environmental benefits, such as solar panels or electric vehicles (EVs).[41] This chapter, however, focuses on a

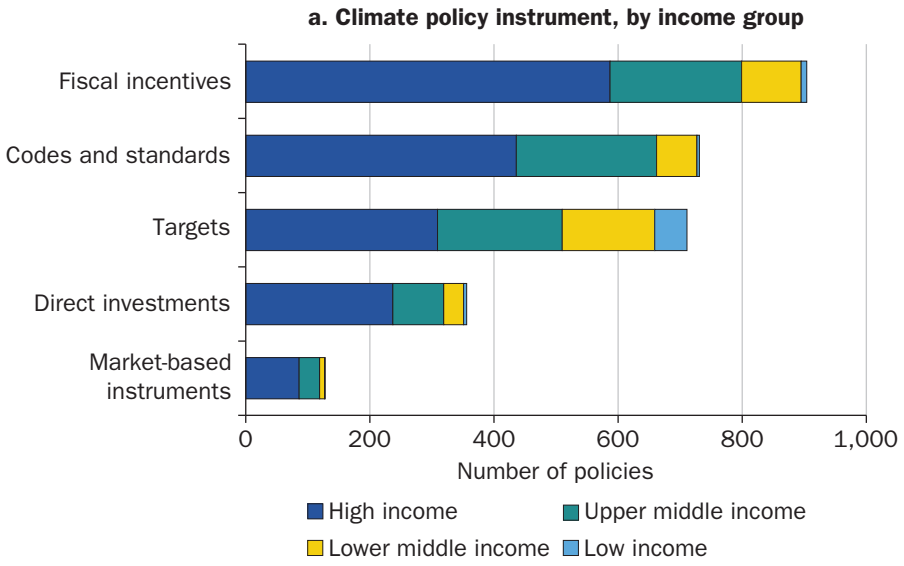
narrower definition of green industrial policy: efforts to reduce the costs that industries face to comply with emissions regulations.

Compliance costs are a central reason why businesses often oppose environmental policy measures, despite broad public support for reducing pollution. While subsidies are an important tool to offset higher costs, to achieve the greatest impact, they must be complemented by explicit limits on industrial emissions. These limits often require substantial business investment in emissions abatement, such as by upgrading or replacing production technologies.[42]

But reducing the harms caused by pollution unavoidably requires setting limits on emissions. Governments do this in two main ways: establishing emissions performance standards, which simply require businesses to meet specific limits, and market-based mechanisms, which require businesses to pay for their emissions but offer flexibility in how they achieve reductions.

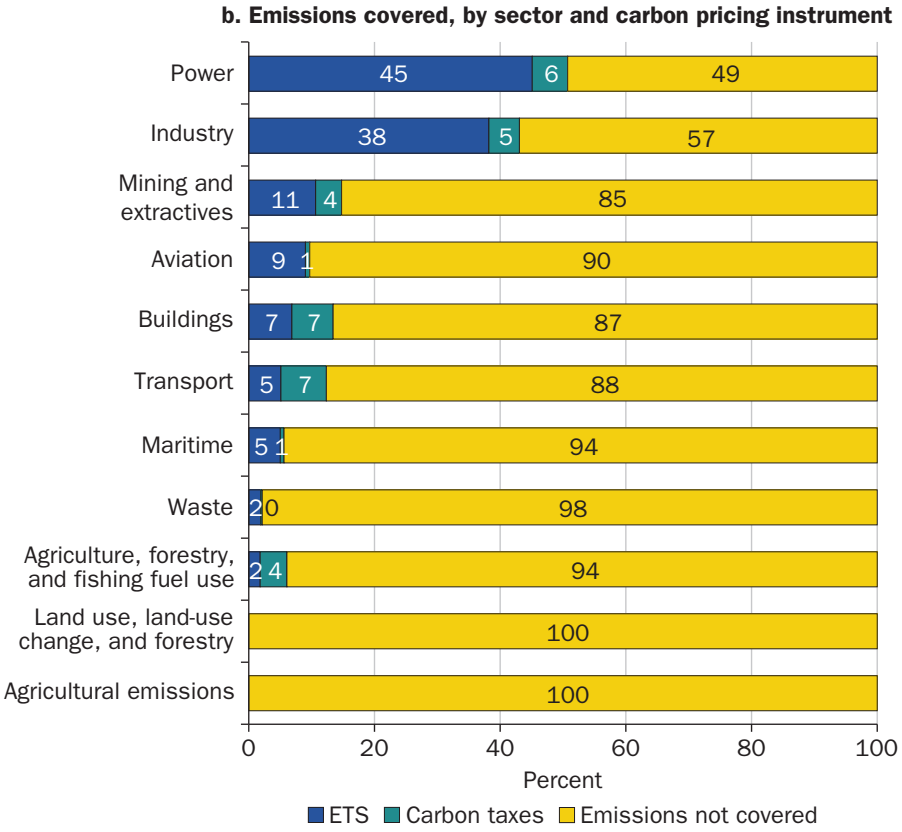
Globally, the second-most-common type of environmental policy instrument is codes and standards, which require businesses to meet specific limits or face financial or legal penalties (refer to figure 6.2, panel a).

Figure 6.2 Environmental policies affecting industry



(Continued)

Figure 6.2 Environmental policies affecting industry *(continued)*



Sources: NewClimate Institute, Wageningen University and Research, and PBL Netherlands Environmental Assessment Agency 2024; World Bank 2025b.

Note: In panel a, the policy instrument category "targets" includes energy efficiency, greenhouse gas reduction, and renewable energy targets. Policies related to institutional aspects and strategic planning have been excluded. A single policy may be counted more than once if it is associated with multiple types. The sample covers 194 economies (65 high income, 53 upper middle income, 50 lower middle income, and 26 low income). Panel b covers 52 national and 43 subnational jurisdictions that have implemented, are developing, or are considering compliance with carbon pricing instruments (carbon taxes or emissions trading systems). ETS = emissions trading system.

Their prevalence reflects the fact that they are relatively straightforward for governments to administer and widely trusted by the public. In India, for example, air-quality standards measured by sensors in local industrial clusters led businesses to electrify production processes, shifting away from coal.[43] Another example is Renewable Portfolio Standards (RPS), which require electricity suppliers to generate a minimum share of their power from

renewable sources. More than 60 countries—including major emitters like Brazil, China, and India—have adopted RPS or an alternative form of renewable energy obligation or quota system.[44]

Yet, reducing pollution through emissions performance standards comes at a cost to businesses. After India's performance standards were imposed on industrial clusters, for example, businesses increased their spending on cleaner technologies and other pollution-abatement efforts.[45] But to offset these costs and maintain profitability, they often shifted production toward higher-margin products. In aggregate, new business formation slowed after the standards were introduced, suggesting that compliance also raised the cost of market entry.

In the United States, seven years after the adoption of RPS, carbon emissions declined by between 11 percent and 24 percent, but businesses and consumers faced 11 percent higher electricity prices. Abating carbon is costly, with the cost per ton of carbon ranging between US$80 and US$210, higher than most current estimates of the value of carbon abatement.[46] However, these costs may decline over time as renewable energy generation gets cheaper and becomes increasingly competitive with conventional power sources.[47]

One drawback of emissions performance standards is that they treat all businesses equally: they do not reward high performers that exceed compliance targets, nor do they account for differences in the costs of reducing pollution. By contrast, market-based environmental policies require polluters to pay for their emissions but allow flexibility in how they reduce them.

A prominent example is the European Union's Emissions Trading System (ETS), a cap-and-trade program that sets an overall emissions limit (the "cap"), requires businesses to purchase emissions allowances from the government, then allows businesses to buy and sell their allowances (the "trade"). Businesses that can reduce emissions cheaply may sell their excess allowances, while others can purchase additional ones if their abatement costs are higher. As of 2025, carbon pricing instruments like the ETS cover about 28 percent of global carbon emissions, comprising roughly 27 percent of emissions from high-income countries and 30 percent from middle-income countries (no low-income countries have yet deployed such instruments).[48] The power and manufacturing industries account for the largest shares of emissions subject to carbon pricing (refer to figure 6.2, panel b).

Despite their greater efficiency, market-based environmental policies can still impose broader costs. Requiring businesses to buy allowances can ultimately make their goods more expensive, especially in energy-intensive industries or if the caps in emissions trading schemes are set very low.[49] This can reduce their competitiveness relative to producers in countries with weaker emissions standards. For example, evidence from Europe shows that tighter emissions regulation has led to "emissions leakage"—with some multinational businesses scaling back their investments in Europe and increasing emissions from their subsidiaries in Africa, effectively shifting pollution rather than reducing it.[50]

Green industrial policy can complement emissions regulation by easing the burden of compliance on businesses. Three approaches offer governments tools to ease these regulatory costs: (1) adapting emissions regulations to avoid harm to the competitiveness of domestic industries, (2) providing subsidies for low-pollution technology adoption and innovation, and (3) combining subsidies with local protection.

Adapting emissions regulations to avoid harm to domestic competitiveness

To reduce the risk that an emissions trading scheme might reduce the global competitiveness of domestic industries, governments can modify their schemes or give certain businesses partial exemptions. Most frequently, this takes the form of free emissions allowances for businesses in energy-intensive industries.

The allocation of free allowances is typically based on benchmarking, a performance-based approach that rewards more efficient businesses. The number of allowances each business receives is calculated by multiplying its historical production output by an industry-specific emissions benchmark, which represents the average emissions of top-performing producers. These benchmarks are often set at the level achieved by the industry's top 10 percent most energy-efficient businesses, creating an incentive for others to improve. In practice, free allowances function like production subsidies: they help businesses remain competitive, while still providing incentives to reduce emissions.[51] However, allocating free allowances also limits governments' ability to generate revenue through emissions trading schemes.

In the European Union, a related but distinct policy tool is the Carbon Border Adjustment Mechanism (CBAM), which aims to maintain European competitiveness by discouraging emissions leakage. These require the EU importer to pay an additional tariff for goods produced with carbon. CBAMs extend ETS carbon pricing to EU imports in key industries, including steel, aluminum, cement, fertilizers, electricity, and hydrogen. CBAMs function by requiring EU importers to pay for their imports' embedded emissions—or the total carbon released during production—at prevailing ETS prices.

In addition to leveling the playing field for European businesses facing domestic emissions caps, CBAMs also aim to encourage trading partners to adopt their own policies to reduce emissions. Rather than allow EU countries to collect revenue on their exports through their CBAM, exporting countries may prefer to introduce an emissions regulation scheme or domestic carbon tax and keep the revenue themselves. Evidence from the European Union and the United Kingdom (which has its own CBAM) suggests that these policies can both enhance domestic competitiveness and encourage trading partners to regulate their own emissions.[52]

However, since CBAMs effectively serve as tariffs on countries with weaker emissions policies, there is growing concern they disproportionately burden developing economies that lack the financial or technological capacity to reduce emissions.[53] To offset these indirect effects, developing economies may need to consider policies to boost the global competitiveness of their own domestic industries.

Providing subsidies for low-pollution technology adoption and innovation

The most widely used environmental policy instrument in both developed and developing economies are fiscal incentives to adopt or invent new green technologies (refer to figure 6.2, panel a). Through grants and tax incentives, these tools promote the uptake and innovation of low-pollution technologies while reducing operating costs for eligible businesses—often enhancing their global competitiveness in the process. After accounting for the associated environmental benefits, these types of renewable energy subsidies can yield high returns to government investment.[54]

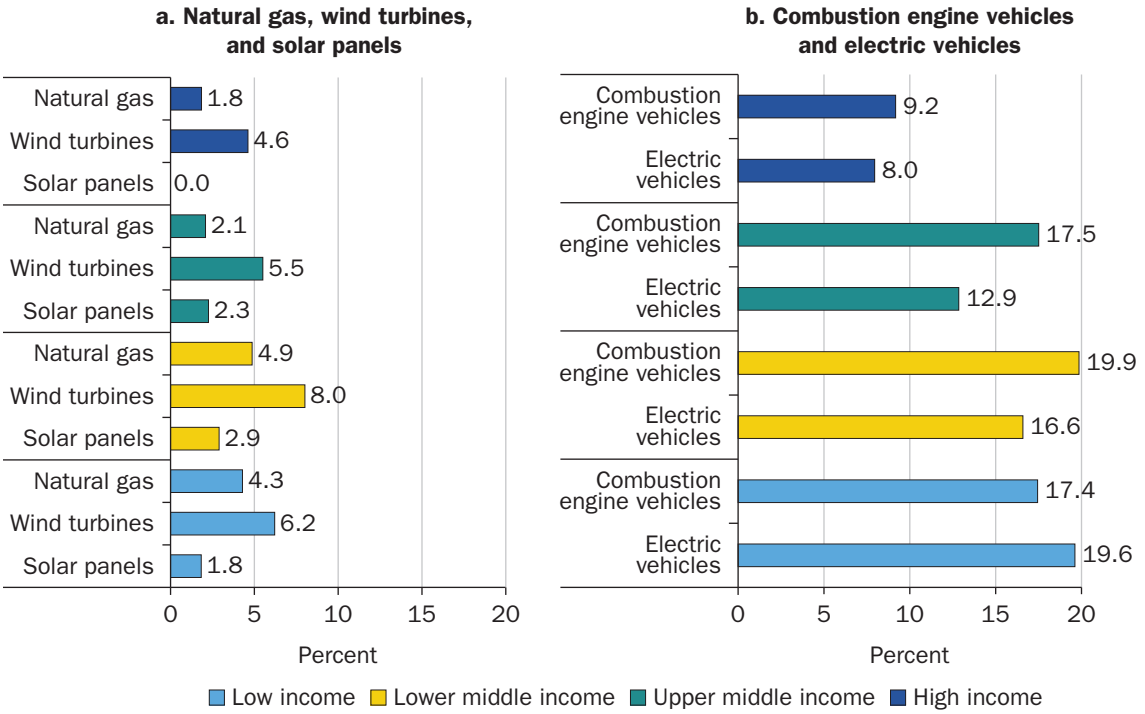
Despite their strengths, however, subsidies for green technology adoption and innovation also have limitations. Most important, they can displace conventional power generation without distinguishing between cleaner and dirtier fossil fuels—potentially replacing low-emission natural gas as readily as high-emission coal. Moreover, while green technology subsidies drive down the cost of energy generation, they do not necessarily promote energy conservation and often need to be complemented by additional policy instruments that encourage energy efficiency.

One question is whether such policies help build political support for environmental regulation amongst those who might oppose it. The United States Inflation Reduction Act (IRA) targeted subsidies to areas reliant on fossil fuel extraction, processing, or transportation for jobs. While subsidies encouraged investment in renewable energy, few new jobs were created because electricity generation is not labor intensive. Ultimately, voting outcomes in the 2024 election did not change.[55]

Combining subsidies with local protection

To ensure that the benefits of green technology adoption and innovation accrue to domestic businesses, governments often pair incentives for downstream adoption with protective trade measures to boost local production, such as local content requirements or import tariffs. For example, between 2016 and 2019, China implemented a policy that restricted EV subsidies to models using batteries from approved domestic businesses. Similarly, the United States IRA ties renewable energy subsidies to the sourcing of critical minerals and battery components from the United States or countries with a free trade agreement, while also imposing a 50 percent tariff on imports of solar components from China and Southeast Asia. Globally, however, most countries maintain relatively low tariffs on imports of solar panels—generally lower than those on imports of natural gas—and lower tariffs on imports of EVs relative to those on imports of combustion-engine vehicles (refer to figure 6.3).

Figure 6.3 Average tariffs for natural gas, wind turbines, and solar panels and for combustion engine and electric vehicles, by income group



Source: Rosenow and Mealy 2024; World Integrated Trade Solution (WITS) TRAINS (Trade Analysis and Information System) tariff data, World Bank, https://wits.worldbank.org/.

Note: Most-favored nation (MFN) tariff rates in 2023 are used. The rankings between products within income groups are identical using applied tariffs, though average rates are slightly lower. The sample covers 187 countries (66 high income, 49 upper middle income, 50 lower middle income, and 22 low income). The mapping of Harmonized System (HS) six-digit codes to the different product groupings shown in the figure follows Rosenow and Mealy (2024).

When aligned with a country's latent comparative advantage, such protectionist policies can foster the development of domestic industries. In China, the local content requirement policy initially created challenges for domestic EV battery producers but ultimately accelerated learning-by-doing and cost reductions by concentrating demand among the most productive businesses. In India and the United States, governments combined import tariffs with production subsidies to promote domestic solar panel manufacturing.

However, it should be noted that these protectionist policies can also impose costs on consumers and trade partners, slow the deployment of green

technology, and delay global environmental goals. China's local content requirement for EV batteries led to a shift away from Japanese and Korean battery producers, which at the time were more efficient, resulting in higher prices for Chinese consumers.[56] In the United States, subsidies under the IRA—when combined with tariffs on imported solar panels—are projected to reduce both the US and global welfare and slow the energy transition by driving up solar equipment costs and weakening the pace of global innovation.[57] The solar tariffs are also projected to reduce overall employment and wages in the US solar industry—since far more workers are employed in solar panel installation than in manufacturing, and higher solar equipment prices are projected to reduce consumer demand for solar installations.[58]

Industrial policies for resilience and economic security

In recent years, industrial policy—particularly in advanced economies—has often been motivated by national security concerns. Governments have sought to boost domestic production and promote self-sufficiency in strategic areas (for example, military goods, food, or medicine) to protect against shocks that are largely geopolitical rather than economic. The increasing frequency of natural disasters and the emergence of new infectious diseases have added further motivation to secure against risks. Such efforts are often framed as enhancing resilience, or the capacity to withstand, recover from, and adapt to shocks, crises, or change.

Notably, the motivation for security-oriented industrial policy often expands beyond national security to include economic security. A common example in developing economies is food security, which seeks to ensure that farmers produce enough food for subsistence. Once households move beyond subsistence, however, promoting domestic production does not always improve resilience. For instance, import tariffs meant to boost food security can backfire during a drought, raising prices when food is already scarce. Likewise, domestic medicine production may not be possible during a pandemic or similar crisis, even when capacity exists; in such cases, ensuring access to imports may provide greater security.

In general, there are three main considerations when designing industrial policies to promote security and resilience.[59]

First, both security and resilience are broad and can only be achieved when they address specific threats. Efforts to strengthen security or resilience against one shock may do little to mitigate another. For instance, efforts to expand domestic production of semiconductors or diversify natural gas imports—industries currently reliant on a relatively small number of supplier countries—are increasingly being pursued to guard against potential supply-chain disruptions. Yet a domestic semiconductor industry is still vulnerable to shocks that interrupt domestic production, like a natural disaster or a public health emergency. Likewise, diversified natural gas imports could still be disrupted by shocks that affect multiple locations, such as the closure of key ports or shipping lanes due to a storm or conflict.

Second, it is unclear how much resilience or security an economy actually needs. Resilience, for example, is often described as the ability to "bend but not break" in the face of a shock,[60] but even this definition leaves ample room for interpretation. Should a business, industry, or entire economy be considered resilient if it merely survives a shock, or only if it fully recovers—and if so, how quickly? Attempts to measure security encounter similar challenges. In practice, the absence of well-defined benchmarks makes it difficult to assess resilience and security. In principle, the desired levels should depend on a society's tolerance for risk, but this is difficult to quantify and can vary widely across contexts and over time.

Third, there is often limited economic rationale for deciding which industries to target when the motivation is security and resilience. One intuitive approach is to focus on essential goods, though what counts as essential varies across countries. Passenger automobiles, for instance, may be vital in countries lacking well-developed public transportation but less so elsewhere. Another approach emphasizes goods with both civilian and military applications, such as precision machine tools or semiconductor chips. But this definition risks being applied too broadly. The Belgian army's dress uniform, for instance, historically used "lace" on its epaulettes (that is, gold or silver braids and embroidery to denote rank and other distinctions)—providing a hypothetical justification for trade restrictions on foreign lace in the name of national security.[61] A similar argument could be used to justify protection of virtually any food, apparel, or footwear industry.

The key implication is that decisions to pursue industrial policy for security and resilience—and assessments of their success—cannot be based solely on technical or scientific criteria. They ultimately require political judgment to identify the most significant threats, the desired level of security or resilience, and the most relevant industries. Economics cannot by itself provide answers to these questions, though it can help clarify the trade-offs involved and guide policy design once targets are chosen.

This section briefly reviews three approaches to industrial policy for security and resilience that take these considerations into account: (1) dispersing production geographically to protect against domestic shocks, (2) diversifying away from unreliable import suppliers, and (3) adapting to evolving export demand.

Protecting against domestic shocks by dispersing production

Some domestic shocks cannot be mitigated by simply expanding domestic production. A nationwide fall in demand—such as during the 2008–09 global financial crisis—can affect all businesses, regardless of whether a supply chain is national, global, or well-diversified. Likewise, some domestic supply shocks, such as a hurricane striking a small island country, can only be addressed by importing goods from abroad. In cases like these, efforts to reshore supply chains can actually reduce resilience by increasing vulnerability to domestic shocks.

Governments have more leverage when domestic shocks are localized and dispersed. As such, one approach is to encourage businesses to establish production facilities in multiple locations, for instance through targeted subsidies. This strategy can be justified as reflecting a government's preference for businesses to be prepared "just in case" domestic shocks materialize. Indeed, this approach appears to be unfolding in the global car industry even without government support. Between 2000 and 2019, many automobile plants have been affected by floods globally—with roughly one-quarter being nearby to severe floods (that is, events expected only once every 100 years, based on historical data). In response, many auto manufacturers diversified production by opening new plants near large consumer markets in regions that are less prone to flooding, including by expanding into new countries. These plants often operate below full capacity, providing flexibility to shift production during future floods.[62]

However, this case also highlights a key trade-off when promoting resilience through dispersed production. While the strategy has reduced the financial impact of floods and potentially improved global automobile supply, it also appears to have raised car prices—both because the new plants are in higher-cost regions and because underutilized capacity is expensive to maintain.

Diversifying import supply away from unreliable suppliers

Shocks affecting input suppliers can have ripple effects throughout supply chains, harming downstream producers. Natural disasters like earthquakes and floods affect not only nearby suppliers but also the international customers that rely on them.[63] To guard against the risk of unreliable suppliers, some industrial policy efforts—particularly those targeting semiconductors and rare earth minerals—aim to build domestic production capacity.

However, replacing imports with domestic production is often not feasible. A European Commission study, for instance, found that Europe depends on a single foreign supplier for basic metals but lacks comparative advantage to compete in the industry.[64] The study concluded that promoting domestic production of basic metals would likely be costly, with a high risk of failure in the terminology of chapter 4. In such contexts, ensuring security depends less on promoting domestic supply than on diversifying import sources.

One strategy is to encourage businesses to switch to alternative suppliers. Most businesses, especially smaller ones, rely on a single supplier for each input.[65] If other low-cost suppliers are available, market access assistance—such as assistance searching for new suppliers in new markets—may be enough to facilitate diversification. Yet if dependence on a single supplier reflects that supplier's cost advantage, sustaining diversification may require ongoing subsidies. A complementary strategy is to support businesses making foreign investments to develop new, lower-cost suppliers. This approach is now being pursued, notably in the mining industries in Africa, where China and the United States have offered state support for mining investments.

Adapting to shifts in export demand

Resilience is also important when demand for key exports falls, such as when a country's trading partners impose new import tariffs. This risk has recently become salient for Europe's trading partners, as two of the European Union's proposed environmental measures—the CBAM and the Deforestation

Regulation—could impose tariffs on goods whose production is linked to carbon emissions or deforestation. The CBAM initially targets six products: iron and steel, aluminum, cement, fertilizer, hydrogen, and electricity. The Deforestation Regulation targets seven products: cattle, cocoa, coffee, oil palm, rubber, soya, and wood.

In such cases, governments have limited policy options. In response to the proposed EU measures, governments could pursue targeted industrial policies to help exporters adopt cleaner technologies or reduce deforestation impacts (refer to the "Green industrial policies" section). When demand falls because of higher import tariffs or shifting trade preferences, the only alternative is to help businesses find new export markets. Here, governments can pursue industrial policy tools like market access assistance and QI, particularly when new markets have different technical or safety requirements. Production or export subsidies covering the affected goods, however, are not advised: such subsidies can discourage businesses from diversifying into new products, as in the Pakistan export subsidy example (refer to chapter 3).

Notes

1. Klein (2023) argues that this denial leads to policies he likens to everything bagels, the type of bagel made with many toppings in delicate proportions—initiatives designed to achieve many goals at once but that ultimately fail. "Everything bagels are the best bagels," he notes, but such policies are very hard to design and implement successfully. Esteves (2023) examines how to assess trade-offs when "multi-solving" across different goals.
2. Goldberg and Reed (2023); Page et al. (1993); World Bank (2020).
3. Amiti and Konings (2007).
4. Kee and Tang (2016) examine the case of China, while a large micro-level literature shows that access to cheaper imported intermediate inputs enhances business export performance (for example, Bas and Strauss-Kahn 2015).
5. Naturally, foreign exchange earnings also play a macroeconomic role in terms of currency stabilization and external debt management.
6. Goldberg and Ruta (2025).
7. Reed (2024).
8. Duty-drawback schemes are acceptable under WTO rules as long as they do not over-rebate. Specifically, Annex I to the Agreement on Subsidies and Countervailing Measures (WTO 1999) indicates that only "excess" drawback remission (that is, drawing back more than the import value of inputs consumed in producing the

exported product accounting for normal waste) would be considered as an export subsidy and thus prohibited under WTO rules. Thus, even though it has an export contingency, if the duty-drawback scheme stays within that boundary (and has a credible verification system), it will not fall into the prohibited export subsidy category.

9. Ianchovichina (2007) discusses the pros and cons of duty drawbacks, examining the effects of a hypothetical removal of duty exemption in China, where it played an important role in export expansion.
10. Fernandes et al. (2021).
11. Barattieri et al. (2025).
12. Irwin (2021). A potential counterexample noted by Rodrik (2005) is that Latin America grew more slowly after it liberalized trade in the early 1980s. Yet this could be due to other factors, and it is not obvious that a return to import substitution would yield faster growth (Zettelmeyer 2006).
13. Extensive evidence shows the productivity benefits of eliminating import substitution regimes: for example, Fernandes (2007), Harrison (1994), and Topalova and Khandelwal (2011).
14. Goldberg and Reed (2023).
15. Development Committee (2025).
16. According to the International Labour Organization (ILO 2025), informal employment comprises 90 percent of the labor force in low-income countries, 83 percent in lower-middle-income countries, 53 percent in upper-middle-income countries, and 8 percent in high-income countries.
17. This narrative is most developed in Latin America, for instance in Brazil (Ponczek and Ulyssea 2022) and Mexico (Levy 2010).
18. For example, in the Middle East and Eastern Europe (Behar and Mok 2015) and Ghana (Duflo et al. 2021).
19. World Bank (2019). For informality, though, it is important to emphasize that it has many reasons other than those justifying the use of industrial policy, for example high costs of formalization and taxes.
20. Crespi et al. (2014).
21. Killick (1978, 259).
22. Bombardini et al. (2024).
23. Historically, light manufacturing often played this role, absorbing workers without significant increases in schooling and limited machinery and equipment. Today, while manufacturing has remained stable or declined only slightly as a share of value added in most economies, its share of employment has fallen more sharply as the industry has become more capital- and skill-intensive (Rodrik 2016). As a result, manufacturing is less able to play this labor-absorbing role.
24. Anderson and McKenzie (2022) and Innovations for Poverty Action (2015). Rodrik and Sandhu (2024) survey other examples of similar interventions.
25. Rodrik and Stiglitz (2025) note this intervention garnered initial interest, but Iacovone and McKenzie (2022) showed this disappointing result.

26. Carranza and McKenzie (2024).
27. Card et al. (2024) estimate industry and large-business wage premiums, while Almeida (2007), Girma and Görg (2007), Setzler and Tintelnot (2021), and Alfaro-Urenã et al. (2022) provide rigorous evidence of the wage premium at multinationals for Portugal, the United Kingdom, the United States, and Costa Rica, respectively.
28. Increased demand for consumer services may lead businesses to improve quality and productivity over time. Productivity growth in consumer services accounted for about one-third of India's overall growth between 1987 and 2011, benefiting primarily high-wage households in urban areas (Fan et al. 2023).
29. Dollar and Sokoloff (1990).
30. Johnson (1982, 202).
31. World Bank (2023).
32. Development Committee (2025).
33. Beason and Weinstein (1996); Lee (1996).
34. Hyman et al. (2024).
35. Castro and Pierola (2025).
36. Blyde et al. (2023). A possible constraint is that, before trade liberalization, expanding the social safety net is politically difficult because doing so implicitly acknowledges that many workers could be displaced by liberalization.
37. Acemoglu and Restrepo (2018) provide qualitative arguments on why a government might choose to tax automation to slow its pace, though they do not recommend specific technologies to be taxed.
38. For death estimates, refer to World Bank (2025a). For evidence on life satisfaction, Besley and Hussain (2023) show that households would be willing to pay to close coal-fired powered plants to improve local air quality.
39. For example, by causing extreme weather, floods, and forest fires (Clausing et al. 2025; Newman and Noy 2023).
40. Coal-fired electricity was the largest single source of energy-related carbon dioxide (CO_2) emissions in 2018—about 29 percent—followed by gas-fired (9 percent) and oil-fired (2 percent) generation (IEA 2020). In manufacturing, cement and steel production are major sources of emissions, responsible for approximately 7 percent of global energy-related CO_2 emissions each (IEA 2018, 2020). Agricultural deforestation—including for palm oil—contributes a further 6.5 percent of global CO_2 emissions (Pendrill et al. 2019).
41. Gerarden et al. (2025), Harrison et al. (2017), and Rodrik (2014) review efforts through this lens.
42. This argument is made, for example, by Acemoglu et al. (2012) and Aghion et al. (2025).
43. De Simone et al. (2024).
44. Heeter et al. (2019).
45. De Simone et al. (2024).

46. Greenstone and Nath (2020).
47. Timilsina (2020).
48. Kotchen (2024); World Bank (2025b).
49. The measurement, reporting, and verification costs associated with such schemes can be substantially higher than just imposing standards or other mandates or incentives.
50. Känzig et al. (2024).
51. Fowlie and Reguant (2022).
52. Clausing et al. (2025); Fischer and Fox (2012).
53. Böhringer et al. (2018).
54. Hahn et al. (2024).
55. Keuzenkamp et al. (2026).
56. Barwick et al. (2025).
57. Hong (2025).
58. Bollinger et al. (2025).
59. This discussion draws heavily from Goldberg and Reed (2023).
60. Brunnermeier (2022).
61. Hudec (1990).
62. Castro-Vincenzi (2024).
63. Barrot and Sauvagnat (2016).
64. Gentner Vavrova et al. (2025).
65. Antràs et al. (2017) show this for the United States.

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CHAPTER 7

Policy Brief

This brief for policy makers and civil society reviews the report's frameworks, focusing on three key questions for those designing and implementing industrial policies for development: Which activities should be targeted, given considerations of comparative advantage and market potential? Which policy tools should be chosen, given context-specific constraints? What should be done to get the institutions right?

Industrial policies for development can be effective only when supported by strong fundamentals, including prudent investments in education, health, and shared infrastructure. This report is intended for governments already working to strengthen those fundamentals, serving as a reference for policy makers who may be considering industrial policies as an additional development tool. The report offers lessons and principles with sufficient detail to enable governments to adapt the guidance to their own contexts and priorities, and to design and implement industrial policy tools and approaches successfully.

Which activities to target? Benefits, opportunity, feasibility, and an industrial strategy portfolio approach

To decide which business activities to strategically target when designing industrial policies for development, governments need a framework that considers both the **development benefits** of activities and their **opportunity and feasibility** in the local context (refer to table 7.1).

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Table 7.1 Criteria to identify strategic business activities for development

Criteria		Indicator
I. Benefits from business activity	Positive spillovers	• Business activity is new, and has not been done in the economy before • Diversification of the economy through new products, processes, and inputs, creating knowledge spillovers • Learning-by-doing with advanced production methods (for example, through worker training, research and development) • Contribution to industrial upgrading (for example, experience producing for a leading international buyer signals ability to produce high quality)
	External impacts	• Foreign exchange earnings • Job creation • Pollution reduction • Economic resilience and security
II. Opportunity	Market potential	• Current value of world imports and/or domestic demand • Growth of world imports and/or domestic demand • Limited competition in international market measured by number of exporters
III. Feasibility	Risk based on evolving comparative advantage	• Low-risk activities have revealed comparative advantage • Medium-risk activities use adjacent technology in "product space" • High-risk activities lack both revealed comparative advantage and adjacent technology

Source: Original table for this publication.

- **Target new activities with positive spillovers, but be aware that measurement is hard.**

The benefits of a business activity stem from market failures, including positive spillovers not fully captured by private businesses—such as knowledge spillovers from learning-by-doing or contributions to a country's industrial upgrading. Because spillovers are difficult to quantify, it is advisable to use a simple rule of thumb: focus only on activities that are new, since adopting new activities requires learning. Quantitatively ranking activities by the size of their spillovers is not feasible.

Other benefits may also include an activity's external impacts, including foreign exchange earnings, job creation, pollution reduction, and economic resilience. However, targeting based solely on these outcomes can be misleading: large-scale employment in an industry (for example, personal services like taxi driving) does not necessarily indicate that industrial policy targeted toward that industry will create productive jobs. Policy choice must consider both effectiveness (that is, achieving desired outcomes) and efficiency (that is, benefits exceeding costs). In principle, industrial policy is efficient only if it promotes an activity with positive spillovers.

- **Trade-led growth is still attractive, but the criteria for success have narrowed.**

For decades, governments pursued an export-led growth model focused on promoting new export activities to capture knowledge spillovers. The model can also be described as **trade-led growth,** since it depended on maintaining low tariffs on imported intermediate inputs and capital goods needed to produce exports. Recently, this model has faced mounting challenges. Technological advances, like automation, have eroded the competitive advantage of low-wage labor in global manufacturing. Policy changes—particularly in advanced economies—including the rise of protectionism and economic nationalism, the growing use of industrial policy, and new climate-related regulations, have limited the space for traditional trade-led growth.

Many governments are now asking: What activities should be targeted in this new era? While manufacturing was once the default target, many governments are now considering tradable services—tourism, software development, and creative industries—as alternative sources of foreign revenue. Governments are also pursuing trade with regional rather than global partners through preferential trade agreements, particularly South-South agreements as well as "deep agreements" that cover a wide range of policy areas beyond tariff liberalization.

The older **import-substitution** model—using high tariffs to build domestic industries—was largely abandoned by the 1980s after repeated failures. Success stories come exclusively from countries with large domestic markets and abundant resources, as in the United States tinplate industry of 1890. But some are now wondering whether import substitution could be revived, given the expansion of the middle class and thus the size of domestic markets in developing economies. Still, major concerns persist: without import competition, businesses have weak incentives to upgrade quality, and foreign investors have limited interest in transferring technology when serving only local markets.

- **Opportunity and feasibility depend on competitiveness, market potential, and comparative advantage.**

An activity's feasibility reflects its likelihood to become economically competitive in the current context. Governments can evaluate this using **market potential, competitive conditions,** and **comparative advantage,** all of which are measurable from publicly available data.

- **Market potential and competitive conditions:** Governments can target activities that have limited global competition or growing demand, where first-mover advantages and expanding export markets may accelerate growth. Many governments pursue strategies that target new and growing industries, particularly those with relatively few established exporters—such as minerals processing for components critical to modern transport and energy infrastructure. It is important to note that policies to target growing markets can face resistance, as businesses in declining or mature industries have stronger incentives to lobby for support.
- **Comparative advantage:** Many activities have strong potential, but not all countries have the capabilities to develop them competitively. Such capabilities are summarized in the concept of comparative advantage, in terms of factors that are fixed (for example, natural endowments) or that can be developed over time (for example, installed infrastructure, human capital, basic research institutions, or liberal trade policy). Governments can consider metrics for both **revealed comparative advantage** (current strengths) and **latent comparative advantage** (future potential).

Activities can be categorized by their risk of failing to grow—and thus their ability to deliver development benefits—in a given context. Governments can balance their targeting efforts across risk levels according to their risk tolerance:

- **Low risk:** Aligns with existing comparative advantages; targeting reduces the chance of supporting unproductive businesses.
- **Medium risk:** New activities that are technologically related or adjacent to current advantages; moderate chance of success.
- **High risk:** New activities that are unrelated to current advantages; difficult to predict but potentially high returns.

- **Adopt a portfolio approach within an industrial strategy that targets broad sectors.**

Governments often think in terms of industrial "strategy" rather than industrial policy, akin to strategies for a particular sector (for example, agriculture, tourism, or mining). How specific should an industrial strategy be? Given the uncertainty over which industries will ultimately succeed, it is often more effective to target broad industries. Broad targeting—like making industrial parks, subsidies, and import tariff protection common for all industries in a

strategic sector, rather than a narrow few industries—can avoid privileging and concentrating investment in narrow industries or individual businesses. The famous industrial policy in the Republic of Korea followed this approach, targeting diversification into a broad grouping called "heavy and chemical industry" rather than only a few narrowly defined products or markets.

Once a strategic sector is identified, a government should experiment with a portfolio of activities within that sector. Experimentation involves the following:

- Engaging entrepreneurs to identify opportunities and constraints caused by market failures
- Tracking progress
- Tailoring public inputs, market incentives, or macroeconomic interventions to relevant challenges.

Governments can identify priority activities through a top-down approach (the government selects industries based on diagnostics) or a bottom-up approach (entrepreneurs highlight opportunities and government tailors support). The **top-down approach** is information-intensive, requiring credible diagnostics from in-house think tanks or consultants. The **bottom-up approach,** by contrast, requires the government to engage entrepreneurs about the opportunities they see and the constraints they face. Governments sometimes distinguish between "my problems," which they commit to address, and "your problems," which they do not. "My" problems (from the perspective of government) are related to market failures like missing public inputs or positive spillovers. "Your" problems are related to the comparative advantages of an industry, which can only be addressed by market incentives. Since entrepreneurs have a strong incentive to lobby for market incentives like subsidies and protective tariffs, the bottom-up approach requires stronger safeguards—such as the "my"/"your" problem distinction—to avoid costly interventions with limited benefit.

How to do industrial policy? Guidance to choose the mix of policy tools

Once a government decides to expand a particular business activity, the central question becomes how best to promote it. Which industrial policy tools offer the greatest potential to stimulate growth, and how does this depend on country context and constraints? Beyond an industry's comparative advantage and market potential, the feasibility and effectiveness of different tools depend on three country

characteristics: **government bandwidth** (institutional capability, trained personnel, and interagency coordination), **local market size** (domestic demand and preferential export markets), and **fiscal space** (the ability to mobilize revenue).

In table 7.2, cells marked "large" indicate where an industrial policy tool requires a large level of fiscal space, market size, or government bandwidth for success. Blank cells indicate feasibility even in countries with limited resources. The purpose of these binaries is to illustrate the assumptions required for industrial policy to be effective. It is up to governments to assess whether the government bandwidth, local market size, and fiscal space are "large" enough in their context. With more talent in government, larger middle classes, and domestic tax mobilization, these preconditions may well be satisfied.

Table 7.2 Minimum country requirements to use industrial policy tools

Market failure	No.	Industrial policy tool	Rank	Minimum country requirements		
				Government bandwidth	Local market size	Fiscal space
		Public inputs tailored to needs of activity				
Coordination failure	1	Industrial parks	**1st choice**			
Underinvestment in training	2	Skills development	**1st choice**	Large		
Asymmetric information	3	Market access assistance	**1st choice**	Large		
	4	Quality infrastructure	**1st choice**	Large		
		Market incentives				
Positive spillovers, including learning-by-doing with advanced products and processes	5	Production subsidies	**1st choice**	Large		Large
	6	Specific innovation subsidies	**1st choice**	Large		Large
	7	Commodity export bans	2nd choice			
	8	Public procurement	2nd choice	Large	Large	Large
	9	Import tariffs or quotas	2nd choice		Large	
	10	Export subsidies	2nd choice			Large
	11	Technology transfer quid pro quo	2nd choice	Large	Large	
	12	Local content requirements	2nd choice	Large	Large	
	13	Consumer demand subsidies	2nd choice	Large	Large	Large
		Macroeconomic interventions				
	14	Competitive exchange rate devaluation	2nd choice			
	15	Research and development tax credit	2nd choice			Large

Source: Original table for this publication.

Note: First-choice policies address market failures directly by subsidizing the activities that are underprovided. Second-choice policies shape industry outcomes by intervening indirectly in adjacent markets. Blank cells indicate that no minimum requirements of a given country characteristic are needed for a policy to be feasible.

Four key messages emerge from evidence and practice:

- **Public inputs tailored to industry needs are fiscally inexpensive tools with proven success, though some require greater government bandwidth.**

Public inputs are first-choice policy tools that target problems directly, such as by addressing specific market failures related to investment or by providing an underprovided activity. They have the advantage of being fiscally inexpensive industrial policy tools that are also fully World Trade Organization (WTO)–compliant, with little risk of retaliation.

Industrial parks help resolve coordination failures by reducing the risk of being a first mover in a new industry. They can include worker housing, as in Tamil Nadu in India (refer to box 4.2), in addition to concentrated infrastructure for businesses. When operation and management are delegated to the private sector, they can be implemented with modest fiscal resources and moderate government bandwidth. More bandwidth is needed for special economic zones (SEZs), which combine the physical features of an industrial park with special regulatory regimes and tax incentives and thus carry fiscal costs. SEZs have a track record of both successes (for example, in China, Ethiopia, and India) and failures (for example, in Indonesia and Nigeria), making sound design essential:

  - Governments should prioritize locations near pools of specialized or low-cost labor and close to ports or major transport hubs and invest in complementary infrastructure, including transportation links and reliable utilities.

Other public inputs—**skills development programs, market access assistance, and quality infrastructure**—are also first-choice tools. They can often be implemented on a cost-recovery basis but require greater administrative capacity to engage with businesses and diagnose needs. Industry-targeted skills development programs, for example, help overcome underinvestment in worker training that can hinder the emergence of a new industry. Successful cases, such as skills development for the electronics industry in Costa Rica (refer to box 3.1), emphasize aligning training programs with industry requirements, adapting as conditions evolve, and addressing managerial as well as technical skills gaps.

- **Market interventions—subsidies, tariffs, commodity export bans, local content requirements, public procurement—are costly both fiscally and to the wider economy.**

Market intervention tools incentivize a specific industry or activity by altering prices. These are actionable under WTO rules and may incur the threat of retaliation. **Production or specific innovation subsidies** are first-choice tools that directly target the problem head-on by subsidizing activities with positive spillovers, but they require sufficient fiscal space and government bandwidth. There is strong evidence on the effectiveness of production subsidies (often tied to sales, investment, or wages), including in the Republic of Korea (refer to box 3.2), Romania, and Tunisia, and on innovation subsidies (which incentivize businesses to adopt or develop new technologies). By often being firm-specific, these tools require intensive engagement and monitoring, and thus high administrative capacity. Effective subsidy design involves the following (among others):

  - Tying subsidies to sales rather than profits and offering support to all businesses within an industry to preserve competition, even if this increases fiscal cost.

Other tools—**import tariffs, commodity export bans, local content requirements, technology transfer quid pro quo, and public procurement**—are second choice because they impose broader economic costs and operate indirectly by regulating entire markets rather than providing benefits to specific firms. Tariffs may support domestic producers, but they raise input costs for businesses and prices for consumers (for example, Colombia). Evidence is limited on the effectiveness of local content requirements or commodity export bans in fostering local industries (for example, Indonesia). Where fiscal space and government bandwidth permit, public inputs as well as targeted production or innovation subsidies should be prioritized as industrial policy tools to capture benefits from foreign investment and develop upstream and downstream industries, rather than relying on economically costly second-choice market incentives.

Macroeconomic interventions that target very broad activities are also available. **Competitive exchange rate devaluation** requires a responsive labor supply and effective capital account management. **Research and development (R&D) tax credits** can be useful in both advanced and developing economies.

However, R&D tax credits need to be evaluated rigorously to demonstrate that they are producing either frontier patents widely cited elsewhere or patents that adapt foreign technology to the local context, which cite foreign patents and coincide with machinery and equipment imports.

- **Industrial policy tools should include termination clauses tied to evidence of learning-by-doing and productivity improvements.**

For any industrial policy tool—particularly those justified by the infant-industry argument—a central question is when to end support. Ending support too early can undermine long-term benefits, but extending it too long can create dependency. How can governments decide when to withdraw a public input, phase out subsidies, or reduce tariffs?

Decisions should hinge on whether the targeted industry is demonstrating "learning-by-doing" as well as productivity improvements that are sufficient for the industry to become internationally competitive. Automatic sunset or termination clauses help ensure this discipline, while also encouraging businesses to invest quickly.

  - Termination windows of 10 years generally give enough time for businesses to gain experience with production processes without entrenching prolonged subsidies.
  - Some governments establish automatic termination milestones every three years, and withdraw support unless there clear evidence of progress—for example, when productivity (measured by input use per unit of output) is improving faster in the targeted industry than in comparable untargeted industries.
  - Automatic termination clauses should not be used for subsidies delivered through tax, duty, or regulatory exemptions that may later be extended to all businesses. In these cases, it is more effective to broaden the exemption than to retract it from the initial beneficiaries.

- **Expect some failure in industrial policy efforts and communicate this expectation.**

Even when support continues beyond a sunset clause, targeted businesses may not become internationally competitive due to lack of a fundamental comparative advantage. With limited scope for future improvements, some businesses may shut down once support is removed. Some industrial policy

targeting efforts will inevitably fail, but a portfolio approach spreads risk, increases overall success, and maintains political support by emphasizing broad industry development rather than individual projects.

How to get the institutions right?

Political economy shapes industrial policy choice and implementation. In Argentina, a Tierra del Fuego special incentive regime for local manufacturing was established in 1972 with an initial sunset clause ending 35 years later, at which point it was still not internationally competitive. Since 2007, the regime has been extended multiple times, most recently to 2038 for some industries—66 years later than its creation. This reflects largely political pressures to preserve employment and regional economic support.

Whatever the political reality, smaller independent agencies have a greater role today in implementing industrial policy tools. These agencies, given their independent charters, especially at the state and local levels, are potentially more insulated from politics relative to finance and trade ministries that were traditionally responsible for implementing industrial policy in the past. These are national development banks, state-owned enterprises, cluster initiatives (including by local governments), public-private dialogue and coordination, innovation agencies, investment promotion agencies, and export promotion agencies. Three institutional qualities can support effective implementation of industrial policy.

- **Implementing agencies should have embeddedness, appropriate use of incentives, and accountability.**

Supporters of industrial policy call it a "process of discovery," aimed at identifying market failures and eliciting information on the private sector's willingness to invest. Of course, most of the things that businesses complain or talk about have little to do with market failures, necessarily, such as a high cost of finance or land; these may be high because of a decision by the central bank or because the location is in demand. Nonetheless, tools and targeting on feasible issues to address through industrial policy emerge iteratively through this process that satisfies three criteria (refer to table 7.3).

Table 7.3 Criteria for industrial policy institutions

Criteria	Indicator
Embeddedness	• High-quality industry diagnostic studies, produced in-house or by consultants • Surveys of beneficiaries and other market participants • Private sector membership in executive committee and general assembly • Managerial expertise in government
Appropriate use of incentives as carrots and sticks	• Avoid automatic termination clauses when subsidies are exemptions from taxes, duties, or rules that may eventually be extended to all businesses • Otherwise, use automatic termination dates of 10 years • Allow extension only when there is clear evidence of productivity gains, measured by declining input cost per unit of output compared to nontargeted industries • Successful exports or import substitution can proxy for productivity gains
Accountability	• Reporting of outcomes, targets, and workplans • Clear, publicly available criteria for policy decisions and program participation • Civil society membership in executive committee and/or general assembly • Independent oversight bodies like supreme audit institutions, judicial oversight

Source: Original table for this publication.

- **Delivery units with access to the head of local, state, or national government can allow for effective strategy setting and oversight.**

Industrial strategy is often set and overseen by a team close to the head of government, a "delivery unit" or "reform team." Such delivery units do not implement policies themselves but rather provide strategic guidance to implementing agencies. Effective delivery units should focus on three functions:

  - **Diagnostics:** Assess global demand, identify strategic industries, and pinpoint constraints that government policy can address.
  - **Coordination:** Plan and coordinate across agencies, specify actions for implementing bodies, and advise on funding allocations.
  - **Monitoring:** Track productivity of supported industries and businesses and recommend corrective action.

- **There are trade-offs for industrial policy with more narrow goals: generating foreign exchange, creating jobs, reducing pollution, and strengthening economic resilience.**

Governments frequently pursue more narrow goals for industrial policy: generating foreign exchange, creating jobs, reducing pollution, and strengthening economic resilience. While it may be possible to push toward multiple goals through one policy, multiple goals also imply trade-offs that can be political, unlike industrial policy for development—which focuses on addressing market failures to boost growth and benefit society. Key trade-offs for each of the narrow goals are provided below.

- **Industrial policy for foreign exchange**
  - Governments can still pursue a trade-led growth model by using public inputs (for example, industrial parks, skills development, market access assistance, quality infrastructure) to help local exporters succeed and expanding preferential trade agreements with a diverse set of partners—particularly South-South agreements and deeper trade agreements allowing for investment and movement of workers.
  - Without large domestic markets—such as those of Brazil or India—encompassed by a preferential trade agreement, import substitution will be difficult limiting the gain from import tariffs, commodity export bans, local content requirements, consumer subsidies, and public procurement.
  - Export subsidies used to generate foreign exchange earnings as well as competitive exchange rate devaluation are used less often, given the risk of retaliation from trading partners.

- **Industrial policy for jobs**
  - Governments face a trade-off between supporting labor-absorbing industries that quickly create many lower-wage jobs and supporting high-wage, skill-intensive industries that raise productivity, increase average wages, and deliver broader economic benefits.
  - Governments must decide when to subsidize labor rather than capital, recognizing that in capital-intensive industries, capital subsidies can be a more cost-effective way to create jobs than labor subsidies.
  - Governments may need to assist workers displaced by trade or technology, even though broader social safety nets that support all workers may provide greater overall benefits.

- **Green industrial policy**
  - Emissions regulations, including emissions trading schemes, may require adaptation to avoid damaging the competitiveness of domestic industries, such as by providing free emissions allowances for energy-intensive industries.
  - Subsidies for adopting or inventing low-pollution technologies can reduce operating costs for eligible businesses, but they may displace conventional power generation without distinguishing between cleaner and dirtier fossil fuels, and they do not necessarily promote energy conservation.
  - Governments may pair subsidies for downstream adoption with protective second-choice tools—such as local content requirements or import tariffs—to ensure that the benefits of green technology uptake accrue to domestic businesses, but this will slow the pace of adoption if domestic businesses cannot produce these technologies competitively.
- **Industrial policy for resilience and security**
  - Governments can protect against domestic shocks by dispersing production across multiple locations, but this raises costs when new plants operate in higher-cost locations or when underutilized capacity is expensive to maintain.
  - Governments can diversify import supply away from unreliable suppliers by building domestic production capacity, but this may be prohibitively costly. A better approach is to encourage businesses to switch to alternative, ideally lower-cost, foreign suppliers.
  - Governments can help businesses adapt to shifts in export demand—such as when trade partners raise tariffs—by providing market access assistance and improving quality infrastructure to support entry into new markets.

APPENDIX A

Statistics for Discriminatory Policies, Import Tariffs, and Subsidies, by Economy

Table A.1 Statistics for discriminatory policies, import tariffs, and subsidies, by economy

	Global Trade Alert discriminatory policies[a]			Import tariffs (average, 2022–23)		Direct funding and tax expenditures in favor of businesses (average, 2020–22)			
Economy	Total no. of measures (2021–23)	% of fiscally expensive measures[b] (2009–23)	% of firm-specific measures[c] (2009–23)	Average MFN rate[d] (%)	Average dispersion[e] (%)	Direct funding to businesses (DF)[f] (% of GDP)	Tax expenditures (TEs)[g] (% of GDP)	Total (DF + TEs) (% of GDP)	Data source for DF (2009–22)
Afghanistan	1	33.3	0.0	6.7	6.2	—	—	—	—
Albania	—	19.7	1.0	4.0	5.2	0.1	5.0	5.1	GFS
Algeria	13	23.7	0.0	13.5	10.2	—	—	—	—
Angola	7	9.1	0.0	11.4	15.2	—	—	—	—
Antigua and Barbuda	—	0.0	0.0	7.5	6.1	—	—	—	—
Argentina	291	25.1	2.9	10.2	8.0	3.0	0.9	3.9	GFS
Armenia	17	17.3	0.0	5.4	5.1	1.9	1.5	3.4	GFS
Aruba	—	—	—	7.7	7.0	—	—	—	—
Australia	440	43.6	20.3	2.5	2.4	4.5	2.8	7.3	GFS
Austria	370	45.4	9.9	3.4	4.3	4.1	0.4	4.5	GFS
Azerbaijan	4	32.1	0.0	7.2	6.4	—	—	—	—

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Table A.1 Statistics for discriminatory policies, import tariffs, and subsidies, by economy *(continued)*

Economy	Global Trade Alert discriminatory policies[a]			Import tariffs (average, 2022–23)		Direct funding and tax expenditures in favor of businesses (average, 2020–22)			
	Total no. of measures (2021–23)	% of fiscally expensive measures[b] (2009–23)	% of firm-specific measures[c] (2009–23)	Average MFN rate[d] (%)	Average dispersion[e] (%)	Direct funding to businesses (DF)[f] (% of GDP)	Tax expenditures (TEs)[g] (% of GDP)	Total (DF + TEs) (% of GDP)	Data source for DF (2009–22)
Bahamas, The	—	0.0	0.0	10.5	16.5	—	—	—	—
Bahrain	5	0.0	0.0	4.3	6.2	—	—	—	—
Bangladesh	29	46.4	0.0	12.9	10.4	0.8	2.4	3.2	BOO; GFS
Barbados	—	0.0	0.0	16.8	22.2	—	—	—	—
Belarus	38	32.6	6.8	5.5	4.6	—	—	—	—
Belgium	405	48.1	8.2	3.2	4.3	4.9	2.1	7.0	GFS
Belize	—	0.0	0.0	11.3	12.5	—	—	—	—
Benin	10	12.4	0.0	14.1	9.1	—	—	—	—
Bermuda	—	0.0	0.0	25.3	12.1	—	—	—	—
Bhutan	1	0.0	0.0	10.3	12.7	0.2	0.2	0.4	BOO; GFS; WBS
Bolivia	19	22.8	1.2	10.0	6.7	—	—	—	—
Bosnia and Herzegovina	1	53.3	0.0	6.0	4.5	—	—	—	—
Botswana	43	22.4	0.0	5.6	9.5	—	—	—	—
Brazil	1,082	70.7	31.0	9.1	8.9	0.2	2.7	2.9	GFS
Brunei Darussalam	1	0.0	0.0	0.1	0.6	—	—	—	—
Bulgaria	332	44.2	3.2	3.1	4.6	4.1	0.4	4.5	GFS
Burkina Faso	10	16.6	0.0	10.4	6.6	1.5	0.6	2.1	GFS
Burundi	9	10.7	0.0	14.4	13.8	—	—	—	—
Cabo Verde	7	16.7	0.0	13.4	13.2	0.4	2.3	2.7	BOO; GFS
Cambodia	—	2.2	0.0	8.6	8.4	—	—	—	—
Cameroon	8	18.5	0.0	17.7	9.4	—	—	—	—

(Continued)

Table A.1 Statistics for discriminatory policies, import tariffs, and subsidies, by economy *(continued)*

	Global Trade Alert discriminatory policies[a]			Import tariffs (average, 2022–23)		Direct funding and tax expenditures in favor of businesses (average, 2020–22)			
Economy	Total no. of measures (2021–23)	% of fiscally expensive measures[b] (2009–23)	% of firm-specific measures[c] (2009–23)	Average MFN rate[d] (%)	Average dispersion[e] (%)	Direct funding to businesses (DF)[f] (% of GDP)	Tax expenditures (TEs)[g] (% of GDP)	Total (DF + TEs) (% of GDP)	Data source for DF (2009–22)
Canada	945	72.5	51.4	2.2	4.1	3.0	1.2	4.2	GFS
Cayman Islands	—	0.0	0.0	18.0	7.3	—	—	—	—
Central African Republic	7	33.3	0.0	13.7	8.7	—	—	—	—
Chad	7	14.3	0.0	16.8	9.9	—	—	—	—
Chile	36	6.7	0.4	5.9	0.7	1.2	1.1	2.4	GFS
China	2,562	91.0	80.6	3.2	5.0	—	—	—	—
Colombia	64	18.4	0.1	6.7	9.2	1.6	1.2	2.8	GFS
Comoros	2	33.3	0.0	9.5	9.1	—	—	—	—
Congo, Dem. Rep.	9	10.8	0.4	—	—	0.7	0.0	0.7	GFS
Congo, Rep.	7	29.5	0.0	17.6	9.5	—	—	—	—
Costa Rica	—	0.0	0.0	6.0	7.7	—	—	—	—
Côte d'Ivoire	10	12.3	0.0	8.9	7.4	1.3	0.0	1.3	GFS
Croatia	338	45.6	4.3	3.7	4.8	—	—	—	—
Cuba	—	0.0	0.0	12.2	8.0	—	—	—	—
Cyprus	301	44.4	4.6	3.7	4.7	1.8	0.4	2.2	GFS
Czechia	360	49.3	8.3	3.0	4.0	3.0	3.9	6.8	GFS
Denmark	372	51.2	16.2	3.6	4.6	3.2	1.0	4.3	GFS
Djibouti	7	50.0	0.0	26.7	11.2	—	—	—	—
Dominica	—	0.0	0.0	9.8	12.7	—	—	—	—
Dominican Republic	3	14.5	0.0	9.6	11.8	1.4	0.6	2.0	GFS
Ecuador	2	12.9	1.4	8.6	9.5	0.2	4.8	4.9	BOO

(Continued)

Table A.1 Statistics for discriminatory policies, import tariffs, and subsidies, by economy *(continued)*

Economy	Global Trade Alert discriminatory policies[a]			Import tariffs (average, 2022–23)		Direct funding and tax expenditures in favor of businesses (average, 2020–22)			
	Total no. of measures (2021–23)	% of fiscally expensive measures[b] (2009–23)	% of firm-specific measures[c] (2009–23)	Average MFN rate[d] (%)	Average dispersion[e] (%)	Direct funding to businesses (DF)[f] (% of GDP)	Tax expenditures (TEs)[g] (% of GDP)	Total (DF + TEs) (% of GDP)	Data source for DF (2009–22)
Egypt, Arab Rep.	33	24.4	2.8	9.0	56.5	—	—	—	—
El Salvador	—	0.0	0.0	8.7	10.5	—	—	—	—
Equatorial Guinea	7	33.3	0.0	18.7	9.5	—	—	—	—
Eritrea	7	100.0	0.0	6.3	6.3	—	—	—	—
Estonia	328	41.9	3.4	3.8	4.5	1.6	0.6	2.2	GFS
Eswatini	32	7.1	0.0	7.8	10.5	—	—	—	—
Ethiopia	10	33.2	0.0	10.5	10.6	—	—	—	—
Falkland Islands	—	100.0	0.0	—	—	—	—	—	—
Faroe Islands	1	100.0	100.0	—	—	—	—	—	—
Fiji	1	0.0	0.0	5.9	6.8	—	—	—	—
Finland	370	53.1	15.8	3.0	4.1	1.5	1.3	2.8	GFS
France	753	63.3	21.3	3.5	4.5	3.1	2.2	5.2	GFS
French Polynesia	—	—	—	8.6	4.7	—	—	—	—
Gabon	7	19.4	2.8	15.4	8.8	—	—	—	—
Gambia, The	7	10.0	0.0	14.8	8.6	—	—	—	—
Georgia	1	0.0	0.0	1.9	4.2	2.8	2.6	5.4	GFS
Germany	1,062	69.1	30.3	3.3	4.4	2.4	0.4	2.8	GFS
Ghana	20	24.4	8.4	12.6	7.5	—	—	—	—
Gibraltar	—	—	—	11.4	5.0	—	—	—	—
Greece	374	56.3	7.0	3.0	4.6	4.4	3.6	8.0	GFS
Grenada	—	0.0	0.0	12.0	9.2	—	—	—	—
Guam	—	0.0	0.0	—	—	—	—	—	—

(Continued)

Table A.1 Statistics for discriminatory policies, import tariffs, and subsidies, by economy *(continued)*

Economy	Global Trade Alert discriminatory policies[a]			Import tariffs (average, 2022–23)		Direct funding and tax expenditures in favor of businesses (average, 2020–22)			
	Total no. of measures (2021–23)	% of fiscally expensive measures[b] (2009–23)	% of firm-specific measures[c] (2009–23)	Average MFN rate[d] (%)	Average dispersion[e] (%)	Direct funding to businesses (DF)[f] (% of GDP)	Tax expenditures (TEs)[g] (% of GDP)	Total (DF + TEs) (% of GDP)	Data source for DF (2009–22)
Guatemala	—	0.0	0.0	7.6	12.9	0.3	0.6	0.8	GFS
Guinea	12	19.7	0.0	12.8	7.3	—	—	—	—
Guinea-Bissau	7	16.7	0.0	14.9	7.3	—	—	—	—
Guyana	—	0.0	0.0	9.9	10.3	—	—	—	—
Haiti	—	0.0	0.0	6.3	7.6	—	—	—	—
Honduras	—	0.0	0.0	9.0	11.0	0.1	3.0	3.1	BOO; GFS
Hong Kong SAR, China	2	62.2	0.0	0.0	0.0	—	—	—	—
Hungary	357	47.6	5.9	2.8	4.0	1.5	0.6	2.1	GFS
Iceland	3	58.7	42.7	1.2	6.2	1.6	0.0	1.7	GFS
India	611	71.4	3.8	6.5	10.3	0.9	0.4	1.3	GFS
Indonesia	196	16.7	1.9	5.5	7.3	1.4	0.5	1.9	GFS
Iran, Islamic Rep.	3	12.3	0.0	20.9	19.2	—	—	—	—
Iraq	1	20.0	0.0	—	—	—	—	—	—
Ireland	331	43.5	7.2	3.0	3.9	1.3	0.6	1.8	GFS
Israel	9	30.2	14.1	3.0	7.0	2.0	0.5	2.5	GFS
Italy	1,023	72.1	20.6	3.1	4.5	2.1	0.5	2.7	GFS
Jamaica	—	0.0	0.0	9.8	10.6	0.5	1.9	2.4	BOO
Japan	444	53.4	40.1	1.4	4.2	—	—	—	—
Jordan	1	2.9	0.0	3.6	5.3	1.6	0.7	2.3	GFS
Kazakhstan	45	35.1	5.4	5.0	4.2	1.1	14.1	15.2	GFS
Kenya	29	20.9	3.7	12.0	12.5	0.5	0.2	0.8	GFS
Kiribati	—	—	—	11.8	10.8	—	—	—	—
Korea, Rep.	284	50.1	17.1	7.6	35.8	7.0	0.8	7.8	GFS

(Continued)

Table A.1 Statistics for discriminatory policies, import tariffs, and subsidies, by economy *(continued)*

Economy	Global Trade Alert discriminatory policies[a]			Import tariffs (average, 2022–23)		Direct funding and tax expenditures in favor of businesses (average, 2020–22)			
	Total no. of measures (2021–23)	% of fiscally expensive measures[b] (2009–23)	% of firm-specific measures[c] (2009–23)	Average MFN rate[d] (%)	Average dispersion[e] (%)	Direct funding to businesses (DF)[f] (% of GDP)	Tax expenditures (TEs)[g] (% of GDP)	Total (DF + TEs) (% of GDP)	Data source for DF (2009–22)
Kuwait	7	0.0	0.0	4.7	9.1	—	—	—	—
Kyrgyz Republic	44	6.7	0.0	6.6	5.3	—	—	—	—
Lao PDR	—	0.0	0.0	8.0	6.8	—	—	—	—
Latvia	332	48.8	3.8	3.5	4.6	2.5	2.5	4.9	GFS
Lebanon	1	0.0	0.0	4.9	5.5	—	—	—	—
Lesotho	34	7.2	0.0	9.5	11.7	—	—	—	—
Liberia	8	20.0	0.0	7.2	4.2	—	—	—	—
Libya	4	41.4	0.0	5.4	4.6	—	—	—	—
Lithuania	328	47.4	4.4	3.3	4.9	1.8	0.6	2.4	GFS
Luxembourg	309	41.4	3.7	4.0	6.7	1.1	0.5	1.5	GFS
Macao SAR, China	—	—	—	0.0	0.0	—	—	—	—
Madagascar	12	9.9	0.0	9.4	7.0	1.9	0.3	2.2	GFS
Malawi	8	10.0	0.0	9.3	9.8	—	—	—	—
Malaysia	86	32.3	1.3	3.4	7.3	—	—	—	—
Maldives	—	0.0	0.0	9.5	17.7	2.0	8.9	11.0	GFS
Mali	11	11.1	0.0	11.7	6.6	1.5	1.3	2.8	GFS
Malta	299	31.3	2.8	2.9	4.0	—	—	—	—
Mauritania	8	33.3	16.7	12.4	7.5	—	—	—	—
Mauritius	8	19.9	0.0	1.3	6.0	1.4	3.3	4.7	GFS
Mexico	183	27.9	5.3	4.9	8.6	0.5	0.8	1.3	GFS
Micronesia, Fed. Sts.	—	—	—	4.8	4.4	—	—	—	—
Moldova	2	14.0	0.0	3.6	5.1	2.0	0.6	2.6	GFS
Mongolia	—	0.0	0.0	5.4	3.2	4.4	0.6	5.0	GFS
Montenegro	1	14.8	0.0	—	—	—	—	—	—

(Continued)

Table A.1 Statistics for discriminatory policies, import tariffs, and subsidies, by economy *(continued)*

Economy	Global Trade Alert discriminatory policies[a]			Import tariffs (average, 2022–23)		Direct funding and tax expenditures in favor of businesses (average, 2020–22)			
	Total no. of measures (2021–23)	% of fiscally expensive measures[b] (2009–23)	% of firm-specific measures[c] (2009–23)	Average MFN rate[d] (%)	Average dispersion[e] (%)	Direct funding to businesses (DF)[f] (% of GDP)	Tax expenditures (TEs)[g] (% of GDP)	Total (DF + TEs) (% of GDP)	Data source for DF (2009–22)
Morocco	34	15.4	0.6	17.4	21.0	2.0	1.2	3.2	GFS; WBS
Mozambique	8	18.2	0.0	7.2	6.0	—	—	—	—
Myanmar	2	0.7	3.3	5.6	6.4	—	—	—	—
Namibia	84	11.1	0.3	6.5	10.4	—	—	—	—
Nauru	—	—	—	12.3	7.7	—	—	—	—
Nepal	17	8.4	0.3	15.2	11.8	—	—	—	—
Netherlands	440	50.3	8.8	2.8	4.0	3.2	3.4	6.6	GFS
New Caledonia	—	0.0	0.0	—	—	—	—	—	—
New Zealand	83	27.9	16.7	2.3	2.8	2.2	0.1	2.3	GFS
Nicaragua	—	0.0	0.0	7.8	7.1	—	—	—	—
Niger	9	14.2	0.0	11.5	7.5	—	—	—	—
Nigeria	29	52.5	6.2	11.3	5.9	—	—	—	—
North Macedonia	3	20.2	0.0	5.7	7.4	—	—	—	—
Norway	134	37.7	36.5	1.4	13.5	2.2	3.6	5.9	GFS
Oman	5	2.0	0.0	4.5	4.3	—	—	—	—
Pakistan	161	49.1	5.7	9.7	11.8	—	—	—	—
Palau	—	—	—	3.1	10.1	—	—	—	—
Panama	2	11.8	0.0	5.4	6.1	0.5	0.1	0.6	GFS
Papua New Guinea	—	0.0	0.0	2.7	6.5	—	—	—	—
Paraguay	6	5.1	0.0	6.6	6.8	—	—	—	—
Peru	47	20.5	8.1	1.7	3.1	0.9	0.4	1.3	BOO
Philippines	91	26.2	2.9	7.2	8.9	1.0	2.1	3.2	GFS
Poland	451	56.7	11.0	3.7	4.4	—	—	—	—

(Continued)

Table A.1 Statistics for discriminatory policies, import tariffs, and subsidies, by economy *(continued)*

	Global Trade Alert discriminatory policies[a]			Import tariffs (average, 2022–23)		Direct funding and tax expenditures in favor of businesses (average, 2020–22)			
Economy	Total no. of measures (2021–23)	% of fiscally expensive measures[b] (2009–23)	% of firm-specific measures[c] (2009–23)	Average MFN rate[d] (%)	Average dispersion[e] (%)	Direct funding to businesses (DF)[f] (% of GDP)	Tax expenditures (TEs)[g] (% of GDP)	Total (DF + TEs) (% of GDP)	Data source for DF (2009–22)
Portugal	410	45.6	2.8	3.8	4.5	1.6	0.6	2.2	GFS
Puerto Rico (US)	—	87.5	25.0	—	—	—	—	—	—
Qatar	5	7.5	2.5	4.0	3.9	—	—	—	—
Romania	359	50.1	7.8	—	—	—	—	—	—
Russian Federation	480	59.0	10.4	4.7	4.2	4.0	13.0	17.1	GFS
Rwanda	12	12.1	0.0	16.0	14.7	2.5	2.4	4.9	GFS
Samoa	—	0.0	0.0	9.5	5.9	—	—	—	—
São Tomé and Príncipe	6	100.0	0.0	10.0	5.7	—	—	—	—
Saudi Arabia	89	82.3	57.5	4.9	4.2	—	—	—	—
Senegal	8	11.1	0.0	11.5	7.6	2.8	1.5	4.2	GFS
Serbia	14	42.5	15.9	—	—	—	—	—	—
Seychelles	7	33.3	0.0	4.6	10.7	—	—	—	—
Sierra Leone	7	14.3	0.0	13.5	8.2	—	—	—	—
Singapore	30	41.7	7.5	0.0	0.0	—	—	—	—
Slovak Republic	340	41.0	4.9	3.3	4.0	1.3	0.6	1.9	BOO
Slovenia	318	42.0	3.7	3.4	4.2	4.0	0.7	4.7	GFS
Solomon Islands	—	0.0	0.0	9.2	2.3	—	—	—	—
Somalia, Federal Republic of	2	100.0	0.0	24.9	8.7	—	—	—	—
South Africa	164	70.0	17.0	5.4	9.8	0.3	1.7	2.0	GFS
South Sudan	11	98.4	0.0	—	—	—	—	—	—
Spain	717	61.7	12.6	3.6	5.0	1.6	0.4	2.0	GFS

(Continued)

Table A.1 Statistics for discriminatory policies, import tariffs, and subsidies, by economy *(continued)*

Economy	Global Trade Alert discriminatory policies[a]			Import tariffs (average, 2022–23)		Direct funding and tax expenditures in favor of businesses (average, 2020–22)			
	Total no. of measures (2021–23)	% of fiscally expensive measures[b] (2009–23)	% of firm-specific measures[c] (2009–23)	Average MFN rate[d] (%)	Average dispersion[e] (%)	Direct funding to businesses (DF)[f] (% of GDP)	Tax expenditures (TEs)[g] (% of GDP)	Total (DF + TEs) (% of GDP)	Data source for DF (2009–22)
Sri Lanka	49	10.7	1.3	7.2	8.9	—	—	—	—
St. Kitts and Nevis	—	0.0	0.0	11.7	10.8	—	—	—	—
St. Lucia	—	0.0	0.0	7.7	8.3	—	—	—	—
St. Vincent and the Grenadines	—	0.0	0.0	10.5	10.8	—	—	—	—
Sudan	6	20.0	0.0	—	—	—	—	—	—
Suriname	—	0.0	0.0	13.1	12.2	—	—	—	—
Sweden	374	53.9	17.9	3.4	4.2	2.3	2.5	4.9	GFS
Switzerland	108	11.1	14.1	0.0	0.0	—	—	—	—
Syrian Arab Republic	—	0.0	0.0	12.0	10.4	—	—	—	—
Taiwan, China	12	1.7	0.0	1.9	4.5	—	—	—	—
Tajikistan	2	33.3	0.0	8.3	5.2	—	—	—	—
Tanzania	13	8.1	0.0	11.3	10.9	0.7	0.1	0.7	GFS
Thailand	95	40.4	8.0	7.1	15.6	—	—	—	—
Togo	9	12.3	0.0	12.3	6.4	0.3	0.5	0.8	GFS
Tonga	—	0.0	0.0	5.3	6.6	—	—	—	—
Trinidad and Tobago	—	0.0	0.0	9.9	8.5	—	—	—	—
Tunisia	14	15.5	0.0	13.0	11.9	—	—	—	—
Türkiye	244	32.3	9.8	7.4	12.0	1.6	0.9	2.5	GFS
Turkmenistan	1	0.0	0.0	3.9	17.5	—	—	—	—
Tuvalu	—	—	—	3.2	7.2	—	—	—	—
Uganda	12	8.7	0.0	11.0	10.9	—	—	—	—
Ukraine	36	16.8	5.1	3.3	4.0	2.5	0.0	2.5	GFS

(Continued)

Table A.1 Statistics for discriminatory policies, import tariffs, and subsidies, by economy *(continued)*

	Global Trade Alert discriminatory policies[a]			Import tariffs (average, 2022–23)		Direct funding and tax expenditures in favor of businesses (average, 2020–22)			
Economy	Total no. of measures (2021–23)	% of fiscally expensive measures[b] (2009–23)	% of firm-specific measures[c] (2009–23)	Average MFN rate[d] (%)	Average dispersion[e] (%)	Direct funding to businesses (DF)[f] (% of GDP)	Tax expenditures (TEs)[g] (% of GDP)	Total (DF + TEs) (% of GDP)	Data source for DF (2009–22)
United Arab Emirates	23	20.0	2.0	3.4	6.7	—	—	—	—
United Kingdom	516	58.8	23.2	2.8	4.3	3.5	3.1	6.6	GFS
United States	2,622	83.8	69.2	2.4	5.0	2.1	0.5	2.6	GFS
Uruguay	4	33.6	3.9	8.5	7.9	0.2	2.3	2.5	GFS
Uzbekistan	1	20.2	1.5	4.3	6.2	—	—	—	—
Vanuatu	—	0.0	0.0	10.9	9.8	—	—	—	—
Venezuela, RB	—	32.5	3.3	17.5	10.1	—	—	—	—
Viet Nam	39	15.5	3.8	6.9	11.2	—	—	—	—
Virgin Islands (US)	—	100.0	0.0	—	—	—	—	—	—
Yemen, Rep.	2	0.0	0.0	6.9	4.9	—	—	—	—
Zambia	8	18.0	0.0	11.2	10.7	—	—	—	—
Zimbabwe	17	15.8	7.2	14.4	14.4	—	—	—	—

Source: Original table for this publication.

Note: BOO = BOOST Initiative, World Bank; GDP = gross domestic product; GFS = Government Finance Statistics, International Monetary Fund; MFN = most-favored nation; WBS = World Bank fiscal surveys. — = data not available.

a. Total number of measures is given for 2021–23 to indicate a flow of measures; the percent of fiscally expensive and firm-specific measures is taken over the full sample. Measures in the Global Trade Alert (GTA) database are coded based on their potential to restrict or liberalize competition between domestic and foreign actors. Discriminatory policies are defined in GTA as "amber" (announced measures that, if implemented, would almost certainly discriminate against foreign commercial interests, and implemented measures that are likely discriminatory), or "red" (their implementation almost certainly worsens the relative treatment of foreign commercial interests).

b. Fiscally expensive measures require substantial government expenditure. The most common policies are state loans, financial grants, and trade finance.

c. Firm-specific measures target specific firms rather than generic industries and thus require greater government resources and capacity.

d. Average MFN rate is the import-weighted average of MFN tariffs across products for a country.

e. Average dispersion is the import-weighted standard deviation of MFN tariffs across products for a country.

f. Statistics on direct funding to businesses are reported for a country only if the country also has information on tax expenditures.

g. Statistics on tax expenditures are reported for a country only if the country also has information on direct funding to businesses.

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