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Industrial Strategy:

Methodological Approaches, Lessons, and Pitfalls

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Abstract:
This discussion paper provides an overview of key approaches, lessons, and pitfalls in industrial strategy design, highlighting take-aways for green industrial strategy. It addresses three aspects of the policy design process: **First, goal setting (the 'why?' of industrial strategy):** It argues for balancing ambitious vision and holistic approaches with concrete, specific missions and highlights the centrality of productive diversification. **Second, industrial targeting (the 'what?' of industrial strategy):** We review the strengths, weaknesses, and complementarities between product space and economic complexity methodologies, multi-criteria industrial targeting approaches, and emergent AI-driven methodologies for value chain analysis and productive capacity mapping. We propose embedding these tools within multi-criteria frameworks that jointly consider ecosystemic, economic-technological, and political-social factors (e.g., demand trajectories, economic linkages, capability requirements, environmental impact, stakeholder buy-in, etc.). Emerging AI-enabled methods —automated value-chain decomposition, trade-code mapping, capability mapping beyond trade, and scaled qualitative interviewing— have recently made it possible to generate granular, actionable insights that were previously unattainable, but these should complement, not substitute, stakeholder engagement and pragmatic judgment. **Third, the means of industrial promotion (the 'how?' of industrial strategy)**: We catalog a broad industrial policy toolbox of 'carrots,' 'sticks,' and enabling institutions and emphasize that effective use of these tools requires pairing near-term, feasible bets with longer-horizon, capability-stretching projects, managing portfolio risk, and deliberately building administrative and coordination capabilities. **The paper concludes with nine lessons and pitfalls:** Political criteria can be decisive; paralysis of analysis squanders windows of opportunity; targeting too many industries often undermines strategy; diversified portfolios balance ambition and realism; fallacy-of-composition hazards are real; available policy space is often underused; class politics must be well managed; organizational capability is pivotal; and ideological flexibility is needed to expand the 'policy imagination.'

Keywords: Industrial strategy, industrial strategy methodologies, industrial policy, industrial targeting, economic transformation, development strategy, development planning, complexity economics, productive capabilities, value chains, AI tools for industrial policy

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Contents

I. Key questions in (green) industrial strategy **2**
II. The 'Why': Goal setting **2**
III. The 'What': Approaches for industrial targeting **4**
Product space and economic complexity methodologies 4
Multi-criteria methodologies for industrial targeting: Key lessons and guidelines from real-world experiences 5
Table 1. Typology of criteria for industrial targeting *6*
Emergent Methodologies: Automated value chain analysis and productive capabilities mapping 7
IV. The 'How': The industrial policy toolbox **8**
Table 2. Taxonomy of Industrial Policy and Planning Tools *10*
V. Key lessons and pitfalls **11**
1. There are many valid criteria for selecting strategic industries —and 'political' criteria can be just as important as 'economic' criteria 11
2. Paralysis of analysis can waste windows of opportunity for industrial upgrading 11
3. If you target too many 'strategic' sectors, you do not really have a strategy 11
4. Industrial strategies can benefit from a 'diversified' portfolio composed of technologically ambitious and more accessible industries 12
5. Fallacy of composition risks 12
6. Failure to make full use of 'policy space' 13
7. Lack of strategic management of class politics 13
8. Ineffective administrative and organizational capabilities 13
9. Lack of ideological flexibility and policy imagination 14
References **15**

Appendix 1. Illustrative examples of industrial targeting methodologies and exercises **18**
USAID industrial targeting exercise 18
Korean Center for International Economic Studies (CIES) 19
Economic Commission for Latin America (ECLAC) Industrial Targeting Exercise 22
Industrial targeting for government procurement exercise 23
Appendix 2. Industrial policy tools, policy space restrictions and flexibilities **26**
1. Procurement 26
2. Public enterprises, public equity stakes, public holding companies 27
3. Public venture capital 28
Table 5. Industrial policy tools restricted in World Trade Organization rules and WTO+ trade and investment agreements *29*

I. Key questions in (green) industrial strategy

From developing countries seeking technological upgrading to leading economic powers seeking to secure and rebuild domestic productive capabilities, policymakers are increasingly examining the role of industrial strategy in economic prosperity. Across the world, and at different levels of government (national, subnational, and local), questions and methodologies that had long been confined to the world of developing economics are gaining traction in the effort to make sense of 'how to do industrial policy right.' While there are many important questions to be explored in the design of industrial strategy, three stand out:

1. **Why**: What is the purpose of industrial strategy? What vision, goal, or mission guides the selection of strategic industries?
2. **What**: What sectors are strategic? How can we identify strategic industries, or collections of productive capabilities?
3. **How:** Through what means —what collection of policy interventions— can those strategic sectors be effectively supported?

We analyze these in turn, highlighting key take-aways from the literature and historical experience.

II. The 'Why': Goal setting[2]

In its broadest sense, 'industrial policy' refers to the deployment of policy tools with the intent of influencing how societies create value —what goods (and services) they produce and how they produce them (Estevez 2023a). The industrial policy toolbox (Table 2) can be deployed toward an array of industrial policy goals, big and small—from ramping up mask production in a pandemic, to developing new exports for global green production networks, to transforming poor economies into rich, industrialized ones.

'Why?' is the most fundamental of industrial strategy questions**.** Without a holistic and systemic vision of the manifold ways that production systems need to change to expand human well-being, it's easy to fall into simplistic industrial strategies that can have counterproductive effects on the many dimensions of human and economic development and ecological integrity (Estevez and Forero 2025). At the same time, without sharp and specific goals, it is almost impossible to engage in effective targeting of strategic productive capabilities and in particular to avoid **one of the most common pitfalls of industrial policy design: the selection of too many 'strategic' industries and missions.** (Estevez, 2022).

Goal setting is context-dependent, but it's worth noting that successful industrial strategies geared toward economic prosperity are often intertwined with the goal of

[2] For more on vision and goal-setting see Estevez 2023a and Estevez 2023b. For a more extensive discussion on vision and mission setting see Mazzucato 2021.

economic-technological independence. Alexander Hamilton's advocacy for industrial policy in the early history of the United States, for example, was driven by the goal of achieving economic independence from Britain, which at the time used its dominant economic position to relegate the United States to the status of raw materials exporter. The US became the world's leading economy by rejecting that proposition through an array of sustained industrial policies that diversified its economy and developed critical infrastructure and manufacturing capabilities (Estevez 2023a). The goal of productive diversification, including the development of substantial productive capabilities in high-value-added sectors, has long been identified by development economists as a common feature of successful development stories around the world (Amsden 1989; Wade 2004; Chang 2007 and 2002) and the positive relationship between 'economic complexity' and economic growth potential has lately been observed through a new generation of methodologies of economic analysis (see Hidalgo 2023 for a broad-ranging review of the literature on economic complexity, growth, and development).

However, 'economic prosperity', 'economic independence' or even 'productive diversification, including substantial productive capabilities in high-value-added sectors' are not sufficiently specific goals to set the course for an industrial strategy.

As industrial policy has made its comeback in recent years, countries have looked to emerging green supply chains and the promise of new export markets in green global production networks, as a way to focus their strategies for industrial upgrading. **This has created new 'fallacy of composition' risks, which can also be a pitfall in industrial strategies** (Estevez 2022). Historically, countries have often looked to emergent global export markets to take advantage of opportunities for export growth—but when too many countries pursue the same strategy, competition becomes stiffer, profit margins tighter, and eventually even 'high-value-added' exports may transform into relatively cheap commodities. Furthermore, countries that have chosen to specialize in the export of raw materials or minimally processed commodities have historically suffered greatly from the volatility of global commodity markets and deteriorating terms of trade (Estevez 2022; Milberg and Winkler 2013). Given the unpredictability of technological cycles of emergent green technologies (will lithium-ion batteries soon be replaced by emergent sodium-based alternatives?) caution is advisable.

This does not mean that productive capabilities tied to green supply chains should not be considered as potential strategic sectors in a country's industrial upgrading strategy. It does mean, however, that policymakers can benefit from thinking more broadly about the 'Why?' and 'What?' of their industrial strategies.

III. The 'What': Approaches for industrial targeting

Product space and economic complexity methodologies

Over the past two decades, the economic complexity scholarship has been prolific in the production of data, digital platforms, and analytical methodologies that can aid industrial strategy design. As discussed at length in Hidalgo 2023 and Estevez 2017 (among others) the insights, methodologies, and policy implications produced by this scholarship are often misunderstood, but if adequately applied, they can be a means of producing useful contextual data that can serve as an in inputs for industrial targeting and industrial strategy more broadly.

When it comes to the question of sectoral/industrial targeting, the economic complexity approaches offer various contributions:

1. They are able to provide proxy measurements about the level of complexity of economies and the sophistication of products.
2. They are able to provide insights about the 'relatedness' or 'proximity' between different export product categories in a 'product space' (for example, the likelihood that an exporter of product A, also exports product B). They can also help distinguish between products that are in the periphery of the product space (less desirable in terms of economic upgrading potential) and those in denser, more connected areas of the product space.
3. Based on different measurements of relatedness or proximity, they are able to map the relative ease or difficulty with which a country *may* be able to develop export capabilities for a given product given its baseline export structure.
4. They can help visualize and think through the potential trade-offs between the proximity of a new product and its sophistication, or contribution to increasing a country's economic complexity and growth potential. As Hidalgo 2023 points out, this is particularly important for designing 'diversified portfolios' of targeted industrial sectors that combine both ambitious and more easily accessible sectors.

These methodologies can also be applied more narrowly to green industrial strategies (see for example Hamwey et al.'s 2013 analysis, 'Mapping Green Product Spaces of Nations').[3]

There are important caveats to consider when using these methodologies, however[4]:

[3] Hidalgo 2023 lists other, more recent works that apply product space analysis applied to green industries specifically: Dordmond et al., 2020; Fraccascia et al., 2018; Montresor and Quatraro, 2019; Moreno and Ocampo-Corrales, 2022; Ning and Guo, 2022; Perruchas et al., 2020; Santoalha and Boschma, 2020; Sbardella et al., 2022.

[4] See Estevez 2017 for a detailed analysis of some of the limitations of product space methodologies as tools for industrial targeting.

1. Trade data does not necessarily reflect the 'productive capabilities' of a country, not least because of today's global hyper-fragmentation of production (just because a country *exports* a given product does not mean it *produces* the whole product).
2. Even 6-digit trade codes[5] are often not nuanced enough to allow one to understand whether the products reflected in a given category correspond to the products used for a particular purpose in a particular productive activity. This highlights the importance of more qualitative approaches (e.g. interviews with producers and engineers) to understand how countries may be able to participate in globally fragmented production systems.
3. As Hidalgo 2023 stresses in his analysis of the policy implications of economic complexity methodologies, it can be tempting to misinterpret *descriptive* relatedness and proximity data as *prescriptive* information (e.g. 'countries should only target products that are close by in the product space'). This has to be avoided in favor of diversified industrial promotion portfolios that also include less accessible but more sophisticated products that can improve an economy's complexity and strengthen the foundation for sustained growth.
4. Finally, economic complexity and product space methodologies should be combined with broader, multi-criteria analysis that contemplates economic, productive, technological, political, and social parameters not captured by these methodologies.

Multi-criteria methodologies for industrial targeting: Key lessons and guidelines from real-world experiences

There is no one 'right' methodology for targeting sectors for industrial policy. There can be many valid, reasonable targeting criteria for sector selection, depending on the objectives a given society chooses to prioritize. These range from, 'ecosystemic' considerations like fighting climate change or preserving local biodiversity, to 'economic' considerations, like potential for demand-growth or the expansion of opportunities for decent work, to 'political' considerations like the level of support from different societal actors.

Table 1 provides a typology of some of these criteria and illustrative examples.

Appendix 1 shows a series of illustrative industrial targeting exercises carried out by different institutions for one country (Ecuador): USAID, the Economic Commission for Latin America (ECLAC), the Korean Center of International Economic Studies (CIES), and the Ecuadorian government. These exercises are intended to show the commonalities and diversity of criteria used by different types of institutions in industrial targeting exercises.

[5] Note: Publicly available tools, such as the Atlas of Economic Complexity and the Observatory of Economic Complexity are not always consistent in the level of specificity of HS trade codes. Some include product categories at the 4-digit level of HS nomenclature (e.g. for Bulgaria); others are specified at the 6-digit level (e.g. for Poland).

Table 1. Typology of criteria for industrial targeting	
Ecosystemic and human health criteria	1. Environmental impact of the industry and indirect effects on people's health and livelihoods, locally and globally
	2. Risk factors created by ecosystemic changes: e.g., how will climate change affect a particular industry?
	3. Windows of opportunity created by the emergence of new technologies related to climate change or other projected ecosystem changes.
Economic, productive, and technological criteria	4. Potential to generate quality work opportunities in the short- and long-run, including opportunities for learning by doing
	5. Productive diversification and upgrading through linkages, knowledge spill-overs, and skills transposition: Potential to stimulate other industries through consumption linkages (demand generated by workers for consumer goods); forward linkages (industries that may use the targeted industry's outputs); backward linkages (demand for raw materials from other industries); and transposition of skills to seemingly 'un-linked', more technologically sophisticated sectors.
	6. Technological requirements: How difficult will it be to create the technological capacities required to succeed in the selected industry?
	7. Demand factors: high income elasticity of demand, fast growth in global demand, domestic potential demand through substitution of imports
	8. Potential to secure investment/financing
	9. Potential to generate foreign exchange reserves and correct trade imbalances
	10. Challenges and opportunities created by emergent changes in the outsourcing strategies of global firms and market structure of global production networks
	11. Fallacy of composition risks: What industries are being promoted by other countries and how likely is it that a particular product will become 'commoditized', like low-tech manufactures have?
Political and social criteria	12. Potential to secure buy-in and collaboration from different societal stakeholders
	13. Potential to increase economic participation by marginalized groups and reduce poverty and inequality
	14. Policy constraints imposed by global economic rules (e.g., trade and investment agreements) or geopolitical pressures
Source: Adapted from Estevez 2022; based on Estevez 2017 and Chang 2016	

Emergent Methodologies: Automated value chain analysis and productive capabilities mapping

Current macroeconomic models and complexity economics approaches are not capable of providing the kind of concrete, granular insights into production systems that countries ideally require to inform their industrial strategies. As noted above, for example, most industrial targeting analysis today is based on trade data, which does not necessarily reflect the 'productive capabilities' of a country, in part because countries don't necessarily export everything they are capable of producing and in part because of the realities of globalized production: Just because a country *exports* a given product does not mean it *produces* the whole product, or even part of it. Efforts to address these challenges (such as the OECD's Trade-in-Value-Added database) are underway but even such initiatives are hindered by the coarseness of trade data (even at the highest resolution, trade codes often do not reach product-level specificity needed) and its inability to capture the relationships of dependency and articulation between products and technologies (i.e., value chains and production networks).

Beyond the specific challenges of trade data, many have noted that prevailing economic analysis methodologies have the tendency to 'look where the light is', rather than illuminating the areas containing concrete, granular information that yields actionable policy insights. A major limitation historically has been data availability: Data providers, such as governments and multilateral organizations, generally provide aggregated and low-resolution data structured in standardized datasets that cater to a maximally generic audience. Consequently, datasets are almost never optimal for specific analytical purposes and analysts are forced to make compromises due to the substantial effort needed to create bespoke datasets from scratch.

However, the emergence of large language models has significantly reduced the time and cost of developing tailored, structured datasets that can be precisely aligned with specific analytical requirements. For example, these tools are enabling:

1. **Automatic value chain decomposition and production network characterization.** This allows researchers to break down products and technologies of interest into their full value chains and analyze the dependencies among thousands of components and associated inputs and production networks. This is essential for better understanding economic linkages, employment and value-added potential, demand dynamics and more.
2. **Automatic trade code mapping for products and their value chains.** Once decomposed, the components of value chains can be automatically mapped onto trade codes to enable analysis (however, such analysis remains hindered by the inherent limitations of available trade data noted above).
3. **Automatic trade-independent analysis of productive capabilities.** Through multi-source scraping, it is now possible to map the components of value chains to the firms capable of producing them (even if they do not export them). It is also possible to map expertise and human capital, relevant natural resources, and more.

4. **Automated large-scale interviews to better understand productive capabilities.** As noted above, qualitative approaches (e.g. interviews with firms, engineers, workers, etc.) are often the most effective way to understand countries' productive capabilities and the prospects of industrial development. AI tools now make it possible to conduct interviews at scale using large language models and to extract insights along topics that emerge from the interviews, rather than having to predefine them during the survey design stage). Such approaches allow us to produce unprecedented insights into countries' productive capabilities, and tap into the creativity and strategic vision of economic actors.

These methodologies are emergent[6] (see the i3T Productive Capabilities Data Lab for more detail on ongoing research and development in this area), but they hold promise for solving long-standing bottlenecks in the quest for more actionable industrial policy research and analysis.

Nonetheless, while all the analytical criteria and methodologies covered in this section can provide useful information to policymakers, there is also a risk to over-analyzing industrial targeting: Paralysis of analysis. Political windows of opportunity for kick-starting industrial strategy are often short, so it's important to quickly catalyze action in at least some industries to begin building strategic capabilities and build momentum for more sustained action.

IV. The 'How': The industrial policy toolbox

In its broadest sense, 'industrial policy' refers to the deployment of policy tools with the intent of influencing how societies create value—what goods (and services) they produce and how they produce them (Estevez 2023a). Table 2 **provides a 'toolbox' of different types of industrial policies, which can be deployed toward an array of industrial policy goals**, big and small.

Appendix 2 provides a more detailed overview of some of the highlights of the industrial policy toolbox —procurement, public enterprises, and public venture capital— as well as restrictions on the use of those tools in trade and investment agreements.

The relevance of each of these tools differs according to context. Economically powerful countries with highly developed industrial policy capabilities, such as China or the United States, are easily able to draw most any industrial policy tool in the toolbox. Countries with weak state capabilities, limited policy space, or low investment capacity may find it more difficult to use tools like large-scale public investment, but many governments are still able to use 'low-hanging' tools, like government procurement to generate demand for local industries. Moreover, **strengthening state capacity has generally been part and parcel of successful**

[6] The i3T-RubidiumData Productive Capabilities Data Lab is currently piloting some of these tools in the context of World Bank projects.

industrial strategy because private sector actors are often ill-suited to take on ventures that require patient capital and high risk. For example, as is often noted in the development literature, the automotive sector in Japan and Korea required decades of loss-making public investments before the national automakers succeeded in the global export market. The Japanese auto industry was established in the 1930s and became competitive in the 1970s (Chang 2007, p.20)[7]

The development of new industries requires a strategy for the development of commensurate state capacity. Historical examples are best suited to provide insights about how to best build that capacity and use the policy toolkit in different contexts,[8] but a few general guidelines stand out. These are outlined in the following section.

[7] The Japanese and Korean auto industries required decades of protection, as did Finland's Nokia (Andreoni, Chang & Estevez 2019).

[8] See, for example Amsden 1989, Wade 2004; Chang 2007 and 2002; Block 2023, 2008; Mazzucato 2013. See also Chang et al, 2016 (Chapter 4) for case studies of the industrial policy experiences of the following countries: China, Brazil, Chile, United Arab Emirates, Malaysia, Vietnam, Uzbekistan, Ethiopia, Rwanda.

Table 2. Taxonomy of Industrial Policy and Planning Tools

This table outlines a range of commonly used industrial policy and planning tools

CARROTS *Policies that support desired productive activities and practices*	1. **Public investments in strategic industries and infrastructure through:** a. **Grants** b. **Loans:** preferential loans, forgivable loans, and loan guarantees c. **Public banks** to make strategic loans and to coordinate investment d. **Public enterprises** to produce strategic necessities better suited to public sector management e. **Public equity stakes** in private/worker-owned (etc.) enterprises f. **Public venture capital** with fair risk and return sharing g. **Public-private partnerships** with private/worker-owned/etc. companies h. **Tax credits/direct pay** for producers and consumers i. **Targeted government procurement** (e.g. through the use of procurement standards that give preference to/increase demand for sustainable products, incorporation of local content, or fair labor practices) j. **Advance market commitments and strategic stockpiling/buffer stocks of critical goods** such as food k. **Targeted private procurement for publicly-supported projects**: requirements for recipients of public money through loans, grants, etc., to give procurement preferences to sustainable products, incorporation of local content, or fair labor practices l. **Investments in human capital and workforce development** supportive of investments in target industries (education, training, apprenticeships, etc.). m. **Investments in innovation**: research, development, deployment, and demonstration n. **Investments in human capital and workforce developmen**t that is supportive of target industries (education, training, apprenticeships, etc.). o. **Quality infrastructure policy** (Standards, Certification, Laboratories, etc. ***Note:*** *These "carrots can" also come with their own "sticks" attached in the form of conditionalities.*
STICKS *Policies that curb undesired productive activities and practices*	1. **Taxation** of undesirable productive activities and practices 2. **Performance standards for producers** at the industry or product level (e.g., pollution caps and reduction targets in heavy industry, agriculture, energy, etc.; price regulation; standards for transparency/ technology adoption) 3. **Trade and investment regulations** (e.g., tariffs, carbon border adjustments and pollution dumping feeds, performance requirements (such as technology transfer) for foreign investors) 4. **Financial sector regulation**, such as differentiated interest rates to increase the costs of borrowing for polluting activities/decrease the costs of borrowing for sustainable activities) 5. **Labor regulations**, such as a minimum wage, health and safety protections, protections for workers rights to organize 6. **Corporate governance regulation** to promote more equitable power-sharing (e.g., through workers representation) and accountability 7. **Antitrust regulation** to prevent/discipline concentrated economic power 8. **Nationalization, acquisition of public equity stakes**, and public management of critical industries currently being mismanaged by the private sector 9. **Enforcement and litigation** (e.g., to ensure compliance with pollution standards)
ENABLING INSTITUTIONS	1. **Planning bodies:** Institutions that fulfill industrial strategy functions (e.g. prospective research; vision-building; mission-setting; sectoral, geographic, and socioeconomic targeting of investments; and public and stakeholder engagement, evaluation, oversight, and accountability) 2. **Coordination bodies** to ensure coherence among different agencies and levels of government

Source: Adapted from Estevez 2023b

V. Key lessons and pitfalls[9]

1. There are many valid criteria for selecting strategic industries —and 'political' criteria can be just as important as 'economic' criteria

As noted above, there is no one 'right' methodology for targeting sectors. These range from, 'ecosystemic' considerations to 'economic' considerations, (like potential for demand-growth or expansion of opportunities for decent work), to 'political' considerations like the level of support that can be expected from different societal actors. Over-reliance on economic criteria can often obscure critical information such as political viability, or geopolitical shifts, which can be much more decisive in determining the outcomes of an industrial strategy.

2. Paralysis of analysis can waste windows of opportunity for industrial upgrading

In a world with an unprecedented abundance of data and analytical tools, it can be tempting to engage in a never-ending process of strategic analysis for industrial targeting. This can waste (often short) windows of opportunity for catalyzing an industrial strategy. This means that it's important to quickly kickstart industrial upgrading strategies in at least some sectors.
Low-hanging industrial policy tools, like government procurement, can help enable early action.

Furthermore, pragmatic approaches to industrial targeting that center dialogue with key stakeholders can often capitalize on collective intuition about high-potential sectors, which may integrate more useful implicit and explicit knowledge than even highly sophisticated economic analysis. This means that practice-oriented dialogues with a diversity of stakeholders (firms, workers, engineers, consumers, governments, etc.) can be an effective and relatively faster methodology for industrial targeting and industrial policy design.

3. If you target too many ‘strategic’ sectors, you do not really have a strategy

As discussed above one of the most common pitfalls of industrial policy design is the selection of too many ‘strategic’ sectors. This can be due to a nebulous and undefined vision of the country's industrial strategy or to an overestimation of state capacity. The examples of targeting exercises in Appendix I illustrate this point.

[9] Parts of this section are adapted from Estevez 2022

4. Industrial strategies can benefit from a 'diversified' portfolio composed of technologically ambitious and more accessible industries

As Hidalgo (2023) highlights, smart industrial strategies include 'diversified portfolios' that combine both ambitious and more easily accessible productive capabilities. As Chang (2009) argues, **industrial targeting involves a balancing act between realism and ambition.** Achieving this balance is particularly challenging when it comes to industrial policy design because it is not easy to judge whether the skills required to develop a particular industry stray too far from the realm of the possible. Japan's entry into the auto industry in the 1950s and Korea's entry into the steel industry in the 1960s show that ostensibly unrealistic 'big leaps' can be successful. Furthermore, **investing in new productive capabilities inherently implies risk-taking and the possibility of failure —this is true whether the investor is a country or a corporation. The key to managing risk is to design a portfolio of projects with different risk profiles (Chang, 2009).** The objective of risk-reduction also plays out at the systemic level: having a diversified export basket (and production capabilities) means that countries are less vulnerable to sudden shocks if one of their exports suddenly drops in price or is displaced by a technological innovation.

However, precisely because industrial promotion is a risky and expensive business, it is important for highly resource-constrained countries to target a manageable number of industries at a high level of specificity— *e.g.,* 'synthetic rubber' as opposed to 'petrochemicals' in general. For the same reasons, it is useful to target some less sophisticated industries for short-term promotion in order to generate the capital needed for more ambitious longer-term investments. Korea, for example, manufactured Nike shoes (Nike outsourced almost all its shoe production to South Korea and Taiwan from the late 1970s to the late 1980s), while deploying a longer-term strategy to develop competitive steel, automotive and semiconductor industries (Chang, Hauge & Irfan 2016).

The level of ambition shown by countries like Korea and the 20th century industrializers are more uncommon in recent industrial policy efforts. If we take concrete historical experiences as a guide, however, ambitious moves toward sophisticated technologies are an important part of industrial strategies that have generated fast growth and poverty reduction (see Wade, 2004; Chang, 1993; Amsden, 1989).

5. Fallacy of composition risks

As discussed above, fallacy of composition risks arise when too many countries target the same industry. This risk may be heightened currently, due to the fact that the 'return' of industrial policy has been closely interlinked with the projected growth of 'green' industries. However,

while all industrial strategies should, in principle, be 'green'[10], they need not be 'green export promotion' strategies. As outlined above, the implications of ecosystem changes posed by today's overlapping environmental crises pose both challenges and opportunities to develop new technological solutions in both domestic and international markets.

6. Failure to make full use of 'policy space'

The promotion of strategic industries can often be undermined by underuse of existing policy space and the inability to find creative ways around existing restrictions (e.g. year limits on infant industry protections). Appendix 2 shows how some key industrial policy tools used by now industrialized countries have been restricted by global trade and investment agreements and highlights existing flexibilities.

7. Lack of strategic management of class politics

Successful industrialization efforts have managed to neutralize economic elites that might oppose industrial policy. For example, South Korea's land reform in the 1940s and 1950s weakened the political power of the landlords, clearing the way for the rise of a pro-industrial policy regime in the 1960s. In the Prussian 'marriage of iron and rye', Bismarck provided protections to the landlord class (the Junkers) in exchange for their acquiescence to industrial policy measures, including tariff protection, for the emerging heavy and chemical industries (Chang, Hauge & Irfan 2016, p.49).

8. Ineffective administrative and organizational capabilities

As noted above, strengthening state capacity has generally been part and parcel of successful industrial strategy.

This ranges from developing 'enabling institutions' such as those outlined in Table 2, to developing clear command structures, institutional routines and records, and the ability to recruit and train a capable bureaucracy. On this last point, Chang et al. (2016) note that the policy-makers responsible for the success of Korea, Japan, Taiwan and China were not economists, but predominantly lawyers, engineers and scientists, whose strength was the ability to learn and to manage complex projects (for more detail see Chang, 2010, Ch. 23).

Similarly, Fred Block (2008) has highlighted the role of 'brokers' —people specialized in connecting and coordinating strategic actors— as critical to eliminating bottlenecks and translating strategy into concrete action.

[10] We mean 'green' in the sense of 'aiming to advance ecological sustainability.' For a longer discussion see Estevez and Forero 2025.

9. Lack of ideological flexibility and policy imagination

The realm of policy imagination can be greatly expanded when policy-makers are willing to think outside the confines of ideological doctrine. A prime example of policy flexibility can be found in Singapore, which combines some quintessential 'free-market' features, like an open trade and investment regime, with quintessential 'socialist' features: state-owned enterprises account for 22% of its GDP, 90% of land is publicly owned and 85% of housing is provided by the government Housing Development Board (Chang, et al. 2013; Chang et al. 2016). Rather than aiming for a coherent ideological-political model, in the face of complex realities it is often preferable to embrace the "productivity of incoherence" (Grabel, 2017).

Beyond ideological flexibility, expanding 'policy imagination' also entails fostering innovative capacity and creativity —the ability to imagine rules, institutions, projects and other policy interventions that significantly change (rather than merely tweak) existing policies, whether by reviving old, perhaps forgotten policies or by inventing new ones. This kind of path-breaking creativity is particularly necessary when profound structural transformation is required or in the case of economic emergencies. Ecuador's experience with 'quantitative easing for the people' (Weisbrot et al. 2017), during the 2010s commodity crash, for example, was a creative, completely unprecedented initiative that gave Ecuador's economy an unlikely degree of resilience in the face of recession. This innovative policy initiative contrasted sharply with the government's approach to industrial policy**,** which consisted of more minor policy modifications and yielded commensurately more minor economic results.

Finally, no matter what industries are chosen, industrial promotion often needs to be aggressive and sustained. For example, France's industrial policy heritage goes back at least to the time of Louis the XIV, but since then it has continued in various forms. From the 1950s to the 1980s France implemented very similar industrial policy to that of the East Asian countries, using indicative planning, directed credit (including through its many state-owned banks), and a state-owned enterprise (SOE) sector that accounted for around 15% of its GDP (Chang, Hauge & Irfan, 2016). Even before the rise of new, high-profile industrial policy action (IRA, etc.), wealthy countries have maintained strong industrial policies through strategic, focused investments in research and development (Mazzucato, 2013; Block, 2008) that ensure their technological lead by increasing barriers to entry for potential competitors. The United States' Defense Advanced Research Projects Agency (DARPA), the Advanced Research Projects Agency—Energy (ARPA-E) or the National Institutes of Health (NIH) (one of the world's foremost medical research centers), are but a few examples (Estevez 2022).

Given today's policy space constraints, policymakers—particularly from countries that do not occupy strong economic and geopolitical positions in the global economy— have to be exceptionally creative to execute ambitious and sustained industrial strategies.[11]

[11] For example, the WTO allowance of eight years for infant industry protection is minuscule compared to the periods of protection that have historically been required to develop competitive industries, like the Japanese and

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Appendix 1. Illustrative examples of industrial targeting methodologies and exercises

USAID industrial targeting exercise

In Ecuador during the 2010s, the Coordinating Ministry of Production, Employment and Competitiveness (MCPE) relied on a 2009 industrial targeting study commissioned from the United States Agency for International Development (USAID). The study selected ten broad sectors for industrial promotion that largely conformed to the country's existing comparative advantage. The recommendations were too generic to be actionable.

The study comprised three phases, implemented from 2007-2008:

Phase I. was aimed at defining a broad list of potential sub-sectors through interviews, international studies, and local studies by government agencies. Three criteria were contemplated:

1. Impact on employment
2. Potential to generate foreign exchange; and
3. Short-term economic impacts

This phase yielded a list of twenty sub-sectors, which were then reduced in Phase II, based on quantitative data on investment, production, exports, productivity of the sub-sector, employment and qualitative data, and their consistency with the National Development Plan. The criteria contemplated in Phase II were:

1. Availability of information
2. Competitive pattern of the sector (current and potential development of ‘clusters’)
3. Comparative advantage
4. Job creation
5. Generation of foreign exchange
6. Current participation in foreign trade

The analysis yielded three sets of sub-sectors:

1. ‘Star’ Traditional Sub-sectors: food commercialization, fish and products derived thereof, aquaculture, flowers, processed fruits and vegetables, forestry
2. ‘Star’ Non-traditional products: software, metallurgy, consultancy services
3. Other recommendation: Tourism

Korean Center for International Economic Studies (CIES)

Ecuador's 2009-2013 National Development Plan of Ecuador included a selection of fourteen sectors for industrial development. Some of these were chosen primarily for their import-substitution potential: petrochemicals, bio-energy and biofuels, metalworking, biomedicine, pharmaceuticals, biochemistry, hardware and software, and environmental services. Others were chosen based on their potential for generating employment and satisfying basic needs: construction (especially social housing), fresh and processed foods, artisanal fishing, community tourism, textiles and foot-ware (SENPLADES 2009, p. 96).

In order to further specify and narrow down the list of industrial sectors, SENPLADES requested the technical assistance of the Center for International Economic Studies (CIES) in Korea. The new list was devised through modeling on the basis of (i) demand-side factors; (ii) supply-side factors ; and (ii) dynamic comparative advantage; (iii) industrial interlinkages were also identified as an important selection criterion for further studies on priority sectors, but the absence of detailed input-output tables at the time made it impossible to take this variable into account.

Table 3. CIES Strategic Sectors (2012)

	Criteria	Selected sectors
Demand-side factors	Global demand	Processed metal products, fresh and processed foods (grain mill products, animal/vegetable oils and fats, dairy products, etc.), biochemicals, bio-medicine, technology: hardware
	Regional demand	Fresh and processed foods (cattle, sheep, goats, horses, mules, dairy farming, bakery products), apparel and footwear (wearing apparel, except fur apparel), processed metal products (tanks, reservoirs, metal containers, structural metal products)
	Domestic demand	Motor vehicles, basic iron and steel, bio-medicine, petrochemicals, fertilizers and nitrogen compounds, soap, cleaning and cosmetic preparations, other food products, general purpose machinery
	Value-addition potential	Processed metal products, dressing & dyeing of fur, TV/Radio transmitters, general purpose machinery, other electrical equipment, motors
	Employment-generation potential	Fresh and processed foods (grain mill products, other food products, wearing apparel, except fur apparel, processed metal products
Supply-side factors	Industrial linkage	(Further information needed for analysis, such as input-output tables)
	Resource endowment	(Resource) Processed metal products, fresh and processed foods, biochemical, petrochemical

		(Labor) Processed metal products, processed wood products, apparel and footwear, petrochemical
Dynamic Comparative Advantage	Current competitiveness Export-connectedness	Apparel and footwear, petrochemical, fresh and processed foods, processed wood products
Source: CIES, 2012		

Thirty-seven sub-sectors were considered within the nine manufacturing industries already defined in the PNBV. The results are summarized in Table 4.

Based on the above analysis, the study makes an important contribution by proceeding to specify sectors according to time horizons , prioritizing 'focused assistance' to relatively well-performing industries in the short-term and more ambitious industries in the medium and long terms (Table 4).[12]

The sectors selected for the short term were chosen for their potential to contribute to quickly establishing a critical mass of export industries. The indicators used to determine their potential were:

1. The existence of sufficient demand from the global markets
2. Promising demand prospects in the regional and world markets
3. The level of technological intensity required to promote exports.

The products within the fresh and processed food sector were prioritized for the short-term strategy because they met the first two criteria and because of their potential to create employment. The 'apparel and footwear' and 'processed wood' products were selected because they met the third criterion (although they have limited demand prospects). The middle-term sectors were selected based on (i) their potential to contribute to transforming Ecuador's "production structure towards capital/technology-intensive products" rather than exclusively resource-intensive ones, and (ii) promising demand prospects. Finally, for the long-term strategy, several sectors and products were selected because of their (i) high levels of technological intensity, (ii) strong domestic demand prospects, and (iii) a certain degree of value-adding

[12] This section also highlights two principles of policy implementation drawn from Korea's own industrial policy experience (i) Principle of performance-based assistance: "In an early stage of industrialisation process, it is necessary to establish a critical mass of export industries, which requires focused assistance to relatively well performing export industries. In doing so, policy makers need to set up not only performance goals of export performance but also 'goals of policy measure implementation' by related government agencies"; and (ii) Principle of first best policy: "While there exist as many policy measures as policy makers want to utilise, policy implementation should begin with identification of challenges that matter most. It makes it possible for policy makers to effectively design policy measures directly addressing the challenges facing the priority industries for export promotion (CIES 2012, p. 61). The first best policy principle should include regular review of challenges and modification of policy measures as well as creation of new ones."

potential. All the specific products selected within the technology (hardware), motors (motor vehicles) and bio-medicine sectors met the three criteria (CIES 2012, pp. 61-63)

Table 4. CIES selection of prioritized sectors by time horizon

Time horizon	Sector	Subsectors
Short-term	Fresh and processed food products	Grain mill products, animal/vegetable oils and fats, dairy products, other food products
	(Apparel and footwear)	(Wearing apparel, except fur apparel) (Dressing, dyeing and processing fur)
	(Wood products)	(Pulp, paper and paperboard)
Medium-term	Processed metal products	Tanks, reservoirs, metal containers, basic iron and steel, other general purpose machinery
	Petro-chemical	Plastic and synthetic rubber
	Bio-chemical	Fertilizers and nitrogen compounds; Soap cleaning and cosmetic preparations
Long-term	Technology (Hardware)	TV/Radio transmitters, line comm. apparatus; other electrical equipment not elsewhere classified (n.e.c.)
	Motors and motor vehicles	Motor vehicles
	Biomedicine	Pharmaceuticals, medical chemicals and chemical products

Source: CIES, 2012

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Economic Commission for Latin America (ECLAC) Industrial Targeting Exercise

During the 2010s, the Economic Commission for Latin America and the Caribbean (ECLAC) developed recommendations for industrial targeting for Ecuador.[13]

The first step in the selection process involved the identification of thirteen sectors based on:

1. **Potential to exploit existing comparative advantage in the agroindustrial sector**, with the aim of building competitive advantages:
    a. Products processed from cacao and coffee; dairy; mariculture
2. **Potential to reduce external dependence**, through the promotion of basic industries:
    a. Petroleum derivatives; metallurgy; pharmaceuticals; rubber and plastic; forestry; cellulose; paper.
3. **Potential to develop knowledge and innovation-intensive activities with high growth potential in the world economy**:
    a. Tourism; software and ICTs; logistics; environmental services

The government expanded and prioritized value chains in the agroindustrial sector and further specified metalworking. The forestry chain was revised, textiles were added, and tourism and software/ICTs were removed (though the latter could still be considered under the new category of 'knowledge-intensive services'). Though the government's official list of prioritized sectors included 25 prioritized sub-sectors and chains, it is difficult to say that it carried out a real targeting exercise in the publicized planning process.

However, in practice there appears to have been a *de facto* prioritization of 'basic industries'[14] (shipyard, flat steel, pulp, aluminum, copper, petrochemicals), and a revised, more precise list of 'intermediate and final industries' closely related to the basic industries (tubes (with and without seams), valves, transformers, cables, and pumps).

The basic industries were selected on the basis of the following criteria:

1. **Potential to generate productive linkages with the extractive sector** (metal and non-metal mining, oil and forestry)
2. **Potential to stimulate new industries**, benefitting, for example, the metallurgy, packaging, forestry, naval, and fishing industries
3. **Potential for import substitution**. (The trade balance for the steel, aluminum and chemical industries was about -$1.2 billion per year on average 2000-2015)

[13] For more detail see Estevez 2022
[14] For more details see Estevez 2022

Industrial targeting for government procurement exercise

'Strategy for National Procurement' (2015), authored by the Coordinating Ministry of Strategic Sectors of Ecuador, with input from Bain & Co.

The government's Strategy for Productive Transformation through National Procurement (2015) had various components. This appendix only discusses its industrial targeting approach.

The methodology for industrial targeting had four phases:

1. Consumption analysis: Ecuador's current and estimated future consumption.
2. Import/export analysis: Production potential and export/import 'references'
3. Government procurement: How much of total demand is accounted for by the public sector?
4. Strategy: What is the development plan? What is the immediate impact on the local economy?

Based on these considerations, six products are prioritized for the procurement strategy: seamless tubes, tubes with seams, cables, transformers, valves and pumps. Rationale for selection of these products and prospects by 2025:

1. Seamless tubes: These tubes use DRI and scrap metal as inputs (all these products use inputs from the prioritized basic industries). Ecuador satisfies local demand for seamless tubes completely through imports. It was estimated that Ecuador could reduce its imports by 75% and become an exporter by substituting imports in SOE procurement.
2. Tubes with seams: These use flat steel as an input. Ecuador was almost self-sufficient in this product, yet SOE procurement was 100% imported. It was estimated that total imports could be substituted by about 60%.
3. Valves: These use flat steel as an input. 90% of valves were imported and demand for these products continued to grow. 98% of SOE procurement was imported. It was estimated that Ecuador could reduce its imports by about 34% and duplicate its exports.
4. Transformers: These use flat steel as an input. Domestic demand was 50% imported; 97% of SOE procurement was imported. Imports could be decreased by about 20% and exports could be increased by about 30%.
5. Cables: These use copper, aluminum and polymers (that could have potentially been manufactured locally upon the completion of the Refinería del Pacífico). Ecuador produces cables, but 70% of domestic demand was satisfied by imports in 2016. SOE procurement was 74% imported. This could have been substantially reduced (to about 28%).
6. Pumps: These use flat steel as an input. 70% of pumps were imported. 98% of SOE procurement was imported. It was estimated that Ecuador could decrease imports by $400 million and increase exports by $100 million.

IngeniaTEC - Electronic catalog for innovation and technological development

Authored by the Secretariat of Higher Education, Science and Technology (SENESCYT), the Coordinating Ministry of Knowledge and Human Talent (MCCTH) and the Government Procurement Service (SERCOP), 2015.[15]

Summary: This initiative constituted a first step toward import substitution through public procurement. The first contest was launched in 2016. National companies (whose projects had obtained an endorsement from a higher education institution) competed for a 5-year Advance Market Commitment contract to supply different products to the public sector. The main objectives of Ingeniatec were (i) To contribute to Ecuadorian productive transformation; (ii) To achieve import substitution of those products for which the country has already the productive capacity; (ii) To avoid capital outflow (ii) To save $370 million through the import substitution of 43 products. The criteria used for selecting the products were:

Criteria	Weight
Procurement amount	(0.40)
Frequency of purchase	(0.20)
Feasibility of technological disaggregation	(0.20)
Feasibility of technological assimilation	(0.05)
Industry or sector prioritized by the country	(0.15)

27 products were chosen for the first contest, which took place in October, 2016. The selection criteria for providers were the following:

Parameter	Weight (points)
Design evaluation	5
Production, quality management or environmental certificates	10
Value added of the prototype	10
Optimal level of productive linkages for serial production	10
Incorporated Ecuadorian value added (VAE) in a 5-year horizon	10

[15] For greater detail on methodology, see Estevez 2022.

Minimum present investment effort required for a production increase of 50%, 100% and 200% with the same VAE of the prototype	25
Minimum investment, in the fifth year, required for a production increase by 50%, 100% and 200% with increased Ecuadorian Value Added	25
Total	100

The chosen providers were granted a market reserve contract through a framework agreement.

Sectors selected for first IngeniaTEC contest in 2016:

Phototherapy lamps, Standing valves, Transformer with voltage above 5 MVA, Digital multimeters, Sterilizers, Blanking bypass plugs, Phonendoscopes, Tractors, Elevator, Blender valves, Digital scales, Sorting machines and threshers, Hospital beds, Jet pumps, Printers, Biometric clocks, Flash drives, Bridge plug cups (for sealing), Printer toner, Water purifiers, Intensive care cribs, Other 13 products for oil production, IP (Internet Protocol) Telephones, Air compressors, Generators, Stop lights, Glucose meters.

Appendix 2. Industrial policy tools, policy space restrictions and flexibilities

Some highlights from the industrial policy toolbox (Table 2) include:

1. Procurement

Composing at least 12 percent of GDP (or $11 trillion) globally (and in some cases much more at the national level), public procurement remains one of the most powerful instruments in the industrial policy toolbox and the lowest-hanging fruit of industrial strategy. Procurement policy presents a unique opportunity for efficiency: It can transform public money allocated for regular government purchases into strategic investments used to stimulate and develop domestic industries. For example, policies like Buy American in the United States **support domestic heavy industries and jobs** by setting domestic content requirements for public purchases of products like cement and steel for the construction of roads, bridges and other infrastructure projects. Similar 'buy-national' legislation exists in Great Britain, France, Germany, and Japan, among others.

Governments also use procurement to stimulate the **ecological transformation of industries**. For example, Policies like Buy Clean in California, and more recently the federal Buy Clean initiative in the United States have been used to strengthen demand for relatively cleaner heavy industry products. Procurement policies can also be used beyond the heavy industry sector t**o stimulate demand for more sustainable food, furniture, clothes and textiles, appliances, minerals, and sustainable housing design** —any product or service that governments purchase.

Governments can also **require *private sector* recipients of public funds to use procurement standards**. For example, the Build America-Buy America (BABA) Act in the US establishes domestic content procurement preferences for all federal financial assistance allocated for infrastructure projects. It requires that all iron, steel, manufactured products and construction materials in covered infrastructure projects are produced in the United States —whether or not the materials are purchased by the government.

They can also be used to **catalyze technological transfer from foreign to domestic producers** in exchange for access to national procurement markets. **Advance Market Commitments (AMCs),** for example, are a type of procurement policy that seeks to solve the problem of uncertainty of demand through inter-temporal demand aggregation. Through advance market commitments, or long-term contracts, governments or private purchasers commit to purchasing the products from companies that make socially desirable goods for a set period, quantity and/or price, lowering uncertainty and risk for producers. Such mechanisms are especially important for nascent industries —and especially many green industries which have high upfront capital expenditures and low profitability. Advance market commitments are commonly used in industrialized countries (especially in the pharmaceutical sector), as well as in developing countries.

Procurement clubs, in which governments and/or private purchasers aggregate their procurement power to purchase socially desirable goods, are another means of solving for uncertainty and scale of demand. These instruments are also often used to create oligopsony power as a counterbalance to oligopoly power held by firms in highly concentrated industries like pharmaceuticals. This often yields fairer pricing and more equitable access to essentials. Successful experiments with pooled procurement abound (see Estevez et al. 2025 for more detail on procurement clubs).

2. Public enterprises, public equity stakes, public holding companies

Public enterprises typically produce 10-15 percent of national output (more in countries like Taiwan and Singapore) (Chang, 2011 and 2010). While neoliberal conventional wisdom tends to malign public enterprises, empirical studies have not corroborated the idea that private enterprises are more effective or efficient or that economies with large public enterprise sectors are less economically successful (Chang and Grabel 2004, p.88). Furthermore, research shows that managers in private firms often seek to maximize stock price to the detriment of the long-term interests of the firm and the broader economy — especially when they are compensated with stock options (Chang and Grabel 2004, p.85; Palladino and Estevez 2022). These pressures are particularly strong in the context of the green transition, where 'green' firms often suffer from lower profitability than highly polluting competitors (Christophers, 2024; Bozuwa et al. 2024) —not least due to the endurance of regulatory frameworks that fail to price in the cost of environmental externalities.

In this context, the green transition can benefit from broader use of public enterprises, which have been a frequent feature in historical cases of economic transformation. For example, in France, Austria, Finland, Norway and Italy, a dynamic public enterprise sector played a key role in industrial development and was correlated with strong growth in per capita income. The most successful economies in East Asia —Taiwan, Singapore and South Korea— also had large public enterprise sectors. Notably, Korean state-owned steel producer POSCO became the most successful producer in the world just ten years after it was established in the early 1970s (Chang and Grabel 2004, p. 87). Public enterprises can also dynamize competition in concentrated sectors. For example, in France, the auto manufacturer Renault, which was nationalized after World War II and remained an SOE until 1996, competed with Peugeot and foreign producers. During the 1980s, South Korea had two state-owned telephone companies that competed vigorously with one another (Chang and Grabel 2004, p.86). China fosters vigorous competition among its state-owned enterprises (Chan 2022).

Today, public enterprises are also leading the way in some sectors of the green transition. Sweden's SSAB (which is majority publicly owned), for example, has pioneered the first steel production facility capable of reaching almost completely decarbonized production. SSAB's

planned investment in the US (backed by an IRA grant) will also be the cleanest investment in the steel industry locally (Estevez et al. 2024).

Many public enterprises, like SSAB, are not *wholly* owned by governments. Instead, it is common for governments to hold 'Golden Shares' or other substantial equity stakes in an array of strategic industries. Public holding companies can own shares in a diversified portfolio of strategic companies. For example, Singapore's Temasek Holdings, whose sole shareholder is the Singapore Ministry of Finance, owns 100% or majority stakes in local power, technology, engineering, and telecommunications companies, and a 57 percent stake in Singapore Airlines, often voted the best airline in the world (Chang 2007b, p.8).

These kinds of ownership structures allow governments to shape decision-making in line with public interest goals, while sharing risks and rewards with private sector actors. This helps prevent unfair distribution of risks and rewards between the private sector and the public —a common flaw in today's industrial policies, which often use public funds to de-risk private investment but do not allow the public to benefit on future potential profits (think Tesla).

3. Public venture capital

In both developing and developed country contexts, patient, long-term investments and public venture capital are essential to the development of new strategic industries. For example, as is often noted in the development literature, the automotive sector in East Asia required decades of loss-making public investments before the national automakers succeeded in the global export market. The Japanese auto industry was established in the 1930s and only became competitive in the 1970s (Chang, 2007, p.20). Similarly, Finland's Nokia required decades of protection (Andreoni, Chang & Estevez, 2019). (Unfortunately, this kind of decades-long fostering of new industries is now hindered by WTO rules which limit protection of nascent industries to eight years (Chang, 2007, p.20)). In the US, public venture capital has been a key component of industrial strategy. In the tech sector, for example, companies like Compaq and Intel benefited from early-stage funding from the Small Business Innovation Research (SBIR) scheme, which has historically provided more early stage high-risk finance to SMEs than private venture capital (Keller and Block, 2012; Mazzucato and Semieniuk, 2017, p.4).

Drawing broader lessons from past technological revolutions (e.g. IT, biotech, nanotech), Mazzucato and Semieniuk (2017, p.5) summarize the role of public venture capital in innovation: "While it is a common perception that it is private venture capital that funds start-ups, evidence shows that most high-growth innovative companies receive their early stage high-risk finance from public sources, such as Yozma in Israel (Breznitz and Ornston, 2013); venture funds in public banks (Mazzucato and Penna, 2016); and the SBIR programme funds in the US (Keller and Block, 2012). Venture capital entered the biotech industry mainly in the late 1980s and early 1990s, meanwhile the State had already made most large-scale investments in the 1950s and 1960s (Lazonick and Tulum, 2011; Vallas et al., 2011)."

Table 5. Industrial policy tools restricted in World Trade Organization rules and WTO+ trade and investment agreements[16]

Industrial policy tool	Restrictions in WTO and other trade and investment agreements
Procurement policy, such as preferential treatment of domestic firms or of foreign providers willing to transfer technology or incorporate rising levels of local content	The WTO Agreement on Government Procurement restricts these measures, but most developing countries are not signatories. However, many "WTO plus" bilateral and multilateral trade and investment agreements also restrict these procurement policy measures (e.g., the USMCA and EU-EPAs categorically prohibit them).
Infant industry protections, such as tariffs, quotas, and market set-asides for domestic producers	WTO member countries are all required to implement an upper limit on at least some of their tariffs. In the Doha Round of Non-Agricultural Market Access negotiations, industrialized countries pushed to bind and slash all unbound tariffs. The General Agreement on Tariffs and Trade (GATT), Art. XVIII, allows developing countries with low standards of living to temporarily raise tariffs to promote the establishment of a particular industry, but this requires difficult negotiations, approval of WTO members, and compensation through other tariff reductions. Furthermore, the time frame allowed (8 years) is very short relative to historically effective time frames for infant-industry protections.[17] For example, the automotive sector in Japan and Korea required decades of loss-making public investments before the national automakers succeeded in the global export market.[18]
Subsidies for key industrial sectors to promote high-value-added industries and exports	The WTO's Agreement on Subsidies and Countervailing Measures (SCM) considers subsidies trade-distorting measures and prohibits any sector-specific subsidies as well as subsidies for export promotion and for enforcing the use of local content in manufacturing. It also prohibits *indirect* subsidies through intra-private sector transfers facilitated by government regulation. In practice, however, subsidies can be used until they are challenged or countervailed. Subsidies for R&D, regional balances, and environmentally friendly technologies are 'actionable' but have seldom been disputed, in part

[16] Adapted from Estevez, "Multi-Solving, Trade-Offs, and Conditionalities in Industrial Policy"; Andreoni, Chang, and Estevez, "New Global Rules"; and Ha-Joon Chang, Jostein Løhr Hauge, and Muhammad Irfan, "Transformative Industrial Policy for Africa," UN Economic Commission for Africa, April 2016, https://archive.uneca.org/sites/default/files/PublicationFiles/tipa-full_report_en_web.pdf.
[17] Ha-Joon Chang, *Globalisation, Economic Development, and the Role of the State (*Zed Books, 2002).
[18] The Japanese and Korean auto industries required decades of protection, as did Finland's Nokia (Andreoni, Chang, and Estevez, "New Global Rules"). The Japanese auto industry was established in the 1930s and became competitive in the 1970s (Ha-Joon Chang, *Bad Samaritans: The Guilty Secrets of Rich Nations and the Threat to Global Prosperity* (Random House Business, 2007)).

	because developed countries often use them. Least Developed Countries are permitted to use export subsidies under certain conditions but are not exempted from countervailing measures from trading partners.
Creation of state-owned enterprises (SOEs) to kick-start new industries	The use of SOEs is not directly affected by WTO agreements. However, tariff cuts in the GATT and market-access and national-treatment requirements in the General Agreement on the Trade of Services (GATS) – Mode 3 (commercial presence) can be fatal for SOEs. That undermines the ability of states to use SOEs to bolster local industry (e.g., by buying goods or services from domestic producers) or supplying services to those industries at a subsidized rate)
Capital controls and capital outflow taxes to prevent capital flight and encourage savings to remain in the country, thereby facilitating productive investments (including investments in R&D)	There are restrictions to capital controls under GATS and the Trade-Related Investment Measures Agreement (TRIMS); however, violations of the rules can only be challenged in a dispute if a member country initiates state-state arbitration. WTO+ agreements are much more restrictive. US Bilateral Investment Treaties (BITs), for example, require that US firms be allowed to freely transfer payments in and out of host countries without delay.
Performance requirements, such as requirements that foreign investors incorporate local content/workers or engage in joint ventures and technology transfer	The TRIMS constrains local content requirements but not conditions for joint venture and transfer of technology. The activities covered by the GATS – Mode 3 (services delivered through commercial presence) are subject to fewer restrictions than those covered by the TRIMS. WTO+ agreements increase restrictions on performance requirements (e.g., US BITs strictly prohibit all performance requirements).

Source: Estevez (2022); adapted from Andreoni, Chang, & Estevez (2019), and analysis from Chang, Hauge & Irfan (2016)